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19 April 2019

Mr. Payson Long, P.E.
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7011

RE: Operable Unit 5 Remedial Investigation/Feasibility Study Work Plan
Contract/Work Assignment No: D007624-33
Site/Spill No./Pin: Dzus Fastener Company, Inc., West Islip, New York (152033)

Dear Mr. Long:

This Letter Work Plan describes the activities proposed for a Remedial Investigation (RI) and Feasibility Study (FS) for Operable Unit 5 (OU5) of the Dzus Fastener Company, Inc. site (152033). The site is located at 425 Union Boulevard, West Islip, New York, Suffolk County, as shown on **Figure 1**. Dzus Fastener Company produced fasteners and springs at the site between 1936 and 2015. Wastes from metal plating, tumbling, electroplating, chromic acid, anodizing, and special finishing operations consisted of oils, heavy metals, and salts. The site description and history has been fully documented in several past reports, including the Remedial Investigation Reports for OU3[1] and OU4[2]. Willetts Creek and Lake Capri are currently in the remediation phase, with construction planned to begin in 2019.

OU5 encompasses the tidal area of Willetts Creek and the surrounding floodplain (**Figure 2**). EA Engineering, P.C. and its affiliate EA Science and Technology (EA) will be conducting a RI/FS to meet the specific objectives outlined in the Work Assignment (WA) Amendment Approval letter dated 12 March 2019. The goals of the RI/FS are to define the nature and extent of cadmium and chromium contamination in tidal area sediments of Willetts Creek, and adjacent floodplain soils, and evaluate potential remedial alternatives.

This Letter Work Plan, in conjunction with EA's Generic Field Activities Plan (EA 2011)[3] (**Attachment A**), will provide the basis for conducting the field activities in the tidal area of Willetts Creek and adjacent residential properties. The protocol and procedures for this RI will be conducted in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2010)[4]. A site-specific Health and Safety Plan (HASP) Addendum and site-specific Quality Assurance Project Plan (QAPP) Addendum are provided as **Attachments B and C**, respectively.

[1] *Remedial Investigation Report, Dzus Fastener Company, Inc. (152033), Operable Unit 3 – Willetts Creek Area*. 2017
[2] *Remedial Investigation Report, Dzus Fastener Company, Inc. (152033), Operable Unit 4 – Lake Capri*. 2018
[3] EA. 2011. *Generic Field Activities Plan for Work Assignments under NYSDEC Contract D007624*. April.
[4] NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

The following tasks will be completed as part of the RI/FS for OU5:

- **Task 1** – Project Setup/Administration and Document Review
- **Task 2** – RI/FS Work Plan, Sampling, and Laboratory Analysis
- **Task 3** – RI Report
- **Task 4** – FS Report.

A summary of each task and further details of the field activities are provided in the following sections.

1. PROJECT SETUP/ADMINISTRATION AND DOCUMENT REVIEW (TASK 1)

EA obtained and reviewed available historical and/or background information (documents, photographs, maps, etc.) provided electronically by NYSDEC, as well as reports previously completed by EA.

2. REMEDIAL INVESTIGATION WORK PLAN, SAMPLING, AND LABORATORY ANALYSIS (TASK 2)

The primary focus of the RI is to evaluate the extent of contamination in the tidal area of Willetts Creek and the adjacent floodplain. This area was formerly part of OU4, and sediment samples were collected from the tidal area of Willetts Creek during the OU4 RI conducted in December 2017 and May 2018. Cadmium and chromium concentrations were compared to the NYSDEC Sediment Guidance Values (SGVs) for Class A saltwater sediment. Concentrations below the Class A threshold are considered to present little or no potential for risk to aquatic life (NYSDEC 2014).[5] Concentrations of cadmium exceeded the Class A SGV of 1.2 milligrams per kilogram (mg/kg) at 34 of the 48 sample locations, at depths up to 48 inches (in.) below the sediment surface. Chromium was detected above the 81 mg/kg SGV at 15 of the 48 sample locations, at depths up to 36 in. below the sediment surface. Since the extent of cadmium and chromium in OU5 has not been delineated, the OU5 RI will continue where the previous investigation left off, expanding the horizontal and vertical extent of the sediment sampling area.

The overall activities to be conducted will include the following:

- ***Sediment Sampling*** – Sediment will be collected to delineate the nature and extent of cadmium and chromium contamination in the tidal area of Willetts Creek. A subset of samples will be analyzed for other contaminants and geotechnical parameters.

- ***Surface Water Sampling*** – Surface water samples will be collected and analyzed for cadmium and chromium.

- ***Floodplain Soil Sampling*** **–** Soil will be collected from select residential properties adjacent to the tidal area of Willetts Creek, and analyzed for cadmium, total chromium, and hexavalent chromium.

[5] NYSDEC. 2014. *Screening and Assessment of Contaminated Sediment.* June.

- ***Hydrographic Survey*** – A single-beam and side-scan sonar survey of the Willetts Creek tidal area sediment surface and shoreline structures will be conducted.

- ***Data Validation/Determination of Usability***—An independent third-party data validator will review analytical data generated during this investigation.

- ***Qualitative Exposure Assessment***—EA will conduct a Qualitative Human Health Exposure Assessment in accordance with DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 3B (NYSDEC 2010).[4]

2.1 REMEDIAL INVESTIGATION FIELD ACTIVITIES

The following sections provide the data types to be obtained during the field activities along with the number, types, and locations of samples. The field sampling procedures and protocols, number of environmental samples to be collected from each media, as well as the quality assurance (QA)/quality control (QC) procedures, are provided in the site-specific QAPP Addendum provided as **Attachment C** to this Letter Work Plan. In addition, field investigation activities will be conducted in a manner consistent with the EA Generic HASP developed for WAs conducted under Standby Contract No. D007624 (EA 2011)[6]. A site-specific HASP Addendum has been developed to address work items related to this investigation and is provided as **Attachment B** to this Letter Work Plan. Daily field reports will be completed for each day field activities are conducted and will be submitted to the NYSDEC Project Manager via e-mail. A copy of the Daily Field Report form, as well as blank field forms, are provided in **Attachment D**. Copies of sampling forms used during the field activities will be submitted to NYSDEC as part of the final report. Field and sampling procedures will be photographically documented.

Sediment, soil, and surface water samples will be submitted to Con-Test Analytical Laboratory located in East Longmeadow, Massachusetts, for contaminant analysis. Geotechnical samples will be submitted to Chemtech in Mountainside, New Jersey. Samples will be placed in appropriate sample containers, sealed, and submitted under standard chain-of-custody procedures. The samples will be labeled, handled, and packaged following the procedures described in the EA Generic QAPP (EA 2011)[7] and site-specific QAPP Addendum (**Attachment C**). QA/QC samples will be collected at the frequency detailed in the EA Generic QAPP, QAPP Addendum, and Table 1 of the QAPP Addendum. Daily Field Reports to be completed during sample collection activities are included in **Attachment D** to this Letter Work Plan.

2.1.1 Sediment

Sediment samples will be collected from each of the 90 locations shown on **Figure 3**, and from two background locations (**Figure 4)**. EA's subcontractor (Aqua Survey, Inc. [ASI]) will utilize a pontoon sampling vessel to navigate to each proposed location. EA will contact Dig Safely New York prior to the start of sampling work.

[6] EA. 2011. *Generic HASP for Work Assignments under NYSDEC Contract D007624.* October.
[7] EA. 2011. *Generic QAPP for Work Assignments under NYSDEC Contract D007624.* October.

2.1.1.1 Precision Navigation and Positioning

Precision navigation and positioning will be provided utilizing a Global Navigation Satellite System (GNSS) Differential Global Positioning System (DGPS) capable of resolving the position of the antenna at an accuracy of ±3 meters at a rate of up to 10 hertz in autonomous (or standalone) mode. To enhance the positional accuracy of the DGPS receiver, corrections for the satellite positioning data will be received in real time through a subscription to the KeyNetGPS Virtual Reference Station (VRS) Network (http://www.keynetgps.com) or to the New York State Spatial Reference Network (NYSNET). KeyNetGPS/NYSNET provides information derived from the National Geodetic Survey Continuously Operating Reference Station Network and serves corrections for GPS satellites via the internet. A broadband cellular modem allows the GPS receiver to interface directly with the VRS network and derive corrections to the satellite positioning information in real time. Following the application of the VRS corrections, the positional information generated by the roving GPS receiver unit will yield position fixes with a geodetic accuracy of 2 centimeters (cm) in the horizontal plane and 5 cm in the vertical plane.

The validity of the VRS correctors, geodetic model, and overall performance of the GPS receiver unit will be verified via cross-check comparisons at a National Geodetic Survey (NGS) benchmark. The benchmark will be occupied at the start of the field effort, at the conclusion of the field effort, and whenever the configuration of positioning equipment is modified to ensure the GPS receiver is properly configured and the geoid model is being applied to the positioning data received.

In addition to the GPS unit, Hydrographic Survey and Processing Software (HYPACK) will serve as the basic primary survey management system, logging time, position, and depth data throughout the survey effort. In addition, HYPACK provides a helmsman display which allows the vessel operator to navigate the vessel along the survey line or to the sampling location. The real-time positioning information provided by the GPS receiver will be ported directly to HYPACK running on a laptop computer via a serial connection.

Some of the proposed sampling locations may be modified in the field due to proximity to docks, bulkheads, or other infrastructure. Once on station (within 10 ft), the vessel will be immobilized using spuds or anchors. The target depth at each sample location is 6 feet (ft).

2.1.1.2 Sediment Sample Collection

At each sampling location, water depth will be recorded in feet (to the nearest tenth of a foot) prior to sediment sampling using the vessel's fathometer. Water depths will be converted to bed elevations referenced to the North American Vertical Datum of 1988 (NAVD88).

A vibracore sampling system will be deployed from the sampling vessel. A steel sample barrel fitted with a 4-inch diameter cellulose acetate butyrate (CAB) liner will be advanced into the sediment at each location. An electric winch will be used to retrieve the sample barrel. The estimated depth of core penetration into the sediments will be measured and recorded. Once the sample is on deck, care will be taken when removing the core tube to prevent the loss of collected sediment. The CAB liner will be extracted from the steel barrel, securely capped and taped on both ends, labeled, and sediment recovery will be measured. For the vibracore samples, the amount

of sample recovery will be measured from the bottom of the core to the top of the sediment using a tape measure (this measurement will not include material present below the core catcher, if present). If core recovery (where core recovery is equal to the core length divided by the depth of penetration) is less than 70 percent, one additional attempt will be made to collect a more complete core at the same location. If enough sediment has still not been recovered, EA in consultation with NYSDEC will decide whether to use the core with the highest recovery or change the sampling location. If a core with poor recovery is collected for processing, it will be documented in the field logbook, and limitations on the usability of data will be assessed as part of the analysis of data from the location. A sediment volume of 20 ounces (approximately three inches of sediment in the core) is required for the suite of analyses anticipated for the core tube samples (see QAPP Table A-1).

Core tubes will be clearly labeled by writing directly on the core tube cap and side using a permanent marker. Labeling will include the core location, date, time, attempt, and an indication of "Top" for the top of the core. In addition, the actual core sample location (horizontal position) will be recorded on the Sediment Lithologic Log (Attachment D) along with water depth, sediment recovery, and other observations on collection.

The steel sample barrel will be decontaminated prior to moving to the next location, with the protocols outlined in the site-specific QAPP Addendum. Cores will not be advanced deeper than 6 ft without prior approval by the NYSDEC Project Manager. A Ponar sampler will also be used to collect surficial sediment for geotechnical analysis.

The sediment cores will be maintained in a vertical position and transferred to a processing area on shore, where EA geologists will characterize the sediment, complete a lithological log for each location describing the full length of the core sample, and prepare the samples. Once transported to shore, cores will be stored vertically in a refrigerated truck at 4±2 degrees Celsius (°C) until they can be logged and processed for laboratory submittal. Each sediment core will be segregated into the following depth intervals: 0–6 in., 6–12 in., 12–24 in., 24–36 in., 36–48 in., 48–60 in., and 60-72 in. Samples to be analyzed for geotechnical parameters will be separated into the following depth intervals: 0–6 in. and 12–18 in. Recovered sediment will be visually characterized for color, composition, and presence/absence of potential contamination before being processed for sampling. Each sample interval will be homogenized by mixing in a stainless-steel bowl (or similar container) until the sample appears consistent throughout. Non-disposable sampling equipment will be decontaminated prior to moving to the next location, with the protocols outlined in the site-specific QAPP Addendum.

Field logs and other types of field documentation will be copied and/or otherwise digitally reproduced and stored on a secure server daily. At the end of each sampling day, the EA Field Operations Leader (FOL) will collect and store the original logbooks, field data collection forms, and sampling equipment in a safe, secure location. Samples and cores that have been collected but not shipped will be kept in coolers in the refrigerated truck. The refrigerated truck will be locked when not in use.

Sediment samples will be placed in analysis-specific sample containers supplied by the laboratory. The samples will be sealed, labeled, handled, and packaged following the procedures described in the site-specific QAPP Addendum. QA/QC samples will be collected at the frequency detailed in

Table 1 of the QAPP Addendum. Sample forms to be completed during sediment sampling activities are included in **Attachment D** of this Letter Work Plan.

All samples will be analyzed for cadmium and total chromium by U.S. Environmental Protection Agency (EPA) Method 6020 and in accordance with the NYSDEC Analytical Services Protocol. Cadmium and total chromium concentrations will be compared to the NYSDEC Class A SGVs for saltwater sediment. A subset of samples will be analyzed for geotechnical parameters (grain size, percent moisture, and bulk density), to help compare various remedial technologies during the FS.

2.1.2 Surface Water

Surface water samples will be collected from 10 locations in the tidal area of Willetts Creek, co-located with sediment samples (**Figure 3**). Surface water samples will be collected prior to sediment sampling activities, and prior to anchoring activities where feasible to avoid potential impacts from disturbed sediments. Samples will not be field filtered. Each surface water sample will be collected from the top of the water column, by submerging a laboratory-provided bottle into the water, and then transferring the collected water into a preserved sample bottle. Surface water samples will be analyzed for cadmium and chromium by EPA Method 6020, and in accordance with the NYSDEC Analytical Services Protocol. Surface water analytical results will be compared to the New York State Ambient Water Quality Standards and Guidance values for cadmium (7.7 micrograms per liter [µg/L]) and chromium (50 µg/L).

Water quality measurements will be collected at each surface water sample location from the top of the water column, using a water quality meter (YSI 6820 or similar) and will include the collection of parameters such as pH, specific conductivity, temperature, reduction-oxidation potential (Eh), turbidity, salinity, and dissolved oxygen. Sample forms to be completed during surface water sampling activities are included in **Attachment D** of this Letter Work Plan. QA/QC samples will be collected at the frequency detailed in Table 1 of the QAPP Addendum.

2.1.3 Floodplain Soil

Soil samples will be collected from the residential properties adjacent to the tidal area of Willetts Creek (**Figure 5**), pending permission from the property owners. Inspectors from NYSDEC will be present during collection of samples from residential properties. Sampling is anticipated to begin during the week of 6 May 2019. EA will contact Dig Safely New York prior to beginning the floodplain soil sampling work. The total number of samples may vary depending on the number of property owners that agree to allow sampling on their property, and whether vegetable or flower gardens are present. Biased sampling locations will be selected based on an evaluation of the extent of the 2-year, 10-year, and 100-year floodplain on each property. Sample locations will be determined as follows:

- One sample within the floodplain boundary.
- One sample outside the limits of the floodplain boundary.
- One sample location from within a vegetable and/or flower garden (planned or present), only if located with the floodplain boundary.

Additional sample locations may be added upon discussion with each property owner. At each sampling location, a hand auger will be advanced to 2 ft below ground surface. Upon extraction, the collected soil will be segregated into four discrete intervals: 0-2 in., 2-6 in., 6–12 in., and 12–24 in. Each sample will be homogenized by mixing in a stainless-steel bowl (or similar container) until the sample appears consistent throughout. Non-disposable sampling equipment will be decontaminated prior to moving to the next location, with the protocols outlined in the site-specific QAPP Addendum.

Soil samples will be analyzed for cadmium and chromium by EPA Method 6020, and hexavalent chromium by EPA Method 7196A in accordance with the NYSDEC Analytical Services Protocol. QA/QC samples will be collected at the frequency detailed in Table 1 of the QAPP Addendum. Sample forms to be completed during soil sampling activities are included in **Attachment D** of this Letter Work Plan. Cadmium and chromium concentrations will be compared to the Unrestricted Use Soil Cleanup Objectives (SCOs).

NYSDOH will contact property owners with the sampling results as soon as they are available. Additional sampling will be conducted to delineate the extent of impacts to floodplain soils.

2.1.4 Bathymetric Survey

An ODOM Echotrac CVM single-beam survey fathometer interfaced with a dual frequency (200 kilohertz [kHz] and 24 kHz) transducer will be used to collect depth soundings to a resolution of 1 ft. The transducer will be mounted to the vessel and set at a fixed depth below the water's surface (draft). A draft correction will be applied to the soundings by the fathometer to reflect the actual water depth relative to the air-water interface versus the bottom of the transducer. The raw depth soundings obtained by the Echotrac CVM will be ported directly to HYPACK, where they will be time-tagged and merged with positioning information; creating continuous depth records along the survey track. These data will then be stored for post-processing and analysis at the conclusion of the survey. The functionality and performance of the fathometer will be verified via a series of lead line measurements.

Sound velocity is a function of temperature and salinity, which influence water density, and can vary over the course of the survey. To yield accurate sound velocity measurements throughout the survey, the water column will be profiled at the start and end of each survey day using a Conductivity, Temperature, and Density (CTD) probe or similar instrument. The data collected by the CTD probe will then be used to account for rapid changes in density that create distinct layers within the water column, and sound velocity correction factors can then be applied to the bathymetric soundings. As a QA/QC measure, bar check and sounding disk measurements will be taken to verify and adjust water column sound velocity settings within the fathometer, as needed.

2.1.5 Side-Scan Sonar Survey

An EdgeTech 4125, dual frequency digital side-scan sonar system will be used to record acoustic lakebed imagery within the project area. The 4125 system uses the acoustic frequencies of 400 kHz (low) and 900 kHz (high) to map substrate type, as well as detect and classify hard targets residing at the sediment-water interface along each survey line. Continuous acoustic records will

be produced using the high definition mode of the 4125, which employs the returns from 30 pings emitted from the transducer array per second to develop an image based on the timing and strength of return. The swath range for both the high and low frequency sonar will be set to 15 m (33 ft), providing significant overlap between survey lines and yielding approximately 200 percent coverage of the lakebed. The exact swath range will be adjusted to account for varying water depths within the project area. As the backscatter from each acoustic pulse is received by the transducer, the information will be digitized and transmitted to the topside data acquisition system onboard the survey vessel, where it is geo-referenced and stored for post- processing.

2.2 LABORATORY DATA VALIDATION

It is anticipated that preliminary analytical results will be available within 2 weeks of sample receipt at the laboratory, and final results will be provided to the NYSDEC within the standard turnaround time (i.e., 30 days). Analytical data will be validated by Environmental Data Services, Ltd. (EDS) of Pittsburgh, Pennsylvania. EDS will conduct a data usability analysis, and will provide a Data Validation/Usability Report, which will be appended to the RI Report for OU5.

2.3 EXPOSURE ASSESSMENT

Primary potential human receptors include adjacent residents that may enter the tidal area from their backyards (or public access points) or consume fish or shellfish collected from the tidal area. Additional human receptors may include nearby residents, community members, visitors, and workers. These receptors represent potentially complete pathways for cadmium and chromium through contact with contaminated sediments in the tidal area of Willetts Creek, and by ingestion of contaminated fish or shellfish tissue.

Results of the sampling described above will be used to develop a supplemental scope to support an ecological assessment. A detailed scope for the additional sampling and analysis will be submitted under separate cover. The potential ecological receptors in the tidal area of Willetts Creek include resident fish populations, benthic organisms and small mammals, and birds that may use the area as a drinking water or food source.

3. REMEDIAL INVESTIGATION REPORT (TASK 3)

After the field investigation activities are completed, EA will prepare the RI Report with the findings of this investigation and submit to NYSDEC and New York State Department of Health (NYSDOH) for review and comment. The RI Report will be prepared in accordance with Section 3.14 of NYSDEC DER-10, and will include at a minimum:

- Summary of field activities, analytical data, and figures depicting impacted media
- Determination of the horizontal and vertical extents of contamination, concentrations and estimated volumes of contamination
- Description of site physical characteristics including geology and hydrogeology

- A conceptual site model and qualitative human health exposure assessment
- Summary of any remaining data gaps
- Conclusions/recommendations based on investigation results.

EA will prepare an initial draft to the RI Report, and a revised Final RI Report based on comments received from NYSDEC and NYSDOH. Electronic copies of the draft and final reports (in .pdf via e-mail or FTP) will be submitted to the NYSDEC and NYSDOH.

4. FEASIBILITY STUDY REPORT (TASK 4)

Following approval of the RI Report, EA will develop remedial action objectives and a Feasibility Study based upon results of the RI. Five alternatives, including no further action, will be evaluated. EA will prepare an initial draft and one revision to the FS report. Electronic copies of the draft and final reports (in .pdf via e-mail or FTP) will be submitted to the NYSDEC and NYSDOH.

5. PROJECT SCHEDULE

Field activities are tentatively scheduled to begin the week of 15 April. Receipt of laboratory data is anticipated in June 2019, with data validation reports in July 2019. An updated project schedule is provided as **Figure 6**. Please feel free to contact me at (315) 565-6564 if you have any questions.

Sincerely yours,

EA SCIENCE AND TECHNOLOGY

Adam Etringer
Project Manager

EA ENGINEERING, P.C.

Donald Conan, P.E., P.G.
Vice-President

Figures

1 General Site Location
2 Site Features
3 Sediment and Surface Water Sampling Locations

4	Background Sediment Sampling Locations
5	Approximate Areas for Soil Sampling
6	Project Schedule

Attachments

A	Generic Field Activities Plan
B	Site-Specific Health and Safety Plan
C	Site Specific Quality Assurance Project Plan
D	Field Forms

Figures

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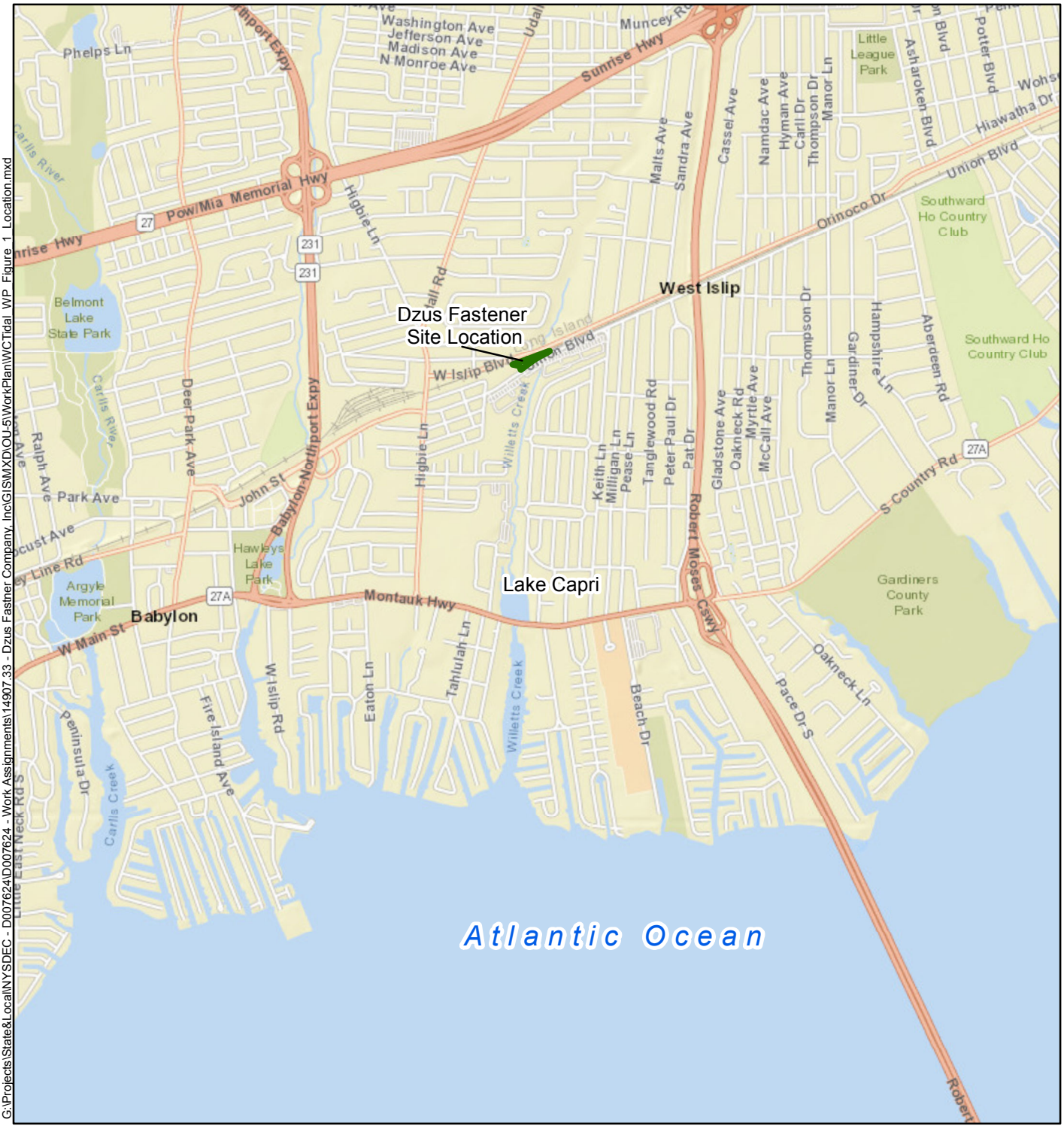

Legend

Dzus Fastener Company, Inc.
Property Boundary

Figure 1
General Site Location
Dzus Fastener Company, Inc.
Willetts Creek Tidal Area (OU5)
Remedial Investigation/Feasibility Study Work Plan
West Islip, NY

Map Date: 2/13/2019
Projection: NAD83 State Plane New York Long Island

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

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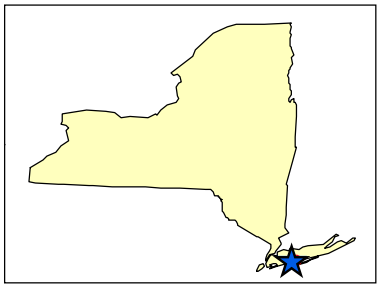

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1 inch = 1,021 feet

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Legend

Approximate Operable Unit Boundary

- Operable Unit 1
- Operable Unit 2
- Operable Unit 3
- Operable Unit 4
- Operable Unit 5

Figure 2
Site Features

Dzus Fastener Company, Inc.
Willetts Creek Tidal Area (OU5)
Remedial Investigation/Feasibility Study Work Plan
West Islip, NY

Map Date: 3/21/2019
Projection: NAD83 State Plane New York Long Island

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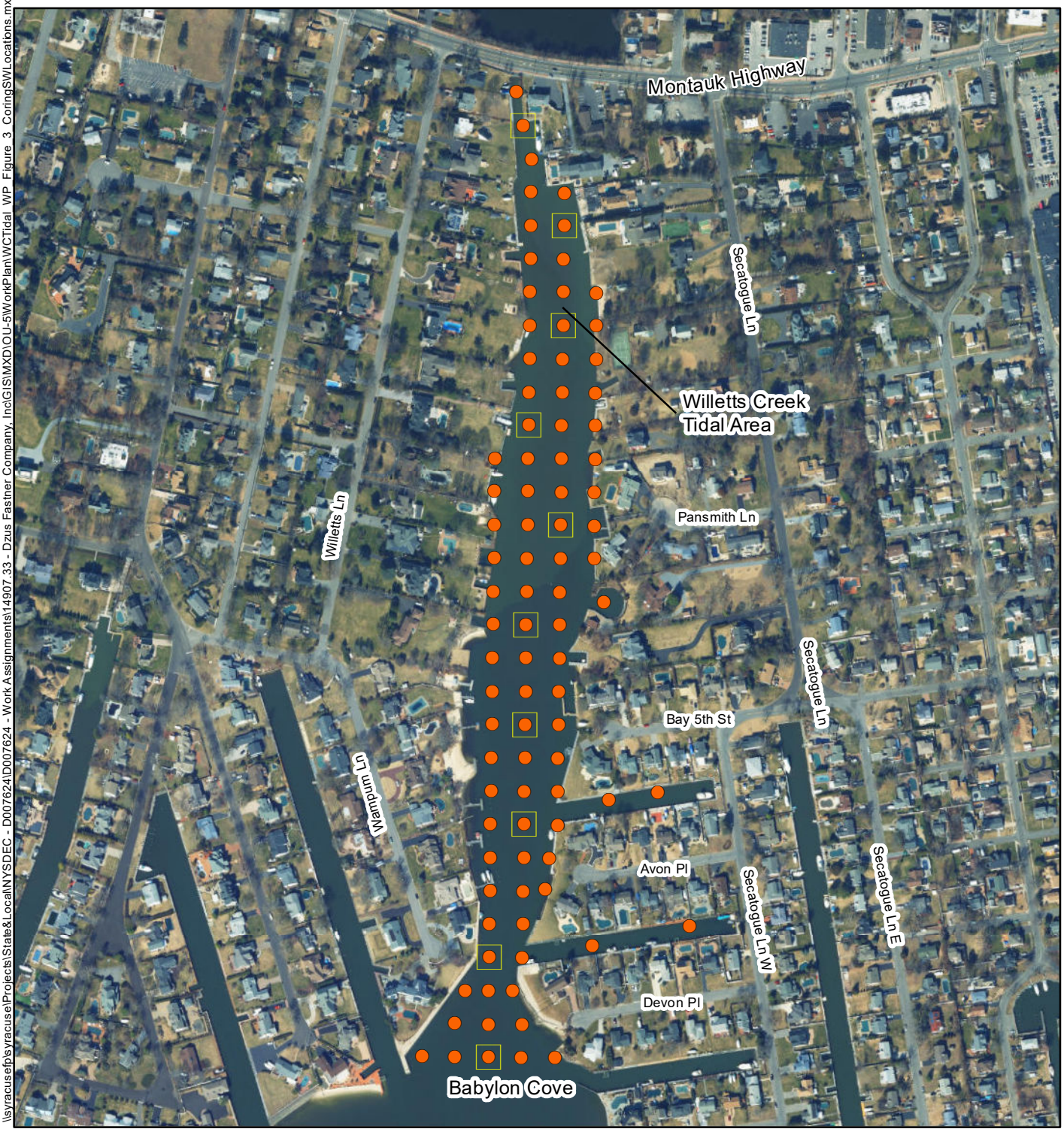

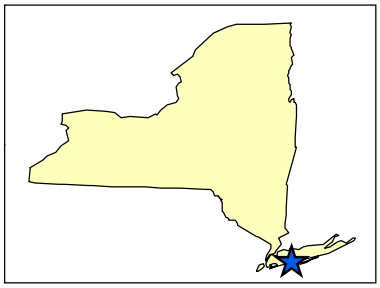

0 200 400 800
Feet

1 inch = 433 feet

N

Legend

- Proposed Coring Location (n = 90)
- Proposed Surface Water Location (n = 10)

Figure 3
Sediment and Surface Water Sampling Locations
Dzus Fastener Company, Inc.
Willetts Creek Tidal Area (OU5)
Remedial Investigation/Feasibility Study Work Plan
West Islip, NY

Map Date: 3/25/2019
Projection: NAD83 State Plane New York Long Island

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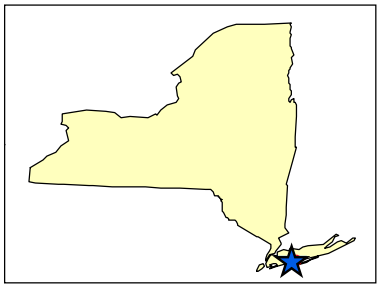

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Feet

1 inch = 1,009 feet

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Legend

- Proposed Background Coring Location

Approximate Operable Unit Boundary

- Operable Unit 5

Figure 4
Background Sediment Sampling Locations

Dzus Fastener Company, Inc.
Willetts Creek Tidal Area (OU5)
Remedial Investigation/Feasibility Study Work Plan
West Islip, NY

Map Date: 3/25/2019
Projection: NAD83 State Plane New York Long Island

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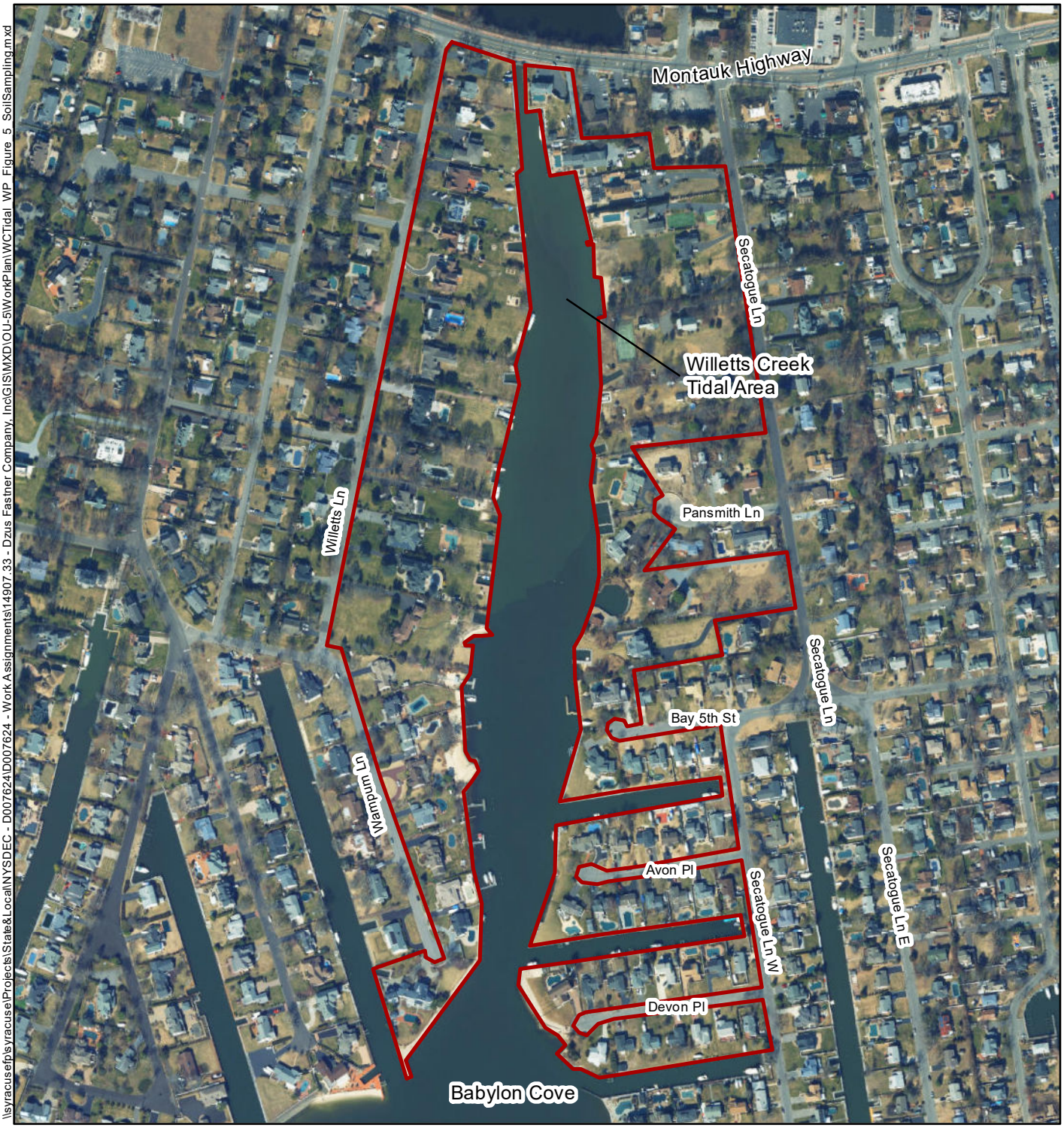

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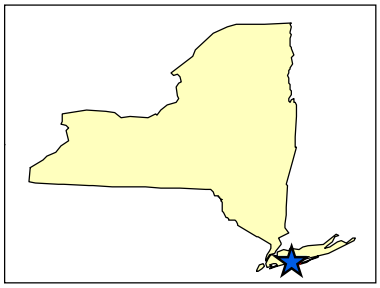

0 200 400 800
Feet

1 inch = 426 feet

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Legend

Soil Sampling Boundary

Figure 5
Approximate Soil Sampling Area

Dzus Fastener Company, Inc.
Willetts Creek Tidal Area (OU5)
Remedial Investigation/Feasibility Study Work Plan
West Islip, NY

Map Date: 4/18/2019
Projection: NAD83 State Plane New York Long Island

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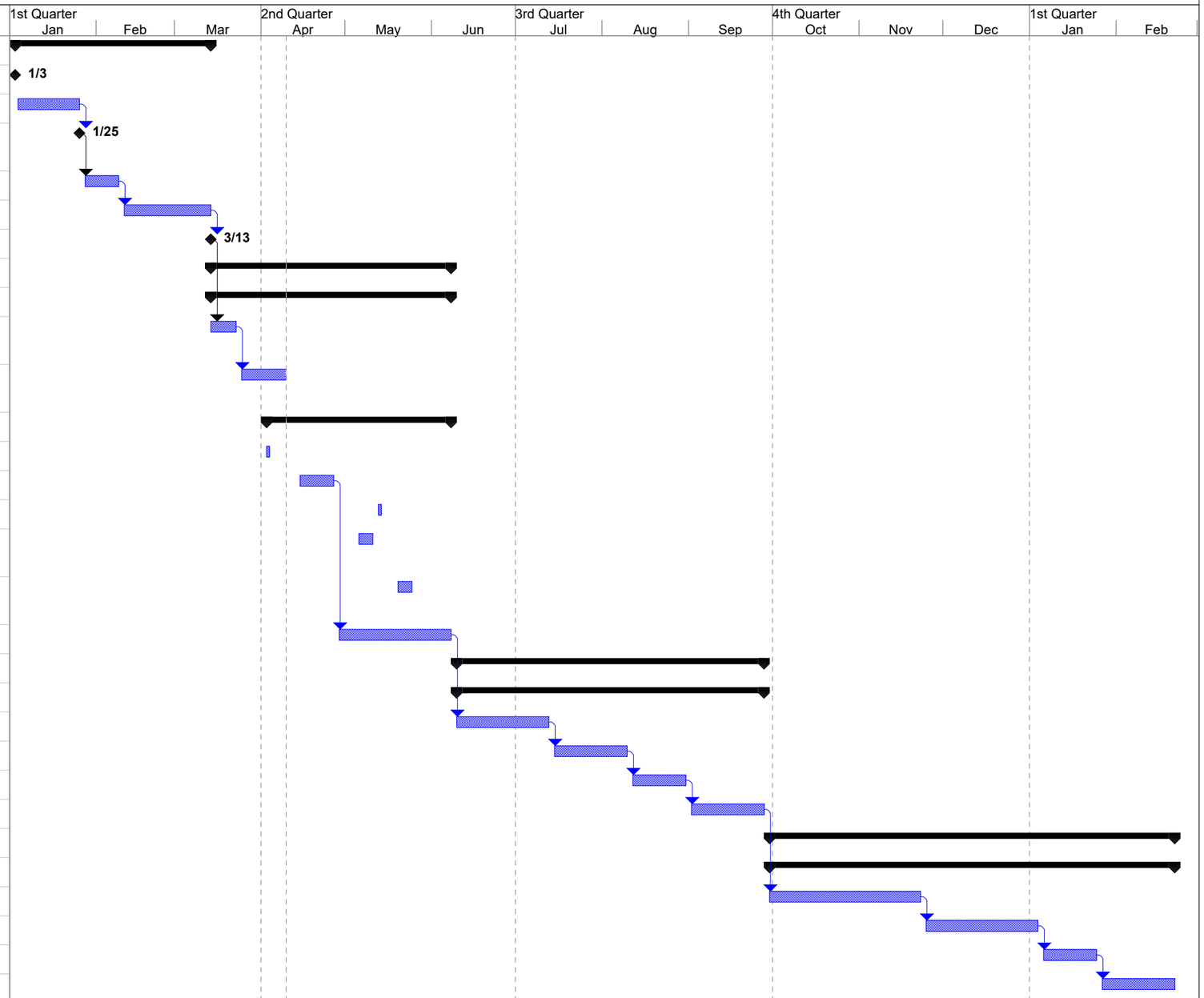
Figure 6
NYSDEC - Dzus Fastener Company, Inc. OU5
EA Project No.: 14907.33
(January 2019 - February 2020)

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Task 1 - Scoping and Records Search**	**50 days**	**Thu 1/3/19**	**Wed 3/13/19**	
2	WA Issuance	0 days	Thu 1/3/19	Thu 1/3/19	
3	Prepare WA Package Amendment 2 (OU4)	16 days	Fri 1/4/19	Fri 1/25/19	
4	Submit WA Package Amendment 2 (OU4) to NYSDEC	0 days	Fri 1/25/19	Fri 1/25/19	3
5	NYSDEC Review	10 days	Mon 1/28/19	Fri 2/8/19	4
6	Final NYSDEC Review and Approvals	23 days	Mon 2/11/19	Wed 3/13/19	5
7	NYSDEC Issuance of Approvals	0 days	Wed 3/13/19	Wed 3/13/19	6
8	**Task 2 - Phase 1 Remedial Investigation**	**62 days?**	**Thu 3/14/19**	**Fri 6/7/19**	
9	**OU5 Remedial Investigation**	**62 days?**	**Thu 3/14/19**	**Fri 6/7/19**	
10	Prepare and Submit OU5 Sampling Plan	7 days	Thu 3/14/19	Fri 3/22/19	7
11	NYSDEC Review & Approval of OU5 Sampling Plan	12 days	Mon 3/25/19	Tue 4/9/19	10
12	**Conduct OU5 Sampling**	**48 days?**	**Wed 4/3/19**	**Fri 6/7/19**	
13	Hydrographic Survey	1 day?	Wed 4/3/19	Wed 4/3/19	
14	Sediment and Surface Water	10 days	Mon 4/15/19	Fri 4/26/19	
15	Culvert and Outfall Inspection	1 day?	Mon 5/13/19	Mon 5/13/19	
16	Residential Soil Sampling (first week)	5 days	Mon 5/6/19	Fri 5/10/19	
17	Residential Soil Sampling (second week)	5 days	Mon 5/20/19	Fri 5/24/19	
18	Lab Analysis and Validation	30 days	Mon 4/29/19	Fri 6/7/19	14
19	**Task 3 - Phase 2 Remedial Investigation**	**80 days**	**Mon 6/10/19**	**Fri 9/27/19**	
20	**RI Report - OU5**	**80 days**	**Mon 6/10/19**	**Fri 9/27/19**	
21	Prepare and Submit Draft RI Report	25 days	Mon 6/10/19	Fri 7/12/19	18
22	NYSDEC Review & Approval of Draft RI Report	20 days	Mon 7/15/19	Fri 8/9/19	21
23	Prepare and Submit Final RI Report	15 days	Mon 8/12/19	Fri 8/30/19	22
24	NYSDEC Review & Approval of Final RI Report	20 days	Mon 9/2/19	Fri 9/27/19	23
25	**Task 4 - Detailed Analysis of Alternatives**	**105 days**	**Mon 9/30/19**	**Fri 2/21/20**	
26	**Feasibility Study - OU5**	**105 days**	**Mon 9/30/19**	**Fri 2/21/20**	
27	Prepare and Submit Draft FS	40 days	Mon 9/30/19	Fri 11/22/19	24
28	NYSDEC Review & Approval of Draft FS	30 days	Mon 11/25/19	Fri 1/3/20	27
29	Prepare and Submit Final FS	15 days	Mon 1/6/20	Fri 1/24/20	28
30	NYSDEC Review & Approval of Final FS	20 days	Mon 1/27/20	Fri 2/21/20	29



Project: Dzus Fastener Company, Inc.
Date: January 2019

Task	Project Summary	Inactive Task	Duration-only	Finish-only	
Split	External Tasks	Inactive Milestone	Manual Summary Rollup	Progress	
Milestone	External Milestone	Inactive Summary	Manual Summary	Deadline	
Summary	Inactive Task	Manual Task	Start-only		

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Attachment A

Generic Field Activities Plan

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Generic Field Activities Plan

NYSDEC Standby Contract
D007624

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation

Prepared by:

EA ENGINEERING, P.C. and Its Affiliate
EA SCIENCE and TECHNOLOGY

April 2011

Generic Field Activities Plan for Work Assignments

Prepared for

New York State Department of Environmental Conservation
625 Broadway
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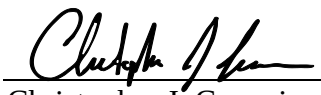

25 April 2011

Christopher J. Canonica, P.E., Program Manager
EA Engineering, P.C.

Date

April 2011

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LIST OF FIGURES

1. PURPOSE AND OBJECTIVES

1.1 PURPOSE

This Generic Field Activities Plan (FAP) has been prepared as a generic document of potential field activities that EA Engineering, P.C. and its affiliate EA Science and Technology (EA) will perform or oversee for standby subcontract work assignments issued by the New York State Department of Environmental Conservation (NYSDEC) under Superfund Standby Contract No. D007624. The principle purpose of this document is to define, detail, and provide rationale for potential field activities that will be performed with each site-specific Work Plan.

1.2 FIELD ACTIVITY PLAN OBJECTIVES

An initial step in every work assignment is the development of a site-specific Work Plan, which includes the preparation of a FAP, which describes anticipated field activities. This FAP provides detailed information about field activities that the consultant (EA), NYSDEC, and/or subcontractor personnel will potentially perform on or adjacent to a work assignment site. This information includes the definition, rationale, protocol, and any construction details or operation and maintenance of field activities.

The elements of this Generic FAP have been prepared in accordance with the most recent and applicable guidelines and requirements of the NYSDEC and the New York State Department of Health (NYSDOH), including *DER-10 Technical Guidance for Site Investigation and Remediation* (2010)[1]. In addition, technical guidance from the United States Environmental Protection Agency (USEPA) has been implemented into potential field activities. Site-specific work plans, which include the FAP, will be developed separately under each individual work assignment or as requested by the NYSDEC.

[1] New York State Department of Environmental Conservation, 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* May.

2. BRIEF DESCRIPTION AND RATIONALE OF FIELD ACTIVITIES

The primary focus of a work assignment is to evaluate existing on-site conditions, groundwater flow direction, the nature and extent of potential contamination, and possible human exposure to contaminants through a systematic site investigation/characterization or a full scale remedial investigation.

The following tasks are anticipated to be completed by EA under standby contract D007624 as part of a site investigation/characterization and/or remedial investigation:

SECTION	FIELD ACTIVITY
3.	***Direct-Push/Macro-Core® Drilling—***Identify possible source areas, characterize the overall volume and distribution of contaminants in an area of concern, delineate the limit and extent of contaminants of concern (COCs), and determine if the site should/should not remain part of Inactive Hazardous Waste Site listing based.
4.	***Monitoring Well Installation and Construction—***Identify hydrogeologic characteristics, groundwater constituents, contaminant plume transport, and the hydraulic relationship between the site and localized groundwater flow.
5.	***Monitoring Well Development—***Develop wells at an appropriate time interval post-installation using surging and/or pumping techniques. Monitor temperature, conductivity, pH, and turbidity for stabilization and appropriate values.
6.	***Groundwater Monitoring and Sampling—***Conduct periodic monitoring/sampling events to delineate the extent of COCs within a groundwater monitoring well network. Monitor groundwater elevations to determine the local groundwater flow gradient and direction.
7.	***Exploratory Test Pits/Trenches—***Provide field identification/verification of potential contaminant source areas and subsurface impact areas.
8.	***Surface Water Sampling—***Collect surface water from surface water bodies (i.e. storm sewers, ditches, streams, etc.) on or adjacent to the site that may act as a conveyance of COCs.
9.	***Sediment Sampling—***Collect sediment samples on or adjacent to the site, typically completed in conjunction with surface water sampling.
10.	***Soil Vapor Point Installation and Sampling—***Install soil vapor points using direct-push technologies for the purpose of collecting representative soil vapor

samples for laboratory analysis, at relevant locations as determined by the NYSDEC and in consultation with the NYSDOH.

11. ***Indoor Air Monitoring/Soil Vapor Intrusion Evaluation—***Evaluate the migration of vapors into on-site and off-site residential, commercial, and/or industrial structures through the collection of sub-slab vapor, indoor air, and outdoor ambient air samples.

12. ***Community Air Monitoring—***Monitor volatile organic compounds (VOCs) and particulate levels at the perimeter of the work area in real-time. May consist of a combination of continuous and periodic monitoring, which will be contingent upon site-specific field and construction activities.

13. ***Storage and Disposal of Waste—***EA will provide proper storage, handling, and disposal of investigative-derived waste.

14. ***Site Survey and Base Map Preparation—***Involves the surveying of all investigation/characterization locations, performing a topographic survey, and preparation of a site base map by a licensed professional land surveyor. EA will locate all field sampling locations using a high-precision global positioning system (GPS) unit as directed by the NYSDEC.

Details of each anticipated field activity are provided in the following sections.

3. DIRECT-PUSH/MACRO-CORE® DRILLING AND SAMPLING

The purpose of direct-push/Macro-Core® drilling and sampling is to evaluate the shallow overburden at a site and to assess the nature and extent of contamination.

3.1 DIRECT-PUSH/MACRO-CORE® SOIL BORINGS

During a direct-push/Macro-Core® drilling program, subsurface soil samples are collected continuously from each soil boring until a unit of low permeability (e.g., clay, bedrock) is encountered. Soil borings are commonly used to classify shallow overburden soils, collect soil samples, delineate the limits and extent of COCs, install temporary monitoring wells/piezometers, and install soil vapor points.

During direct-push/Macro-Core® drilling, the subsurface soil are extracted, screened, and classified to identify soil types, visualize potential contaminants, assess VOC vapors within the soil, and collect representative soil samples from selected depth intervals. Photoionization detector (PID) or flame ionization detector (FID), visual, and olfactory observations are used when selecting soil samples for potential laboratory analysis. The selection of subsurface soil for laboratory analysis will be made in consultation with the NYSDEC field representative, when present on-site, and are based the following parameters:

1. Subsurface soil materials that exhibit visual or olfactory signs of contamination

2. Subsurface soil materials that cause a sustained response above the measured background response on a calibrated PID of FID screening instrument

3. A combination of Items 1 and 2.

Any soil samples collected will be submitted to an approved NYSDOH Laboratories Approval Program (ELAP)-certified laboratory for analytical analysis using USEPA methods.

Soil samples are collected from the most contaminated interval at each soil boring location, i.e. high PID reading, visually stained, or strong odor, and sent for laboratory analysis. If no contamination is detected or observed, a subsurface soil sample is collected at the water table interface or directly above the low permeability unit; whichever occurs first.

Soil borings will be classified and logged according to the Unified Soil Classification System. A field record of each soil boring's classification, sampling interval, PID reading, and other field observations will be recorded on a soil boring log form provided in Appendix A.

Drill cuttings exhibiting gross contamination (i.e., staining, free product, visual, olfactory, high PID screening) generated during a direct-push/Macro-Core® drilling program will be drummed in accordance with Section 13 (Storage and Disposal of Waste).

4. MONITORING WELL INSTALLATION AND CONSTRUCTION

Monitoring wells are installed and constructed to identify hydrogeologic characteristics, groundwater constituents, contaminant plume transport, and the hydraulic relationship between the site and localized groundwater flow direction. Monitoring wells may be installed in overburden or bedrock and within confined and/or unconfined aquifers in order to delineate the nature and extent of a contaminant plume on an areal and vertical basis. The exact location of monitoring wells are based upon the information collected during the field investigation activities, knowledge of the existing distribution of contaminants, historical data and/or preliminary site assessment (PSA) results. If there are existing monitoring wells at a site, any new monitoring wells will be constructed similar to the construction of the existing monitoring well network.

4.1 TYPES OF MONITORING WELLS

Permanent (shallow, intermediate, or deep) or temporary monitoring wells will be installed depending on site specifics. The actual depth of permanent wells will vary relative to groundwater monitoring objectives and site geology, and may be placed in overburden or bedrock and within confined and/or unconfined aquifers. Temporary monitoring wells are typically installed within an overburden unconfined aquifer and utilized for short-term monitoring events and specific work assignment objectives.

Monitoring well identification will start with "MW-#" notation. Shallow, intermediate, or deep depth wells will be identified with an "S", "I", or "D" that is immediately preceded by the well number (e.g., "MW-#I").

Shallow depth monitoring wells will be used for monitoring water table elevations or collecting analytical data that is not sensitive to significant fluctuations in the water table. Intermediate depth monitoring wells can be used to evaluate the vertical hydraulic gradient and the vertical distribution of contaminants within the geologic formation. Deep monitoring wells have varied use, typically to handle complex site geology or meet more rigorous/long-term monitoring objectives. The drilling and installation of monitoring wells will be supervised and documented by a field geologist according to the procedures described in Sections 4.2 and 4.3. The field geologist shall document relevant information pertaining to drilling, soil and bedrock characterization, and monitoring well construction info into the soil boring log form (Appendix A). A typical groundwater monitoring well construction diagram is included as Figure 1.

4.2 TEMPORARY MONITORING WELL CONSTRUCTION

Any temporary groundwater monitoring wells required will be installed using direct-push/Macro-Core® techniques to the appropriate depth. A temporary 1-in. diameter well will be installed into an open borehole. The temporary monitoring wells will be constructed with an appropriate length of 0.01-in. slot well screen and an appropriate length of Schedule 40 polyvinyl chloride (PVC) riser to the ground surface. The annulus space will be backfilled with sand to

approximately 2 ft above the screen interval. A bentonite seal will be placed from the top of the sand to the ground surface to eliminate potential run-off from rain events, or spills into the temporary monitoring well.

4.3 PERMANENT MONITORING WELL CONSTRUCTION

4.3.1 Overburden Wells - Hollow-stem Augers, Mud Rotary

Overburden groundwater monitoring wells will typically be installed using hollow-stem auger techniques. A 4-¼ in. inside-diameter hollow-stem auger will be used to install 2-in. wells, and 6-¼ in. inside-diameter hollow-stem augers will be used to install 4-in. wells. Split spoon or MacroCore® samplers will be used to collect soil samples for classification and sampling. Once groundwater is encountered, the borehole will be extended an additional 5 ft into the groundwater table, or to a depth as directed by the NYSDEC. Once the desired depth is reached, the inner bit will be removed, and the well material will be placed within the augers. Monitoring wells will be constructed with an appropriate length of 0.01-in. slot well screen, and the appropriate length of schedule 40 PVC flush-joint casing to ground surface. Once the well material has been set, the annular space between the augers and the well screen will be backfilled with #0 Morie Sand, or equivalent. Simultaneously with the installation of the sandpack, the augers will be retracted. The sand pack will be brought to 2 ft above the top of the screened interval. A 2-ft layer of bentonite chips will be placed on top of the sand pack and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture. The augers will then be withdrawn and the grout within the borehole will be topped off as necessary. Monitoring wells will be completed as flush mounts with a curb box, or with a steel riser casing depending on well location and/or as directed by the NYSDEC. Each well will have a vented cap and a locking cover. A cement pad will be installed to channel surface water away from the well. A weep hole will be drilled in the protective casing to allow any water between the inner and outer casing to drain.

For deep overburden wells located in geologic formations where hollow-stem augers would not be ideal, mud-rotary drilling will be utilized. Mud-rotary utilizes a circulation fluid (mud) which is pumped through the drill stem, out the bit, and up the annulus between the drill stem and the borehole wall. The mud runs through a de-sander at the ground surface and then re-circulated back down the drill stem. Soil samples can be collected at desired intervals using split-spoon samplers. Once the well is drilled to depth, the well casing will be placed in the open borehole. A trimie pipe will be placed at the bottom of the borehole and clean potable water will be circulated to thin out the mud. Once it is determined that there is no longer a presence of mud in the borehole, the monitoring well will be constructed as described above.

4.3.2 Bedrock Monitoring Wells

The installation of bedrock monitoring wells will utilize combination of hollow-stem augering and rock coring/air rotary drilling. The overburden material will be drilled to bedrock using 6-¼ in. inside-diameter hollow-stem augers. Split spoon, or MacroCore® samplers will be used to collect soil samples for classification and sampling to the top of bedrock. Once bedrock is

encountered, the inner bit will be removed and the hollow-stem augers will act as a temporary casing. If rock cores are to be collected, the bedrock will be NX or HQ cored to a site-specific depth below ground surface. If no rock cores are to be collected, a 3-⅝ in. diameter air rotary hammer will be utilized to drill to the desired depths. Monitoring wells will be constructed with an appropriate length of 0.01-in. well screen, and the appropriate length of schedule 40 PVC flush-joint casing to ground surface or be left as open rock boreholes. The annular space around the well screen will be backfilled with #0 Morie Sand, or equivalent. The sand pack will be brought to 2-ft above the top of the screened interval. A 2-ft layer of bentonite chips will be placed on top of the sand pack and hydrated. The remaining annular space will be backfilled with a cement/bentonite grout mixture to ground surface. Monitoring wells will be completed as flush mounts with a curb box, or with a steel riser casing depending on the preference of the NYSDEC. Each well will have a vented cap and there will be a locking cover. A cement pad will be installed to channel surface water away from the well. A weep hole will be drilled in the protective casing to allow any water between the inner and outer casing to drain.

5. MONITORING WELL DEVELOPMENT

Groundwater monitoring wells installed at a site will be developed prior to sampling, in order to purge any drilling fluids or sediment that may have entered the well through the filter pack and well screen during installation. Well development helps to establish good hydraulic connection between the well and the surrounding formation and to remove fine-grained material that may have infiltrated the sand pack and/or well during installation. In general, groundwater monitoring well development will follow *Monitoring Well Development Guidelines for Superfund Project Managers* (USEPA, 1992)[2], unless otherwise specifically directed by the NYSDEC.

Monitoring wells will be developed no sooner than 48-hours following installation and shall generally be developed using surging and pumping techniques. Surging techniques force existing water and sediment back and forth through the screen and filter pack with the repeated raising and lowering of a surge block within the well casing. Following surging, pumping will be used to remove water and sediment from within the well. During pumping, a Horiba U-52 water quality meter (or similar) with a flow-through cell, which includes probes for measurement of pH, Eh, turbidity, dissolved oxygen, temperature, salinity, and conductivity will be utilized to collect groundwater water quality parameters during development. Additionally, water level readings will be collected throughout monitoring well development with an electronic water level measurement unit with accuracy of 0.01 ft. Pump rates during well development will be greater than the highest anticipated pump rate to be utilized during sampling. During monitoring well development, a field record of each monitoring well's development purging, water quality and water level measurements, and sampling flow rates and other field observations will be recorded on a monitoring well development form provided in Appendix A.

Well development will be considered complete when temperature, conductivity, and pH have stabilized and a turbidity of less than 50 nephelometric turbidity units (NTUs) has been achieved. Development water will be discharged to the ground surface away from the well, unless otherwise directed by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the development water will be containerized, handled, and disposed of as detailed in Section 13.

[2] United States Environmental Protection Agency, 1992. *Monitoring Well Development Guidelines for Superfund Project Managers.* April.

6. GROUNDWATER MONITORING AND SAMPLING

Groundwater samples will be collected from temporary and permanent monitoring wells in order collect obtain samples that are representative of the aquifer in the monitoring well vicinity. Groundwater sampling techniques will be based upon *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers* (USEPA, 2002)[3], unless otherwise specifically directed by NYSDEC.

6.1 GROUNDWATER MONITORING AND SAMPLING PROCEDURES

Groundwater monitoring well sampling procedures will include water level measurements, well purging, field water quality measurements, and sample collection at each monitoring well location. A copy of the purging and sampling log form used to record well purging, water quality measurements, and sampling flow rates is provided in Appendix A. The objective of the groundwater sampling protocol is to obtain samples that are representative of the aquifer in the well vicinity so that analytical results reflect the composition of the groundwater as accurately as possible. Monitoring wells will be allowed to stabilize at least 14 days after development prior to collecting samples for analysis.

Prior to the start of a groundwater sampling event, water levels will be collected from the entire monitoring well network to identify groundwater equipotential contours and develop a potentiometric map which facilitate an evaluation of groundwater flow patterns. If applicable, an oil/water interface probe will be used to measure non-aqueous phase liquids (NAPL) (if any) in the groundwater monitoring wells.

Rapid and significant changes can occur in groundwater samples upon exposure to sunlight, temperature, and pressure changes at ground surface. Therefore, groundwater sampling will be conducted in a manner that will minimize interaction of the sample and the surface environment. The equipment and protocol for collecting groundwater samples by each method are described in Sections 6.2 through 6.4. During groundwater sampling, a groundwater purge/sample form will be completed for each monitoring well location to be sampled (Appendix A).

Groundwater samples will be analyzed by USEPA methods in accordance with the NYSDEC Analytical Services Protocol (ASP) during sampling events.

6.2 GROUNDWATER SAMPLING FROM TEMPORARY MONITORING WELLS

Groundwater samples will be collected from temporary monitoring wells using a peristaltic pump and section of polyethylene tubing. The groundwater sample will be collected using the procedures outlined Section 6.3.3.

[3] United States Environmental Protection Agency, 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers.* May.

Upon completion of sampling, the temporary monitoring wells will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper location identification, and will be illustrated on the site map so it can be located at a later date. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

6.3 GROUNDWATER SAMPLING FROM PERMENANT MONITORING WELLS

6.3.1 Purging and Sampling Equipment

Monitoring well purging and sampling may be performed using the following:

- Submersible or peristaltic pumps to be used for well purging
- Electronic water level measurement unit with accuracy of 0.01 ft
- Flow measurement device (containers graduated in milliliters) and stop watch
- PID instrument (MiniRAE or similar) to monitor vapor concentrations during purging and sampling as required by the site-specific Health and Safety Plan (HASP) Addendum.

6.3.2 Field Analytical Equipment

Field equipment to be used at the site will include a Horiba U-52 water quality meter (or similar) with a flow-through cell, which includes probes for measurement of pH, Eh, turbidity, dissolved oxygen, temperature, salinity, and conductivity. Additionally, a PID will be used to obtain a headspace reading on the well head. Each piece of equipment will be checked by the EA Site Manager to be in proper working order before its use and calibrated as required by the manufacturer. Prior to each use, field analytical equipment probe(s) will be decontaminated. After each use, the instrument will be checked and stored in an area shielded from weather conditions.

Instruments will be calibration-checked at the beginning of each day of groundwater sampling.

6.3.3 Low-Flow Groundwater Sampling Procedures

Groundwater samples will be collected from each well a minimum of 14 days following monitoring well development. During each groundwater sampling event, groundwater samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. The following procedures will be used for monitoring well groundwater sampling:

- Wear appropriate personal protective equipment as specified in the site-specific HASP and the HASP Addendum. In addition, samplers will use new sampling gloves for the collection of each sample.

- Unlock and remove the well cap.

- Obtain PID readings and record them in the field logbook.

- Measure the static water level in the well with an electronic water level indicator. The water level indicator will be washed with Alconox detergent and water, then rinsed with deionized water between individual wells to prevent cross-examination. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the decontamination water will be containerized, handled, and disposed of as detailed in Section 13.

- Calculate the volume of water in the well.

- Place polyethylene sheeting around the well casing to prevent contamination of sampling equipment in the event sampling equipment is dropped.

- Purge water from the well utilizing low flow techniques utilizing one of the methods below. If necessary, purged water will be containerized separately from decontamination fluids.

  — Pump with a peristaltic pump using new polyethylene tubing and silicone flex tubing within the pump housing dedicated to each well. Set intake within the screened interval of the monitoring well, and purge at a rate no higher than 250 mL per minute.

  — Pump with a submersible pump equipped with a check valve to avoid backflush and new polyethylene tubing dedicated to each well. Set intake within the screened interval of the monitoring well, and purge at a rate no higher than 250 mL per minute.

- During purging of the well, monitor the water quality indicator parameters, including pH, temperature, salinity, specific conductance, oxidation-reduction potential, dissolved oxygen, and turbidity, every 3-5 minutes (or as appropriate). Record purge rate, volume purged, depth to water, water quality indicator parameters values, and clock time at 3- to 5-minute intervals on the purging/sampling form.

- Allow field parameters of pH, Eh, dissolved oxygen, specific conductivity, and turbidity stabilize before sampling. Temperature readings should also be recorded along with the aforementioned water quality indicators. Although it is not critical in determining the stabilization of the discharge water, it is important for data interpretation and should also be measured.

- Purging will be complete if the following conditions are met:

  — Consecutive pH readings are ±0.1 pH units of each other
  — Consecutive measured specific conductance is ±10 percent of each other
  — Consecutive measured redox potential is ± 10 mV of each other

- Consecutive measured dissolved oxygen is ±10 percent of each other
- Consecutive measured turbidity readings are ±10 percent of each other and below 50 NTUs.

- If these parameters are not met after purging a volume equal to 3-5 times the volume of standing water in the well, the EA Project Manager will be contacted to determine the appropriate action(s).

- If the well goes dry before the required volumes are removed, the well may be sampled when it recovers (recovery period up to 24 hours).

- Obtain sample from well with a bailer suspended on new, clean nylon twine. The sampling will be performed with a new bailer dedicated to each individual well.

- Collect the sample aliquot for VOC analysis, first by lowering and raising the bailer slowly to avoid agitation and degassing, and then collect sample aliquots for the semi-volatile organic compounds analysis and carefully pour directly into the appropriate sample bottles. Sample bottles containing appropriate preservative for the parameter to be analyzed will be obtained from the laboratory.

- Obtain field measurement of pH, dissolved oxygen, temperature, redox potential, specific conductivity, and turbidity, and record in on the purging and sampling form. The instruments will be decontaminated between wells to prevent cross-contamination.

- Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the analytical laboratories within 24 hours.

- If a centrifugal or submersible pump is used, it will be decontaminated with an alconox and water flush followed by a potable water rinse, and the polyethylene suction/discharge line will be properly discarded.

- Re-lock well cap.

- Fill out field logbook, sample log sheet, labels, custody seals, and chain-of-custody forms.

Groundwater samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory for analysis. The samples will be labeled, handled, and packaged following the procedures described in Generic Quality Assurance Project Plan (QAPP)[4] and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

Purge water will be discharged to the ground surface away from the well, unless otherwise directed

[4] EA. 2011. Generic Quality Assurance Project Plan for Work Assignments. April.

by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the purge water must be containerized, handled, and disposed of as detailed in Section 13.

6.4 GROUNDWATER SAMPLING USING AQUEOUS DIFFUSION SAMPLERS

This procedure is designed to permit the collection of representative groundwater samples for analysis of VOCs. Groundwater sampling using aqueous diffusion samplers will be conducted using the procedures described below and in accordance with the *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells* (Vroblesky, 2001)[5].

6.4.1 Construction of Aqueous Diffusion Samplers

Aqueous diffusion samplers are constructed by sealing de-ionized water in a 2-in. diameter × 1-mil thick polyethylene tubing. The de-ionized water is sealed in the polytubing by using a heat seal device. One end of the polytube is rolled over onto itself several times then heat is applied to seal this end. The polytube is then filled with de-ionized water. The top end (unsealed end) of the tube is then rolled over onto itself until there is no headspace in the polytube; heat is then applied to seal this end. Care is taken to ensure that no headspace or air bubbles are present in the tube prior to sealing the top end. Each diffusion sampler is approximately 2 ft in length. The samplers are weighted with stainless steel weights, and a stainless steel line is attached to the top of the sampler for placement and retrieval.

6.4.2 Equipment/Materials

Aqueous Diffusion Sampler Placement

- Well construction data, location map, and field data from the previous sampling event
- Field logbook and Field Record of Well Gauging, Purging, and Sampling form
- Electronic water level measuring device, 0.01-ft accuracy for monitoring water level prior to installation of the diffusion sampler
- Diffusion sampler constructed of 2-ft length × 2-in. width 1-mil polyethylene lay-flat tubing filled with de-ionized water and weight attached to bottom
- Stainless steel cable; the depth of each sampler should be established prior to field placement so enough line is available for installation.

[5] Vroblesky, D. 2001. User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells.

Aqueous Diffusion Sampler Retrieval

- Volatile organic analyte sample bottles and sample preservation supplies (as required by the analytical methods) needed for diffusion sampler retrieval
- Sample tags or labels
- Cooler with bagged ice for storage of sample bottles during shipment to a laboratory.

6.4.3 Sampling Procedures

The following procedures will be followed to obtain representative groundwater samples.

Field logbooks and sampling forms will be filled out as the procedure is being performed, as noted:

- Enter the following information in the field logbook and field sampling form, as appropriate, prior to installation of the diffusion sampler: date and time of sampler installation, depth of sampler, and total depth of well.
- Prepare the diffusion sampler by attaching weight at the base of the sampler and line to the top of the sampler.
- Install the sampler at the predetermined depth. The depth of the sampler will be determined on a well-by-well basis, based on previous sampling data or previously collected aqueous diffusion samplers.
- Allow the diffusion to equilibrate for approximately 14 days. Return after no less than 14 days to retrieve the sampler. Samplers can remain in the well for longer than 14 days, if necessary.
- Enter the following information in the field logbook and field sampling form, as appropriate, during retrieval of diffusion sampler: date and time of sampler retrieval, analytical method, and quality assurance/quality control as necessary.
- Retrieve the diffusion sampler from the well.
- After retrieval is complete, install an in-well water quality parameter meter. Remove the line and weight, and make a diagonal cut toward the top of the sampler. The diagonal cut allows easier filling of the sample containers.
- Begin filling the sample containers from the diagonal cut, allowing the water to fill the volatile organic analyte sample containers by allowing the water to flow gently down the inside of the container with as little agitation or minimal aeration as possible.

- Label each sampler as it is collected. Samplers will be placed into a cooler with ice for delivery to a laboratory.

- After collection of the samplers, record water quality parameter readings. After readings have been recorded, remove the water quality meter from the well. The well will then be capped and locked.

- Complete remaining portions of the field sampling form after each well is sampled, including sample date and time (time of retrieval from the well), well sampling sequence, types of sample bottles used, sample identification numbers, preservatives used, parameters requested for analysis, and field observations of the sampling event.

7. EXPLORATORY TEST PITS/TRENCHS

When detailed observation of subsurface soil and/or fill material is necessary, exploratory test pits/trenches can be utilized to for the collection of subsurface soil samples. Test pits/trenches utilize a backhoe to removed significant amounts of subsurface soil/fill material for classification.

7.1 PROCEDURES FOR TEST PIT/TRENCHING SAMPLING

When deemed appropriate, a backhoe will be utilized to excavate subsurface soil and fill material for classification and sampling. The following procedures will be utilized during test pit/trench installation and sampling.

- Utilizing the backhoe, remove a 3-ft wide section of soil to a depth of approximately 1 ft below ground surface (bgs). Place excavated soils on plastic sheeting or requirements of the site-specific work plan.

- Screen and classify the excavated material to identify soil types, visualize potential contaminants, assess VOC vapors within the soil, and collect representative soil samples from selected depth intervals. PID or FID, visual, and olfactory observations are used when selecting soil samples for potential laboratory analysis.

- Continue excavation with backhoe removing shallow layers of soil for classification until the desired depth of the test pit/trench is reached.

- The selection of subsurface soils for laboratory analysis will be made in consultation with the NYSDEC field representative, when present on-site, and are based the following parameters:

  — Subsurface soil materials that exhibit visual or olfactory signs of contamination
  — Subsurface soil materials that cause a sustained response above the measured background response on a calibrated PID of FID screening instrument

- Following sample collection, backfill the excavation with the excavated soil/fill material and flag the corners of the test pit for future surveying.

Any soil samples collected will be submitted to an approved NYSDOH ELAP-certified laboratory for analytical analysis using USEPA methods.

Soil samples are collected from the most contaminated interval at each test pit location, i.e. high PID reading, visually stained, or strong odor, and sent for laboratory analysis. If no contamination is detected or observed, a subsurface soil sample is collected from the base of the test pit/trench.

Test pits/trenches will be classified and logged according to the Unified Soil Classification System. A field record of each soil boring's classification, sampling interval, PID reading, and other field observations will be recorded on a test pit/trench log form provided in Appendix A.

Selected subsurface soil samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Soil samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, and site-specific QAPP Addendum.

8. SURFACE WATER SAMPLING

Local surface water may or may not be affected by site hydrology or hydrogeology. If surface water sampling is necessary, surface water sampling locations will be flagged after sampling to facilitate locating these sampling locations with a high-precision GPS unit.

The names and addresses of property owners where the off-site surface water sampling is anticipated to occur will be contacted by the NYSDEC prior to sampling. This will be accomplished through a telephone call and then through a 10-day written notice consistent with NYSDEC-Division of Environmental Regulation (DER) DER-10 Technical Guidance for Site Investigation and Remediation. The NYSDEC Project Manager will contact the property owners to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and surface water sampling schedule.

Following identification of the surface water sampling locations, field personnel will collect the sample by entering the surface water to reach the desired sample location. If the water is sufficiently deep, surface water samples will be collected using a sample container. Otherwise, surface water samples will be collected with a dipper, beaker, or pond sampler.

The approximate location of the sample will be noted in the field logbook. Field measurement of pH, dissolved oxygen, temperature, and specific conductivity will be obtained and recorded in the field logbook. The field sampling crew will record visual observations (sample color, any unusual characteristics [odor, staining, etc.]) in the field notebook and on the field record of the surface water sampling (Appendix A). Instruments used in sample collection will be decontaminated between locations to prevent cross-contamination.

Surface water samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory analysis. The samples will be labeled, handled, and packaged following the procedures described in the Generic QAPP[4] and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, site-specific QAPP Addendum.

Selected surface water samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Surface water samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

9. SEDIMENT SAMPLING

Sediment sampling is typically done in conjunction with surface water sampling, and much of the sampling procedure in this section is similar to Section 8 (Surface Water Sampling).

If sediment sampling is necessary, sampling locations will be flagged after sampling to facilitate locating these sampling locations with a high-precision GPS unit.

The names and addresses of property owners where the off-site sediment water sampling is anticipated to occur will be contacted prior to sampling. This will be accomplished through a telephone call and then through a 10-day written notice consistent with NYSDEC-DER TAGM 4053. The NYSDEC Project Manager will contact the property owners to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and sediment sampling schedule.

The field sampling crew will examine the sediment samples and record visual observations (sample color, texture, any unusual characteristics [odor, staining, etc.]) in the field notebook and on the field record of sediment sampling (Appendix A). The instruments will be decontaminated between locations to prevent cross-contamination.

Surficial (0-6 in.) sediment samples will be collected using a clean, stainless steel coring device, a stainless steel hand auger, Ponar® dredge sampler or a stainless steel scoop as appropriate for the sediment conditions. If sediment depth allows, additional samples will be collected from subsurface depths from 6 to 12 in, 12 to 24 in., and regular intervals beyond 24 in. Dedicated sampling equipment will be used to prevent cross-contamination and to minimize decontamination requirements.

The following procedures will be utilized to collect sediment samples with a Ponar® dredge sampler:

- Identify the proposed sample location in the field notebook along with other appropriate information collected during sediment probing activities.
- Don personal protective equipment (as required by the HASP).
- At each sample location, drop the dredge in the opened position, making sure that the end of the rope is maintained at all times.
- Once the dredge has been allowed to settle into the bottom sediments, a hard pull on the rope will close the sediments inside the dredge.
- Retrieve the dredge.

- Open the dredge to allow the sediments to empty onto a stainless steel tray.
- Describe and record sample descriptions.
- Package sediments in the appropriate containers.

Selected sediment samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. Sediment samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and site-specific QAPP Addendum. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP and site-specific QAPP Addendum.

10. SOIL VAPOR POINT INSTALLATION AND SAMPLING

The primary purpose of a soil vapor investigation is to further characterize and quantify the lateral and longitudinal extents of soil vapor contamination within the vadose zone. The soil vapor data will also be used to evaluate the potential for vapor intrusion in structures located onsite, downgradient of the site, or adjacent to the sampling locations.

Vadose zone monitoring can be used to develop subsequent site characterization activities such as installation of groundwater monitoring points. The vadose zone monitoring will be completed using an acceptable soil gas methodology and will include the collection of quality assurance and quality control samples.

Soil vapor point locations will be pin flagged and labeled with the relevant sample location identification. Each pin flag will include sample identification information that can be used during a subsequent high-precision GPS survey.

10.1 SOIL VAPOR POINT INSTALLATION

Soil vapor points will be installed using Geoprobe® direct-push or Macro-Core technologies to install stainless steel drive points to approximately 8 ft bgs and/or 1 ft above the water table interface or the bedrock interface. Once the sampling depth is reached, the 6-in. stainless steel sampling screen attached to a dedicated section of 0.25-in. diameter Teflon or Teflon-lined tubing that is identified as laboratory or food grade will be installed and used to collect the soil vapor samples. The borehole will then be backfilled with sand/glass beads to a minimum of 6 in. above the screened interval. Granular bentonite pellets will then be placed from approximately 6 in. above the screen to the ground surface hydrating concurrently with placement. Sufficient time will then be provided for the bentonite to set (24 hours minimum). Soil boring spoils will be assumed to be non-hazardous waste and reworked into the surrounding ground surface unless a visible sheen or odor is evident, in which case the spoils will be drummed and disposed of in accordance with Section 13. A typical soil vapor point construction diagram is included as Figure 2.

10.2 SOIL VAPOR POINT SAMPLING

Soil vapor samples will be collected in the same manner at all locations to minimize possible discrepancies. The following procedures will be strictly adhered to when sampling soil vapor:

- At least 24 hours after the installation of the temporary soil vapor points, 2-3 implant volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the samples to ensure that representative samples are collected.

- Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.

- Samples will be collected using conventional sampling methods and appropriate containers, which meet the objectives of the work assignment (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), and meet the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters, which are certified clean by the laboratory, using an appropriate USEPA Method). The sample duration for these samples will be 2 hours.

- A tracer gas (e.g., helium, butane, or sulfur hexafluoride) will be used at each location before collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring). Once verified, continued use of the tracer gas may be reconsidered.

When soil vapor samples are collected, the following actions will be taken to document local conditions during sampling that may influence interpretation of the results:

- Sample location will be noted, including the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north).

- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed, and direction) will be noted for the past 24-48 hours.

- Any pertinent observations will be recorded, such as odors and readings from field instrumentation.

The field sampling team will maintain a soil vapor sample log sheet (Appendix A) summarizing the following:

- Sample identification
- Date and time of sample collection
- Sampling depth
- Identity of samplers
- Sampling methods and devices
- Purge volumes
- Volume of soil vapor extracted
- Canister and associated regulator identification
- Helium leak test results
- Vacuum before and after samples collected
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone
- Chain-of-custody protocols and records used to track samples.

After the sample collection period, the Summa® canisters will be sent for subsequent laboratory analysis. The soil vapor samples will then be analyzed for target constituents. The soil vapor

samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC ASP. A minimum reporting limit of 1 microgram per cubic meter ($\mu g/m^3$) will be achieved for all analytes, with the exception of trichloroethylene (TCE) and carbon tetrachloride, which will achieve a minimum reporting limit of 0.25 $\mu g/m^3$, unless otherwise directed by the NYSDEC or NYSDOH.

Upon completion of the sampling, the sample tubing will be removed and the temporary soil vapor point location will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper sample identification and illustrated on the site map so it can be located by the site surveyor. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

11. VAPOR INTRUSION EVALUATION

Vapor intrusion (VI) evaluations are completed in accordance with the NYSDOH Indoor Air Sampling and Guidance document. *Guidance for Evaluating Soil Vapor Intrusion (SVI) in the State of New York* (NYSDOH, 2006)[6] and NYSDEC Department of Remediation *DER-10 Technical Guidance for Site Investigation and Remediation*[1] protocol will be followed during the planning and implementation of any VI evaluation.

Indoor air sampling and analysis is performed at structure locations identified by the NYSDEC and NYSDOH. The overall goal of a VI evaluation is to determine and evaluate the potential for vapor intrusion into these structures.

Notices of solicitation to participate in the indoor air monitoring program and scheduling appointments will be conducted by the NYSDEC and NYSDOH. Prior to initiating the air sampling, property owners will be contacted through a telephone call and then through a 10-day written notice consistent with NYSDEC TAGM 4053. The NYSDEC Project Manager will contact the property owners, discuss the sampling program, and schedule the sampling. The NYSDEC Project Manager will provide EA with a copy of the correspondence and indoor air sampling schedule.

11.1 INDOOR AIR SAMPLE COLLECTION

An inspection of general site conditions will be performed at each property location as part of the VI evaluation. The inspection will include the following activities:

- Completion of the NYSDOH Indoor Air Quality Questionnaire and Building Inventory included in Indoor Air Sampling and Analysis Guidance. A sample of the questionnaire is included in Appendix A.

- Documentation of weather conditions outside and temperature inside.

- Ambient air (indoor and outdoor) screening using field equipment (i.e., parts per billion photoionization detector).

- Selection of air sampling locations.

Indoor air samples will be collected at structures during the SVI evaluation. In accordance with the NYSDOH SVI Guidance, indoor air samples will be set up to collect a representative air sample from within the breathing zone (i.e., 3-5 ft above the floor). A 6-L Summa® canister with a vacuum gauge and flow controller will be used to collect the indoor air samples. The canisters

[6] New York State Department of Health. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. New York State Department of Health, Division of Environmental Health Assessment, Center for Environmental Health. October.

will be batch or individually certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury (Hg). Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period. The air laboratory will meet the reporting limit of 0.25 µg/m^3 or less for TCE and carbon tetrachloride and 1.0 µg/m^3 for other compounds on the TO-15 list.

Prior to initiating the sampling, the serial number of the canisters and associated regulators will be recorded on the field sampling forms. Field sampling forms will include the collection of canister/regulator serial numbers, sample identifications, sample start date/times, vacuum gauge pressures, and required analysis (USEPA Method TO-15).

11.1.1 Sub-Slab Sample Procedures

During the VI evaluation, sub-slab vapor samples will be collected from identified structures that have been constructed with poured concrete foundations. A typical sub-slab vapor point construction diagram is included as Figure 3. The following procedures will be followed for sub-slab vapor point installation and sampling.

11.1.1.1 Sub-Slab Vapor Point Installation

The following procedures will be followed during the selection and installation of all sub-slab vapor points within structures sampled during a VI evaluation.

- A visual assessment of the condition of the basement floor will be completed. The locations of the sub-slab vapor point will be selected to be out of the line of traffic, away from major cracks and other floor penetrations (e.g., sumps, pipes, etc.), and a minimum of 5 ft from an exterior wall.

- Once the location is determined, a ⅜-in. diameter hole will be drilled approximately 2 in. below the concrete floor slab using an electric hammer drill. A 1-in. diameter drill bit will be used to over drill the top ½ in. of the borehole to create an annular space for the surface seal.

- Concrete dust and flooring material will be swept away from the drill hole and wiped with a dampened towel.

- Teflon-lined polyethylene tubing (¼-in. outside diameter × ⅛-in. inside diameter, and approximately 3-ft long) will be inserted into the borehole drilled in the floor, extending no further than 2 in. below the bottom of the floor slab.

- Melted beeswax will be poured around the tubing at the floor penetration and allowed to set tightly around the tubing.

- A dedicated 60-cm^3 syringe will be used to purge approximately 100 ml of air/vapor from the sampling point. The syringe will be capped and the purge air released outside the

building as to not interfere with the basement indoor air sample collection. The purge air will be discharged into a ppbRAE and the associated reading will be recorded on the field sampling form. Sub-slab vapor points installed will be leak tested before and after collecting the air sample using helium tracer gas procedures in accordance with the NYSDOH Guidance.

- A 6-L Summa® canister (provided by an independent laboratory) with a vacuum gauge and flow controller will be connected to the sample tubing using a compression fitting and placed on the floor adjacent to the sampling point. The canisters will be batch or individually certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury in Hg or a replacement canister will be used. Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period.

- The serial number of the canister and associated regulator will be recorded on the field sampling form. Sample identification including sample identification, sample start date/time, vacuum gauge pressure, and required analysis (USEPA Method TO-15) will be recorded on the canister identification tag and the field sampling form.

- A digital photograph will be taken of the canister setup and the surrounding area at each location.

The following procedures will be used for sub-slab vapor sampling:

- Visually assess the condition of the floor. Select an area for sampling that is out of the line of traffic and away from major cracks and other floor penetrations (e.g., sumps, pipes, etc.).

- Drill a ¼-in. diameter hole completely through the concrete floor slab using an electric hammer drill, over drill a ½-in. diameter hole to approximately ½ in. depth.

- Sweep concrete dust away from the drill hole and wipe the floor with a dampened towel. Concrete dust can be cleaned with a vacuum equipped with a high efficiency particulate air filter only after the sample tubing is properly sealed and sample collection has begun.

- Insert the Teflon-lined polyethylene tubing (⅛-in. inside diameter × ¼-in. outside diameter, approximately 3-ft long) into the hole drilled in the floor, extending no further than 1 in. below the bottom of the floor slab.

- Pour the melted beeswax around the tubing at the floor penetration, packing it in tightly around the tubing.

- Attach a syringe to the sample tube and purge approximately 100 ml of air/vapor. The syringe will be capped and the air released outside the building so it does not interfere

with the indoor air sample collection.

- Place a canister on the floor adjacent to the sample tube. The canister will be a 6-L canister (provided by an independent laboratory) with a vacuum gauge and flow controller. The canister must be certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no more than -30 in. of mercury in Hg. Flow controllers must be set for a 24-hour collection period.

- Record the serial number of the canister and associated regulator on the chain-of-custody form and field notebook/sample form. Assign sample identification on the canister identification tag and record this on chain-of-custody and field notebook/sample form. For the property owner's privacy, do not use a sample identifier containing the name of the property owner or the address of the property.

- Record the gauge pressure; the vacuum gauge pressure must read -25 in Hg or less, or the canister cannot be used.

- Record the start time on the chain-of-custody form and on the air sampling form (Appendix A), and take a digital photograph of canister setup and the surrounding area.

11.1.2 Termination of Sample Collection

- Close the canister valve; record the stop time on the chain-of-custody form and in the field notebook/sample form.

- Record the final gauge pressure and disconnect the sample tubing and the pressure gauge/flow controller from the canister, if applicable.

- Install the plug on the canister inlet fitting and place the sample container in the original box.

- Complete the sample collection log with the appropriate information, and log each sample on the chain-of-custody form.

- Remove the temporary subsurface probe and properly seal the hole in the slab with hydraulic cement.

Field quality control samples will include duplicates and trip blanks. Field duplicates will be collected at the rate of 1 duplicate per 20 original samples (20 percent). Field duplicates will be collected by installing an in-line "tee," which will essentially split the flow coming from the sample tubing penetrating the floor to two canisters set up adjacent to each other and each collecting vapors at identical flow rates.

11.2 OUTDOOR AIR SAMPLE COLLECTION

Outdoor ambient air samples will be collected to determine outdoor air quality during the sampling event. Outdoor ambient air samples will be collected at the same time as the sub-slab vapor, and indoor air sampling. Outdoor air samples will be collected at a rate of one sample per day.

In accordance with the NYSDOH SVI Guidance, outdoor ambient air samples will be collected from the breathing zone (i.e., 3-5 ft above the ground surface) during the same sampling period as indoor air and sub-slab samples. To reach the sampling zone outdoors, dedicated Teflon-lined polyethylene tubing attached to a metal stake will be used to reach the breathing zone. A 6-L Summa® canister with a vacuum gauge and flow controller will be used to collect the outdoor ambient air samples. The canisters will be batch certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no less than -25 in. of mercury (Hg). Flow controllers will be regulated to collect at 3.8 mL/minute over a 24-hour collection period during the SVI investigation. The air laboratory will meet the reporting limit of 0.25 $\mu g/m^3$ or less for TCE and carbon tetrachloride and 1.0 $\mu g/m^3$ for other compounds on the TO-15 list.

Prior to initiating the sampling, the serial number of the canisters and associated regulators will be recorded on the field sampling forms. Field sampling forms include the collection of canister/regulator serial numbers, sample identifications, sample start date/times, vacuum gauge pressures, and required analysis (USEPA Method TO-15).

11.3 LABORATORY ANALYSIS OF AIR SAMPLES

Air samples will be analyzed by an ELAP-certified laboratory. Detection limits for the analyzed compound list will be defined by the NYSDEC and NYSDOH prior to sample submittal and outlined in the site-specific work plan. For specific parameters identified by NYSDOH, where the selected parameters may have a higher detection limit (e.g., acetone), the higher detection limits will be designated by NYSDOH.

12. COMMUNITY AIR MONITORING PLANS

In accordance with DER-10, A Community Air Monitoring Plan (CAMP) will be developed at sites in which the public using the site, surrounding community, or site workers may be exposed to contamination at the site. A site-specific CAMP will be prepared for sites in which intrusive activities at the site may impact site workers or the surrounding community. The following sections provide generic information regarding CAMPs which may be implemented at a site, based upon the intrusive work completed at the site, and in accordance with the NYSDEC and NYSDOH. The NYSDOH Generic Community Air Monitoring Plan, provided in Appendix 1A of DER-10, shall be the basis for development of site-specific CAMPs for intrusive site work. Additional guidance for fugitive dust and particulate monitoring is provided in Appendix 1B of DER-10.

12.1 MONITORING

Real-time air monitoring for VOCs and/or particulate levels at the perimeter and surrounding community of the work area may be necessary. Monitoring activities will consist of a combination of continuous and periodic monitoring, which will be performed dependent upon the type of activity being conducted at the site, as discussed below.

12.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates may be required for all ground intrusive activities associated with the site. Sites known to be contaminated with heavy metals alone may only require particulate monitoring. Ground intrusive activities include soil/waste excavation and handling and installation of test pits and trenches, soil borings, and groundwater monitoring wells.

VOCs should be monitored at the downwind perimeter of the immediate work area on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a MiniRAE 2000 or equivalent, which is appropriate to measure the types of contaminants known or suspected to be present at the site. The MiniRAE 2000 shall be calibrated at least daily for the COCs or for an appropriate surrogate. The MiniRAE 2000 is capable of calculating 15-minute running average concentrations, which will be compared to the action levels specified in Section 12.2.1.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using a Thermo MIE pDR-4000 DataRam or equivalent. The Thermo MIE pDR-4000 DataRam is a real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size [PM-10] and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action level. The Thermo MIE pDR is equipped with an audible alarm to indicate exceedance of the action level. In addition to using the Thermo MIE pDR-4000 DataRam, fugitive dust migration will be visually assessed

during all work activities. If particulate concentrations are recorded at higher or equivalent concentrations at the upwind station during investigation activities then continuous air monitoring will be discontinued, as approved by NYSDEC representative.

12.1.2 Periodic (As-Needed) Air Monitoring

Periodic or as-needed air monitoring for VOCs may be required during non-intrusive activities associated with the site-specific Work Plan. Non-intrusive activities are anticipated to include the collection of soil and sediment samples, the collection of groundwater samples from existing monitoring wells, and the collection of indoor air and soil vapor samples. Periodic air monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

12.2 ACTION LEVELS AND RESPONSE

This subsection identifies the action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site.

12.2.1 Volatile Organic Compounds

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring will continue. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be stopped, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 ft downwind of the work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 ft), is below 5 ppm over background for the 15-minute average.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

Fifteen-minute readings will be recorded and be available for NYSDEC, NYSDOH, and county health department personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

12.2.2 Particulates

If the downwind PM-10 particulate level is 100 μg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 μg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, the downwind PM-10 particulate levels are greater than 150 μg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 μg/m^3 of the upwind level and in preventing visible dust migration.

Similar to the VOC readings, all particulate readings will be recorded and be available for NYSDEC, NYSDOH, and county health department personnel to review.

13. STORAGE AND DISPOSAL OF WASTE

EA is responsible for the proper storage, handling, and disposal of investigative-derived waste; including personal protective equipment, solids and liquids generated during the well drilling, well development, and well sampling activities. Drummed materials will be clearly labeled as to their contents and origin. Drill cuttings and spoils will be managed in accordance with NYSDEC-DER TAGM 4032.

Accordingly, handling and disposal will be as follows:

- Liquids generated from contaminated equipment decontamination that exhibit visual staining, sheen, or discernable odors will be collected in drums or other containers at the point of generation. They will be stored in the staging area. A licensed waste subcontractor will then remove the drums and dispose at an offsite location.

- Liquid generated during well purging or a decontamination activity that does not exhibit visible staining, sheen, or discernable odors will be discharged to an unpaved area on the site, where it can percolate into the ground.

- Concrete dust will be collected in shop vacuums and disposed of as non-regulated solid waste, unless photoionization detector readings or visual indications of contamination are noted during field operations.

- Soil and rock cuttings from drilling operations that do not exhibit visible staining, sheen, or discernable odors will be disposed of onsite.

- Soil and rock cuttings from drilling operations that exhibit visible staining, sheen or discernable odors will be staged onsite until an appropriate treatment/disposal procedure has been determined after the completion of the feasibility study.

- Excavated soils from test trenching will be backfilled back into excavations upon test pit completion.

- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags, packed in 55-gal ring-top drums, and transported to the drum staging area.

- Non-contaminated trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.

- Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local garbage hauler.

14. SITE SURVEY AND BASE MAP PREPARATION

A site survey will involve the surveying of all soil boring locations, monitoring well locations, test pit locations, soil vapor point locations, and surface water/sediment sampling locations, performing a topographic survey, and preparation of a site map (typically based upon a previous base map or site control markers). To ensure the collection of consistent elevation data, each of the existing monitoring wells or other pertinent locations will be included in the site survey.

A detailed topographic base map of the site and immediate vicinity will be developed. All relevant features of the site and adjacent areas will be plotted. As previously mentioned, the consultant will be responsible for placing either survey flags or survey stakes at each of the pertinent locations. The base map will be used to accurately plot all sampling locations including soil borings, monitoring wells, and all other sample/monitoring locations. These locations will be included in a high-precision GPS survey to be completed by the NYSDEC.

The site map will also include site-specific features associated with the characterization/investigation (i.e., surface water drainage, above and underground storage tanks, buildings, drywells, cesspools). Additionally, engineering controls implemented or to be implemented at the site must be clearly labeled. Contours will be plotted at 1-ft intervals. The location and elevation of each survey point will be surveyed by a New York State licensed surveyor.

The elevations of all monitoring well casings will be established to within 0.01 ft based on the National Geodetic Vertical Datum. A permanent reference point will be placed in all interior polyvinyl chloride casings to provide a point to collect future groundwater elevation measurements.

The site tax map number will also be identified. The tax maps will be reviewed and the property lines of the parcels will be plotted on the base map.

With respect to the site survey and base map preparation, the following assumptions have been made:

- The estimated survey area should include the whole site boundary. All elevations will be referenced to the NAVD 88. All horizontal locations will be referenced to the NAD 83.

- Three blueline copies of the site base maps with topography (1 ft intervals), and three blueline copies of the site basemap, without topography, will be submitted to the NYSDEC.

- The site map must be provided in AutoCAD, version 12 or higher and ArcMap™ 9.1.

15. REFERENCES

EA. 2011. Generic Quality Assurance Project Plan for Work Assignments. April.

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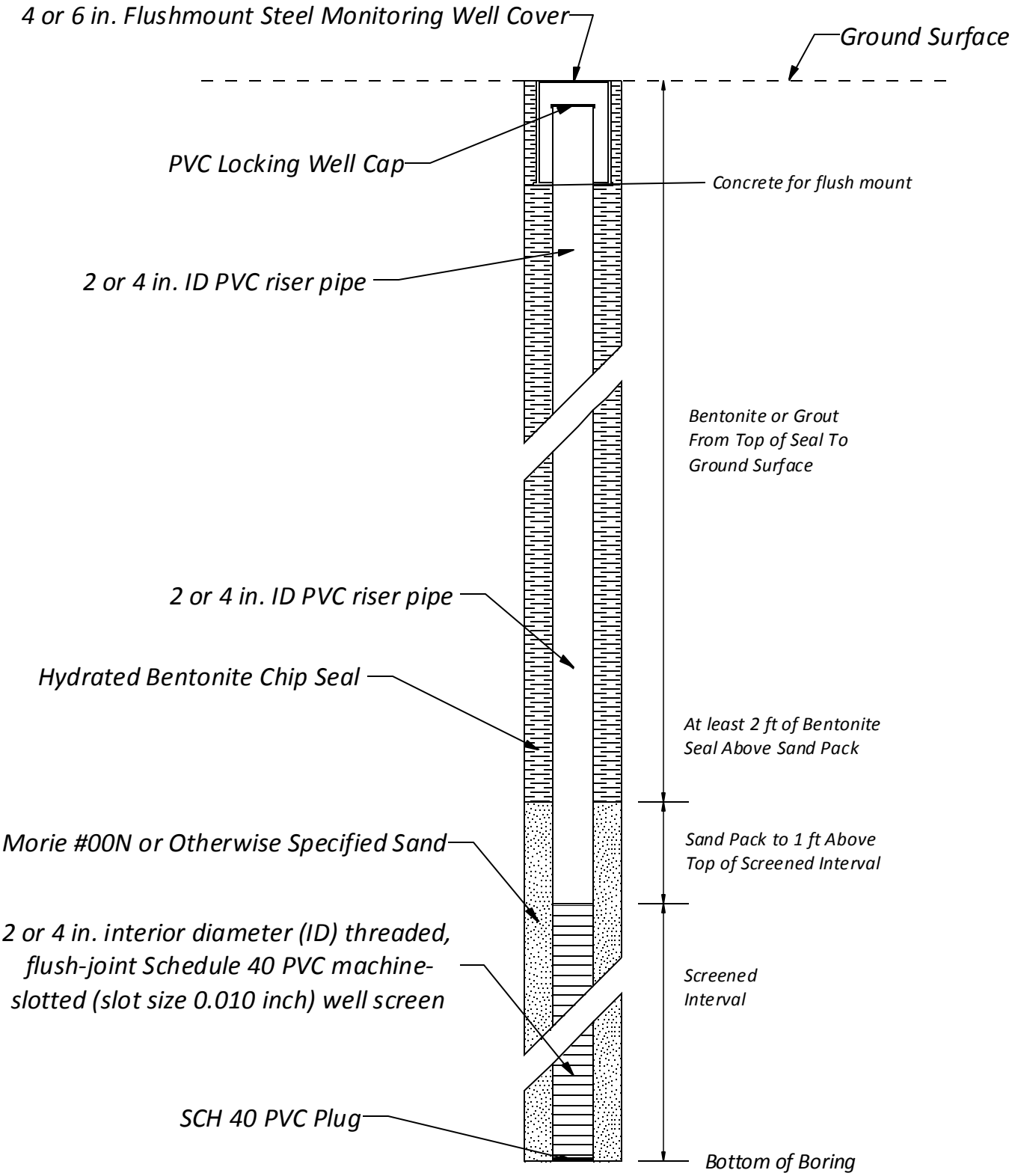
New York State Department of Health. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* New York State Department of Health, Division of Environmental Health Assessment, Center for Environmental Health. October.

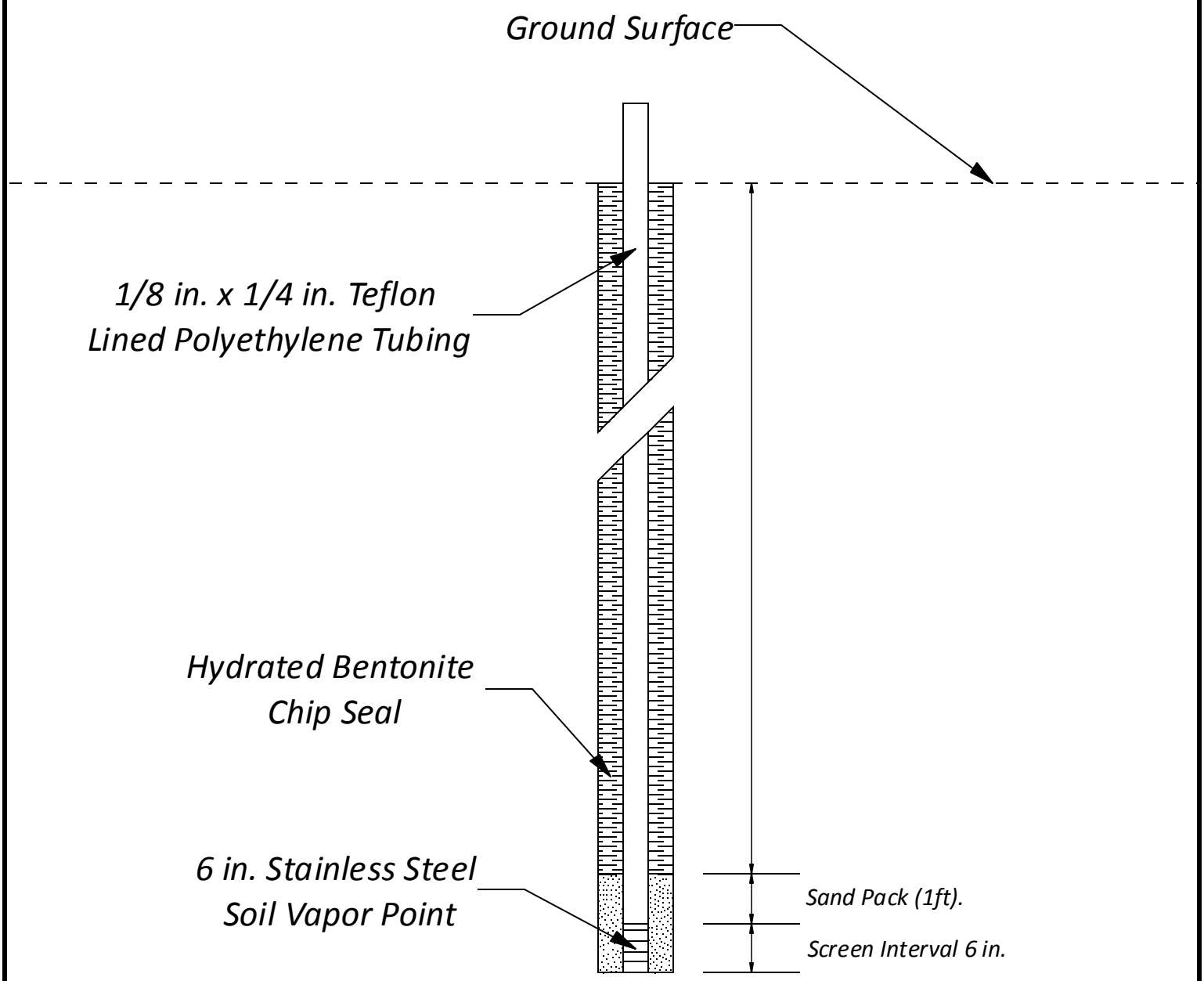
United States Environmental Protection Agency. 1992. *Monitoring Well Development Guidelines for Superfund Project Managers.* April.

-----. 2002. *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers.* May.

Vroblesky, D. 2001. User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells.



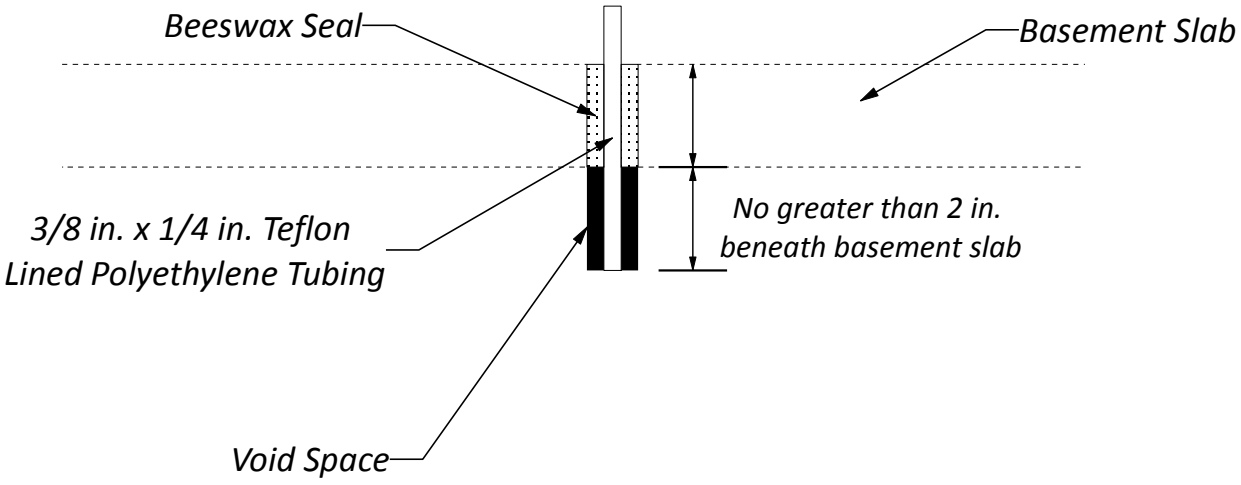
	NYSDEC CONTRACT NO. D007624 GENERIC FIELD ACTIVITIES PLAN					FIGURE 1 Typical Monitoring Well Construction Diagram	
CONTRACT MGR: CJC	DESIGNED BY: DCC	CREATED BY: DCC	CHECKED BY: RSC	NOT TO SCALE	DATE: APRIL 2011	PROJECT NO: 14368.39	FILE NO: GIS/PROJECTS/ FIGURE1.MXD



Soil vapor sampler set at 8 ft bgs or 1 ft above water table

	NYSDEC CONTRACT NO. D007624 GENERIC FIELD ACTIVITIES PLAN	FIGURE 2 Typical Temporary Soil Vapor Point Construction Diagram

CONTRACT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	NOT TO SCALE	DATE:	CONTRACT NO:	FILE NO:
CJC	DCC	DCC	RSC		APRIL 2011	D007624	GIS/PROJECTS/ FIGURE2.MXD



	NYSDEC CONTRACT NO. D007624 GENERIC FIELD ACTIVITIES PLAN	FIGURE 3 Typical Sub-Slab Vapor Sample Point Construction Diagram

CONTRACT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	NOT TO SCALE	DATE:	CONTRACT NO:	FILE NO:
CJC	DCC	DCC	RSC		APRIL 2011	D007624	GIS/PROJECTS/ FIGURE3.MXD

Appendix A

Field Forms

FIELD AIR SAMPLING FORM

EA Engineering and Its Affiliate EA Science & Technology 6712 Brooklawn Parkway, Suite 104 Syracuse, NY 13211	Project #: Project Name: Location: Project Manager:

Sample Location Information:

Site ID Number:				Sampler(s):	
PID Meter Used: (Model, Serial #)				Building I.D. No.:	

SUMMA Canister Record:

INDOOR AIR - FIRST FLOOR		INDOOR AIR - BASEMENT		SUBSLAB SOIL GAS		OUTDOOR AIR	
Flow Regulator No.:		Flow Regulator No.:		Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:		Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:		Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)		Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:		Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:		Sample ID:		Sample ID:	

Other Sampling Information:

Story/Level		Story/Level		Basement or Crawl Space?		Direction from Building	
Room		Room		Floor Slab Thickness (inches) *[if present]*		Distance from Building	
Indoor Air Temp (^{o}F)		Indoor Air Temp		Potential Vapor Entry Points Observed?		Intake Height Above Ground Level (ft.)	
Barometric Pressure?		Barometric Pressure?		Ground Surface Condition (Crawl Space Only)		Intake Tubing Used?	
Intake Height Above Floor Level (ft.)		Intake Height Above Floor Level (ft.)		If slab, intake Depth If Crawl Space, intake height		Distance to nearest Roadway	
Noticeable Odor?		Noticeable Odor?		Noticeable Odor?		Noticeable Odor?	
PID Reading (ppb)		PID Reading (ppb)		PID Reading (ppb)		PID Reading (ppb)	
Duplicate Sample?		Duplicate Sample?		Duplicate Sample?		Duplicate Sample?	

Comments:

Sampler Signature:

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER DEVELOPMENT FORM

Well I.D.:	**EA Personnel:**	**Client:** NYSDEC
Location:	**Well Condition:**	**Weather:**
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
	Gauge Time:	
Stick Up/Down (ft):	**PID Headspace Reading:**	**Well Diameter (in):**

Purge Date:	**Purge Time:**
Purge Method:	**Field Technician:**

Well Volume

A. Well Depth (ft):	**D. Well Volume (ft):**	**Depth/Height of Top of PVC:**
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (^{o}C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)

Total Quantity of Water Removed (gal): _____ **Personnel:** _____

COMMENTS AND OBSERVATIONS: _____

EA Engineering, P.C.
EA Science and Technology

GROUNDWATER SAMPLING PURGE FORM

Well I.D.:	**EA Personnel:**	**Client:** NYSDEC
Location:	**Well Condition:**	**Weather:**
Sounding Method:	**Gauge Date:**	**Measurement Ref:**
	Gauge Time:	
Stick Up/Down (ft):	**PID Headspace Reading:**	**Well Diameter (in):**

Purge Date:	**Purge Time:**
Purge Method:	**Field Technician:**

Well Volume

A. Well Depth (ft):	**D. Well Volume (ft):**	**Depth/Height of Top of PVC:**
B. Depth to Water (ft):	**E. Well Volume (gal) C*D):**	**Pump Type:**
C. Liquid Depth (ft) (A-B):	**F. Three Well Volumes (gal) (E3):**	**Pump Intake Depth:**

Water Quality Parameters

Time (hrs)	pH (pH units)	Conductivity (mS/cm)	Turbidity (ntu)	DO (mg/L)	Temperature (^{o}C)	ORP (mV)	DTW (ft btoc)	Rate (Lpm)	Volume (liters)

Total Quantity of Water Removed (gal): _____ **Sampling Time:** _____

Samplers: _____ **Split Sample With:** _____

Sampling Date: _____ **Sample Type:** _____

COMMENTS AND OBSERVATIONS: _____

NEW YORK STATE DEPARTMENT OF HEALTH INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____ Date/Time Prepared _____

Preparer's Affiliation _Independent Consultant – EA Engineering_ Phone No._315-431-4610_____

Purpose of Investigation ___ _____

1. OCCUPANT: Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

3. BUILDING CHARACTERISTICS Type of

Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _____

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many?
_____ If the property is commercial, type?

Business Type(s) _____
Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors_____ Building age_____
Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors
Airflow near source
Outdoor air infiltration
Infiltration into air ducts

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other _____
c. Basement floor:	concrete	dirt	stone	other _____
d. Basement floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: _____(feet)
Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

6. HEATING, VENTING and AIR CONDITIONING

Type of heating system(s) used in this building: (circle all that apply –note primary)

Hot air circulation - Heat pump - Hot water baseboard - Space Heaters - Stream radiation - Radiant floor - Electric baseboard - Wood stove - Outdoor wood boiler - Other _____

The primary type of fuel used is:
Natural Gas - Fuel Oil - Kerosene - Electric - Propane - Solar - Wood - Coal

Domestic hot water tank fueled by: _____
Boiler/furnace located in: Basement - Outdoors - Main Floor - Other_____
Air conditioning: Central Air - Window units - Open Windows - None
Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

7. OCCUPANCY

Is basement/lowest level occupied? Full-time - Occasionally - Seldom - Almost Never

Level General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)

Basement _____
1st Floor _____
2nd Floor _____
3rd Floor _____
4th Floor _____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage?	Y / N	
b. Does the garage have a separate heating unit?	Y / N / NA	
c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car)	Y / N / NA	Please specify_____
d. Has the building ever had a fire?	Y / N	When?_____
e. Is a kerosene or unvented gas space heater present?	Y / N	Where? _____
f. Is there a workshop or hobby/craft area?	Y / N	Where & Type? _____
g. Is there smoking in the building?	Y / N	How frequently? _____
h. Have cleaning products been used recently?	Y / N	When & Type? _____
i. Have cosmetic products been used recently?	Y / N	When & Type? _____
j. Has painting/staining been done in the last 6 months?	Y / N	When & Type? _____
k. Is there new carpet, drapes or other textiles?	Y / N	Where & When? _____
l. Have air fresheners been used recently?	Y / N	When & Type? _____
m. Is there a kitchen exhaust fan?	Y / N	If yes, where vented? _____
n. Is there a bathroom exhaust fan?	Y / N	If yes, where vented? _____
o. Is there a clothes dryer?	Y / N	If yes, is it vented outside? Y / N
p. Has there been a pesticide application?	Y / N	When &Type? _____

Are there odors in the building? Y / N
If yes, please describe:
_____

Do any of the building occupants use solvents at work? Y / N

(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)

If yes, what types of solvents are used? _____
If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation:
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE
Water Supply: Public Water Drilled Well Driven Well Dug Well Other: _____
Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other: _____

.10. RELOCATION INFORMATION (for oil spill residential emergency)
.a. Provide reasons why relocation is recommended: _____
.b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel
.c. Responsibility for costs associated with reimbursement explained? Y / N
.d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

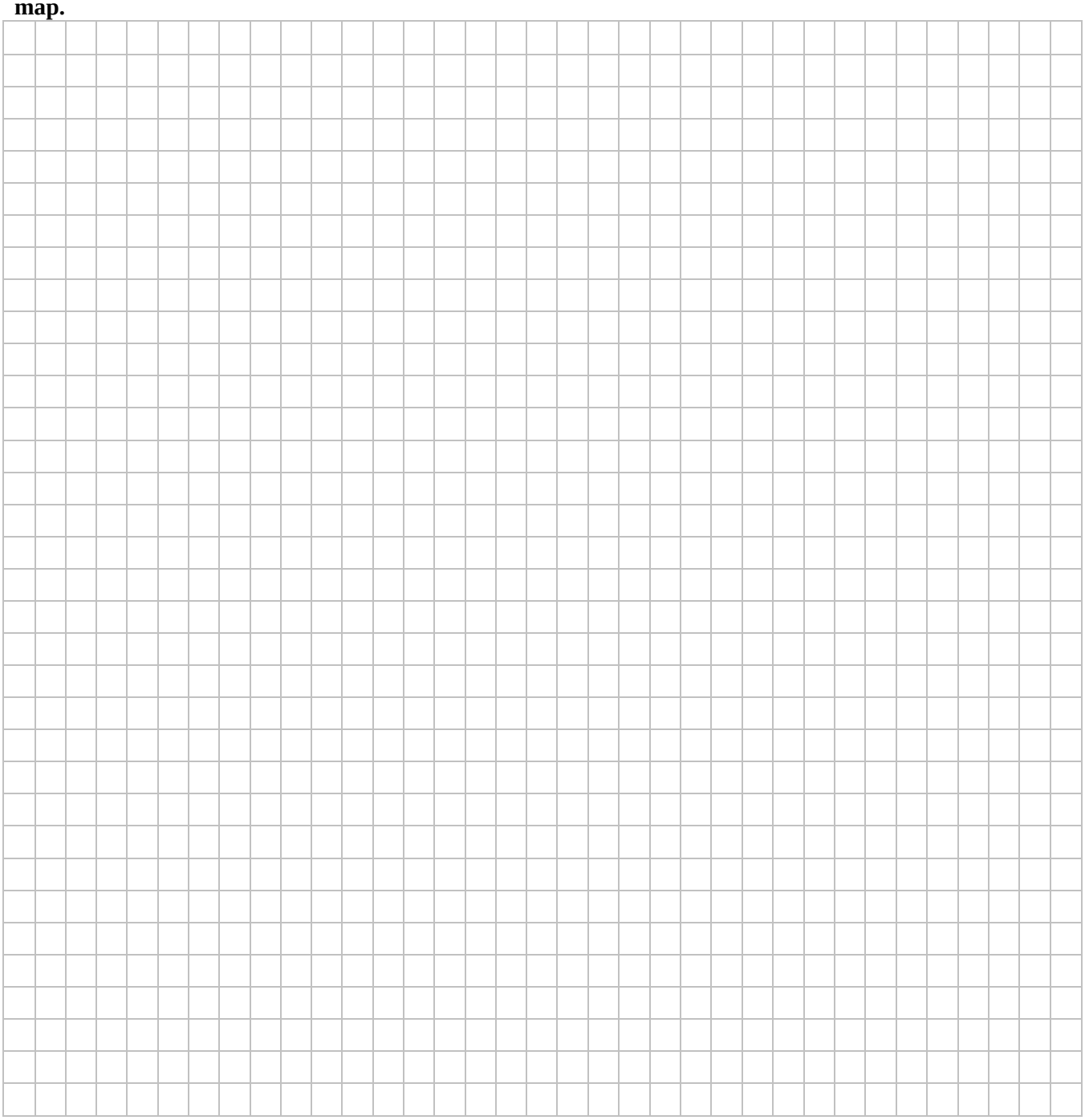
Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.
Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM
Make & Model of field instrument used: _____

List specific products found in the residences that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

FIELD SOIL VAPOR SAMPLING FORM

EA Engineering and Its Affiliate EA Science & Technology 6712 Brooklawn Parkway, Suite 104 Syracuse, NY 13211	Project #: Project Name: Location: Project Manager:

Sample Location Information:

Site ID Number:				Sampler(s):	
PID Meter Used (Model, Serial #) :□				Soil Vapor I.D. No.:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test:		Depth to sample point:	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?		Additional info:	
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:			

Comments:

Sampler Signature:

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates: Northing _____ Easting: _____
Surface Elevation: _____
Casing Below Surface: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	**Client:** NYSDEC **Project:**	**Location:**
Drilling Method:		**Soil Boring Number:**
Sampling Method:		**Sheet 1 of**

					Drilling	
Water Level:					**Start**	**Finish**
Time:					DATE	DATE
Date:					TIME	TIME

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Ft. Driven/ Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
				0	
				1	
				2	
				3	
				4	
				5	
				6	
				7	
				8	
				9	
				10	
				11	
				12	
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				26	
				27	
				28	
				29	

Monitoring Well Construction Information

Monitoring Well Diameter: _____ in
Bottom of Monitoring Well: _____ ft bgs
Stick Up or Flush Mount: _____
Screen Interval: _____ To _____ ft bgs
Riser Interval: _____ To _____ ft bgs
Sand Pack Interval: _____ To _____ ft bgs
Bentonite Seal: _____ To _____ ft bgs
Grout Interval: _____ To _____ ft bgs

Soil Vapor Point Installation Information

Depth of Soil Vapor Point: _____ ft
Bottom of Tubing: _____ ft
Top of Sand Pack: _____ ft
Top of Bentonite Seal: _____ ft

Logged by: _____ Date: _____
Drilling Contractor: _____ Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description:

Job. No.	Client:	NYSDEC	Location:
14368.41	Project:	Old Upper Mnt. Road	Lockport, New York
Drilling Method:		Geoprobe Direct-Push	Soil Boring Number: 932112-SB-
Sampling Method:			Sheet 1 of

					Drilling	
Water Level:					Start	Finish
Time:						
Date:						

Surface Conditions:
Weather:
Temperature:

Blow Counts (140-lb)	Feet Driven/Ft. Recvrd	Boring Diagram	PID (ppm)	Depth in Feet	USCS Log
				33	
				34	
				35	
				36	
				37	
				38	
				39	
				40	
				41	
				42	
				43	
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				61	
				62	
				63	
				64	
				65	

Logged by: _____ Date: _____

Drilling Contractor: _____ Driller: _____

EA Engineering, P.C.
EA Science and Technology

LOG OF SURFACE SOIL

Coordinates: Northing: _____ Easting: _____
Surface Elevation: _____
Reference Elevation: _____
Reference Description: _____

Job. No.	**Client:** NYSDEC **Project:**	**Location**
Sampling Location Description:		**Sample Location ID:**
		Sheet 1 of 1
		Sampling Date/Time
Sample Method:	**Start**	**Finish**
	DATE TIME	DATE TIME

Sample Interval (in.)	**PID (ppm)**	**TCL VOCs**	**TCL SVOCs**	**TCL Metals**	**TCL PCBs/ Pesticides**	**USCS Log**	**Surface Conditions:** **Weather:** **Temperature:**

Logged by: _____ **Date:** _____

Sample Interval: _____ **Time:** _____

EA Engineering, P.C.
EA Science and Technology

Log of Surface Water Sample Collection

Coordinates: Northing: Easting:
Surface Water Elevation:
Reference Elevation:
Reference Description:

Job. No.	Client: NYSDEC Project:	Location
Sampling Location Description:		Sample Location ID:
		Sheet 1 of 1
Sample Method:		
Depth of Water Body:		Sampling Date/Time
Width of Water Body:		Start / Finish
Water Body Location		DATE / DATE
		TIME / TIME

	Water Quality Parameters							Surface Conditions: / Weather: / Description of Surface Water
	Time (hrs)	pH (pH units)	Cond. (mS/cm)	Turb. (ntu)	DO (mg/L)	Temp (°C)	ORP (mV)	

Total Quantity of Water Removed (gal):
Samplers:
Sampling Date:

Sampling Time:
Split Sample With:
Sample Type:

EA Engineering, P.C.
EA Science and Technology

LOG OF TEST PIT

Coordinates: Northing: Easting:
Surface Elevation:
Reference Elevation:
Reference Description:

Job. No.	Client: NYSDEC Project:	Location
Sampling Location Description:		Sample Location ID:
		Sheet 1 of
Sample Method:		
Depth of Test Pit:		Sampling Date/Time
Depth to Bedrock (ft bgs):		Start: DATE TIME
Groundwater Encountered (ft bgs):		Finish: DATE TIME
Dispostion of Test Pit:		

Depth Interval (ft bgs)	PID (ppm)	Analysis						USCS Log	Surface Conditions: Weather: Description of Material
		TCL VOCs	TCL SVOCs	TCL Metals	TCL PCBs/ Pesticides	Other	Other		

Logged by: _____ **Date:** _____

Sample Interval: _____ **Time:** _____

Attachment B

Site-Specific Health and Safety Plan Addendum

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Site-Specific Health and Safety Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York

Prepared for

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by

EA Engineering, P.C. and its affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13202
(315) 431-4610

April 2019
Version: Final
EA Project No. 14907.33

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Site-Specific Health and Safety Plan Addendum
Dzus Fastener Company, Inc.
West Islip, New York

Prepared for

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by

EA Engineering, P.C. and its affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York 13202
(315) 431-4610

10 April 2019

Donald Conan, P.E., P.G., Vice President — Date
EA Engineering, P.C.

10 April 2019

Adam Etringer, Project Manager — Date
EA Science and Technology

April 2019
Version: FINAL
EA Project No. 14907.33

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
EA	EA Engineering, P.C. and its affiliate EA Science and Technology
FS	Feasibility Study
HASP	Health and Safety Plan
in.	Inch(es)
lb	Pound(s)
No.	Number
NYSDEC	New York State Department of Environmental Conservation
OU	Operable unit
PFD	Personal flotation device
PPE	Personal protective equipment
RI	Remedial Investigation
ROD	Record of Decision
SCO	Soil Cleanup Objective
SGV	Sediment Guidance Value
SHSO	Site Health and Safety Office

1. INTRODUCTION

1.1 GENERAL

A Generic Health and Safety Plan (HASP) (EA Engineering, P.C. and its affiliate EA Science and Technology [EA] 2011)[1] was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D007624-33. This HASP Addendum supplements the Generic HASP with site-specific information to protect the health and safety of personnel while performing field investigation activities to complete implementation of a Remedial Investigation (RI)/Feasibility Study (FS) for Operable Unit 5 (OU5) of the Dzus Fastener Company, Inc. site located at 425 Union Boulevard, West Islip, Suffolk County, New York (NYSDEC Site No. 152033).

This HASP Addendum describes the safety organization, procedures, and protective equipment that have been established based on an analysis of potential physical, chemical, and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential for accidents or injuries to occur. One copy of the Generic HASP (EA 2011)[1] and this HASP Addendum will be maintained onsite for use during the scheduled field investigation activities. The copies will be made available for site use and employee review at all times.

This HASP Addendum addresses regulations and guidance practices set forth in the Occupational Safety and Health Administration Standards for Construction Industry, 29 Code of Federal Regulations (CFR) 1926, including 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response and 29 CFR 1926.59, Hazardous Communications.

The following are provided as appendixes:

Appendix A—Worker Training and Physical Examination Record
Appendix B—Health and Safety Plan Addendum Review Record
Appendix C—Site Entry and Exit Log
Appendix D—Accident/Loss Report
Appendix E—Emergency Telephone Numbers and Hospital Directions
Appendix F—Emergency Equipment Available Onsite
Appendix G—Map to Hospital
Appendix H—Personal Protective Equipment Activity Record
Appendix I —Material Data Safety Sheets
Appendix J—Corporate Vessel Operations Manual and Standard Operating Procedure No. 035 for Small Boat Operations.

NOTE: This site-specific HASP Addendum should be left open to display Appendix E (Emergency Telephone Numbers and Hospital Directions) and made available to all site

[1] EA. 2011. *Generic HASP for Work Assignments under NYSDEC Contract No. D007624.* April.

personnel in a conspicuous location for the duration of field investigation activities in the event of an emergency.

1.2 SITE DESCRIPTION

The subject site is located at 425 Union Boulevard, West Islip, Suffolk County, New York. The Site is 1 acre in size and is in a mixed residential, commercial, and industrial area (**Figure 1**). The site is bounded by Union Avenue to the south, the former Dzus Fastener Company, Inc. facility and Beach Street to the west, and Long Island railroad tracks to the north. Immediately to the east of the site is Willetts Creek, which flows south into Lake Capri, an 8-acre man-made lake. Lake Capri drains into the tidal portion of Willetts Creek through a culvert located under Montauk Highway (**Figure 2**).

1.3 SITE HISTORY

Dzus Fastener (incorporated in the State of New York under the name Dzus Fastener Company, Inc. in 1936) produced fasteners and springs since 1932. Wastes from metal plating, tumbling, electroplating, chromic acid, anodizing, and special finishing operations consisted of oils, heavy metals, and salts. Leaching pools onsite were used for the disposal of hazardous wastes. A Phase I Investigation was completed by NYSDEC in 1984, and a Phase II Investigation report was submitted by Dzus Fastener Company, Inc. in August of 1990. An Interim Remedial Measure was completed by Dzus Fastener Company, Inc. in October 1990, during which approximately 1,960 cubic yards of contaminated soil from the area of the industrial leach field were removed. Soils and groundwater were contaminated with cadmium, chromium, cyanide, and organic compounds.

The facility changed its name from Dzus Fastener Company, Inc. to DFCI Solutions, Inc. in 2001; however, operations have remained the same since the facility's construction at this location in 1937. Operations included the design and manufacture of ¼-turn fasteners, quick acting latches, and panel strips in steel, stainless steel, aluminum, and plastic for use in military and commercial aerospace, transportation, electronics, air handling, refrigeration, motor control, and computer industries to secure access panels, covers, or detachable components. In 2015, DFCI Solutions, Inc. ceased operations and removed all equipment from the facility.

The site consists of five OUs. OU1 encompassed the one-acre leaching pool source area (onsite) at the eastern end of the former Dzus facility property along with offsite areas of soil contamination at the Dzus facility. A Record of Decision (ROD) for OU1 was issued for the site by NYSDEC in March 1995. The selected remedy consisted of in situ stabilization/solidification for onsite soils containing cadmium at concentrations greater than 10 parts per million. Soils from three areas on the western portion of the facility were excavated and mixed with the soils to be treated on the eastern portion of the facility property.

Additional remedial components included design and installation of a final topsoil/asphalt cover at both the eastern and western portions of the facility, which would protect the stabilized area from erosion, and implementation of institutional controls, in the form of a deed restriction at the site.

OU2 is comprised of the offsite contamination, including sediment and water contamination of Willetts Creek upstream of Lake Capri and Lake Capri. A ROD for OU2 was issued for the site by NYSDEC in October 1997. The selected remedy included dredging, dewatering, and offsite disposal of contaminated sediments from Lake Capri; excavation and offsite disposal of approximately 100 cubic yards of sediment from Willetts Creek, corresponding to levels of cadmium exceeding 9 ppm; and a long-term monitoring program to evaluate the effectiveness of the onsite remedy and to verify that any existing groundwater plume does not impact public health or the environment. Subsequent post-remedial monitoring of the wetland sediments in the Willetts Creek area found significant levels of cadmium in sediments.

OU3 encompasses an area of wetlands adjacent to and inclusive of the Willetts Creek channel upstream of Lake Capri, which were found to be contaminated during routine post-remedial action effectiveness sampling. OU3 extends south along the creek to a point approximately 700 feet (ft) upstream of Lake Capri. A ROD for OU3 was issued by NYSDEC in October 2017 and subsequently amended on 30 November 2018. The selected remedy includes removal of soils that exceed unrestricted use Soil Cleanup Objectives (SCOs) and sediment exceeding Class A Sediment Guidance Values (SGVs).

OU4 encompasses the southern 700 ft of Willetts Creek (beginning at the downstream terminus of OU3) and Lake Capri. A ROD was issued by NYSDEC in November 2018, stipulating excavation and offsite disposal of floodplain soil to unrestricted use SCOs, and removal of sediment in Willetts Creek and Lake Capri to Class A SGVs.

OU5 encompasses the tidal portion of Willetts Creek, which extends approximately 3,000 ft downstream of the Lake Capri outlet, and the surrounding floodplain. The Willetts Creek tidal area was previously investigated as a portion of OU4.

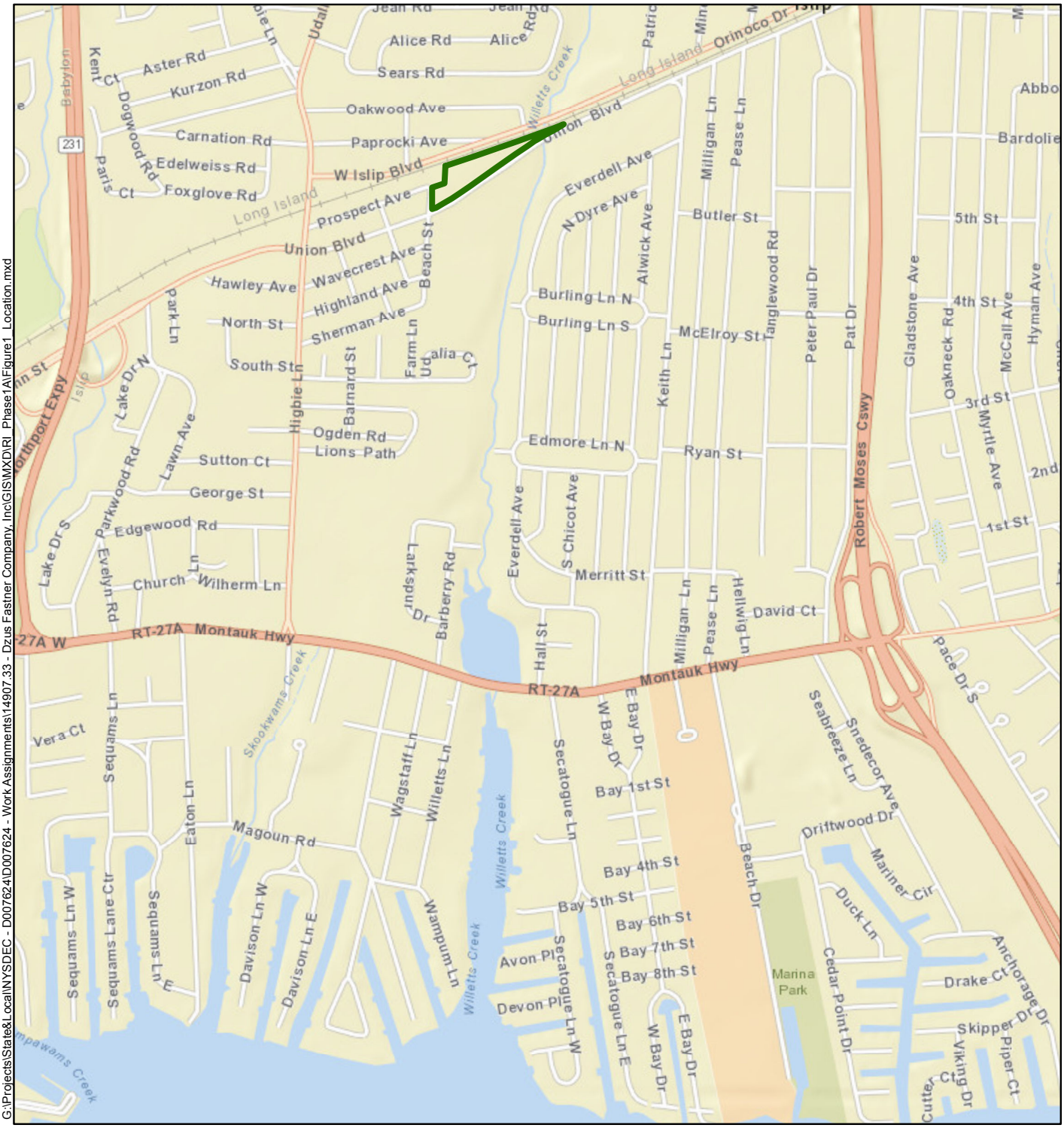
The primary focus of this OU5 RI/FS is to evaluate the extent of sediment contamination in the tidal portion of Willetts Creek (OU5). The OU5 RI field activities will include the collection of sediment, surface water, and soil samples at various locations throughout the targeted areas.

1.4 POLICY STATEMENT

EA will take every reasonable step to provide a safe and healthy work environment and to eliminate or control hazards in order to minimize the possibility of injuries, illnesses, or accidents to site personnel. EA and EA subcontractor employees will be familiar with this HASP Addendum for the project activities that they are involved in. Prior to entering the site, the HASP Addendum will be reviewed, and an agreement to comply with the requirements will be signed by EA personnel, subcontractors, and visitors (**Appendix B**).

Operational changes that could affect the health and safety of the site personnel, community, or environment will not be made without approval from the Project Manager and the Program Health and Safety Officer. This document will be periodically reviewed to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review

and modification to the HASP Addendum. Such changes will be documented in the form of a revision to this Addendum.



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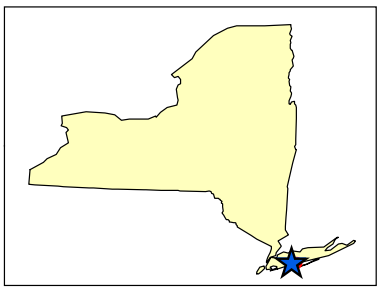

0 0.125 0.25 0.5
Miles

1 inch = 0.242 miles

N

Legend

Site Boundary

Figure 1
General Site Location

Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 5/26/2016
Projection: NAD83 State Plane New York Long Island

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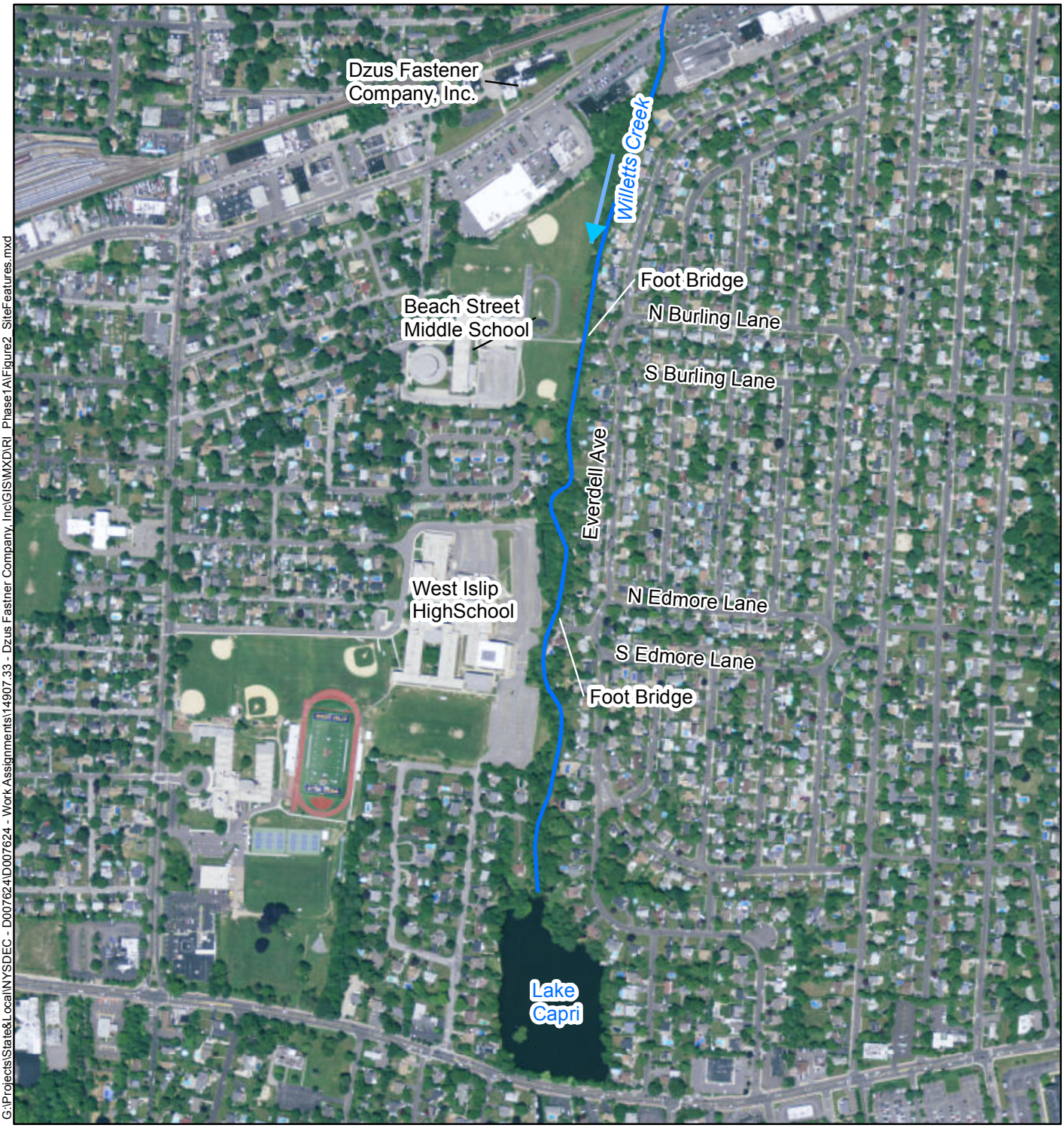
EA



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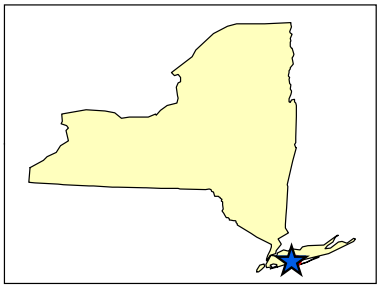

Legend

Willletts Creek

Figure 2
Site Features
Dzus Fastener Company, Inc.
West Islip, NY

Map Date: 5/26/2016
Projection: NAD83 State Plane New York Long Island

0 0.125 0.25
Miles

1 inch = 0.124 miles

N

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

EA

2. KEY PERSONNEL

The following table contains information on key project personnel.

Title	Name	Telephone No.
Program Health and Safety Officer	Peter Garger, Certified Industrial Hygienist, Certified Safety Specialist	732-404-9370
Program Manager	Donald Conan, P.E., P.G.	315-565-6551
Quality Assurance/Quality Control Officer	Robert Casey	315-565-6550
Project Manager	Adam Etringer	315-565-6564
Site Manager/Site Health and Safety Officer (SHSO)	Justin Marra	315-565-6569
Site Geologist/Scientist	Erica Thielman	315-565-6562
NYSDEC Project Manager	Payson Long	518-402-9813
New York State Department of Health PM	Scarlett McLaughlin	518-402-7860
Suffolk County Department of Health Services	Amy Juchatz	631-854-0087

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3. SCOPE OF WORK

This HASP Addendum was developed to designate and define site-specific health and safety protocols applicable to project activities to be implemented and followed during field activities and consulting work at the Dzus Fastener Company, Inc. site, West Islip, New York. The scope of work covered by this HASP Addendum includes the following activities:

- Evaluation of sediment and surface water collected from the tidal area of Willetts Creek
- Evaluation of surface and subsurface soil collected from properties near the Willetts Creek tidal area.

Each of these activities is summarized below and additional detail for each activity is provided in the Letter Work Plan (EA 2019).[2]

3.1 SEDIMENT COLLECTION

EA will implement a sediment sampling program as described in the Letter Work Plan to define the extent of chromium and cadmium contamination in OU5. EA's subcontractor will use a pontoon sampling vessel and vibracore sampling equipment to collect sediment from 90 locations in the tidal area of Willetts Creek. The sediment cores will be transferred to a processing area on shore, where EA geologists will characterize the sediment and prepare the samples. Each sediment core will be segregated into the following depth intervals: 0–6 inches [in.], 6–12 in., 12–24 in., 24–36 in., 36–48 in., 48–60 in., and 60–72 in. Samples will be analyzed for cadmium and chromium by EPA Method 6020. A subset of samples will be analyzed for the following geotechnical parameters: grain size, percent moisture, and bulk density. Geotechnical samples will be collected from the 0-6 in. and 12-18 in. intervals.

3.2 SURFACE WATER COLLECTION

Surface water samples will be collected from 10 locations in the tidal area of Willetts Creek, co-located with sediment samples. Surface water samples will be analyzed for cadmium and chromium by EPA Method 6020. Water quality measurements will be collected at each surface water sample location using a water quality meter and will include the collection of parameters such as pH, specific conductivity, temperature, reduction-oxidation potential (Eh), turbidity, salinity, and dissolved oxygen.

3.3 FLOODPLAIN SOIL COLLECTION

EA will implement a soil sampling program as described in the Letter Work Plan to further define the nature and extent of contamination in soil of residences adjacent to the tidal area of Willetts Creek.

[2] EA. 2019. *Operable Unit 5 Remedial Investigation/Feasibility Study Work Plan. Dzus Fastener Company, Inc. (152033).* April.

The total number of samples may vary depending on the number of property owners that agree to allow sampling on their property and whether vegetable gardens are present. Biased sampling locations at each property will be selected during a visual inspection by NYSDEC and EA personnel as follows:

- One sample location from the lowest point on the property closest to Willetts Creek.
- One sample location collected approximately half-way between the normal flooding line and the lowest point.
- One sample location from within a vegetable garden (planned or present).

At each sampling location, a hand auger will be advanced to 1 foot below ground surface. Upon extraction, the collected soil will be segregated into four discrete intervals: 0–2 in., 2–6 in., 6–12 in., and 12–24 in. Each sample will be homogenized by mixing in a stainless-steel bowl (or similar container) until the sample appears consistent throughout. Soil samples will be analyzed for cadmium and chromium by EPA Method 6020, and hexavalent chromium by EPA Method 7196A in accordance with the NYSDEC Analytical Services Protocol.

3.4 STORAGE AND DISPOSAL OF WASTE

EA is responsible for the proper storage, handling, and disposal of investigative-derived waste including personal protective equipment (PPE) and solids and liquids generated during sampling activities. All drummed materials (if generated) will be clearly labeled as to their contents and origin. All investigative-derived waste will be managed in accordance with NYSDEC—Division of Environmental Remediation-10 Technical and Administrative Guidance Memorandum 4032 (NYSDEC 2010)[3].

[3] NYSDEC. 2010. *Division of Environmental Remediation-10 Technical Guidance for Site Investigation and Remediation.* May.

4. POTENTIAL HAZARD ANALYSIS

Based on the field activities detailed in Section 3 of this report, the following potentially hazardous conditions may be anticipated:

- Field operations conducted during the winter months can impose excessive heat loss to personnel conducting strenuous activities during unseasonably cold weather days and can impose cold-related illness symptoms during unseasonably cold weather days or when the wind chill is high. In addition, heavy rains, electrical storms, and high winds may create extremely dangerous situations for employees.

- Field operations conducted during the summer months can impose heat stress on field personnel conducting strenuous activities during unseasonably hot weather days. Because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses and be able to recognize these signs and symptoms in both themselves and their co-workers. In addition, heavy rains, electrical storms, and high winds may create extremely dangerous situations for employees.

- Entry into a confined space in support of this project is forbidden. However, it is not anticipated that confined space entry will be required during the completion of the field activities.

- Field investigation activities intended to define potential sources of environmental contamination often require employees to be in direct proximity or contact with hazardous substances. PPE, properly designed for the chemicals of concern, will always be provided and worn when a potential for skin contact is present.

- Personnel involved in activities associated with boating and watercraft are potentially exposed to a variety of hazards from activities including operations, maintenance, and transportation. All boats must carry one wearable personal flotation device (PFD) for each person on board. A Vessel Operations Manual and a Standard Operating Procedure for Small Boat Operations are provided as Attachment J.

- Hazards associated with working on the water include slips caused by wet surfaces, shifting of equipment because of vessel instability, drowning, and electrocution caused by electrical storms. In addition to being required to wear a PFD and steel-toe muck boots while on-board the vessel, personnel will be requested to identify and prevent unsafe work conditions such as accumulations of water or sediment on the work surface, obstructions on the work deck that could cause a trip or fall, or overhead obstructions that could cause a fall. Work on the boat will be suspended during thunderstorms and other severe weather situations.

- Personnel may be injured during lifting and handling of heavy materials, equipment, or containers. Additionally, personnel may encounter slip, trip, and fall hazards associated

with sampling activities. Precautionary measures should be taken in accordance with the Generic HASP (EA 2011)[1] and this HASP Addendum.

- Weather—Daily, before beginning work over water, Mr. Marra, SHSO, will evaluate weather reports and conditions to ascertain local weather and prevent personnel exposure to severe weather. Weather has the propensity to change rapidly over water so personnel should continually monitor conditions. If severe weather is encountered, personnel will cease field operations, immediately return to shore, and find a safe space to shelter during the storm. A few signs to look for that indicate an approaching weather change:

  — Cloud build up, especially rapid vertically rising clouds
  — Sudden drop in temperature
  — Sudden change in wind direction and/or increase in speed.

- Injury to Hands – During sample collection and processing activities, field team members must wear appropriate protection to guard against hand and arms injury that cannot be eliminated through engineering and work practice controls. Potential hazards include skin absorption of harmful substances, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment will vary based on task and will include gloves and arm coverings or elbow-length gloves.

  Field team members will use gloves specifically designed for the tasks at hand. Sample collection and processing activities will involve the following factors that should be considered when selecting the proper type of protective gloves: type of materials handled, nature and duration of contact, grip requirements, size and comfort, and abrasion/resistance requirements.

  Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvass gloves also protect against sustained heat. Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride, polyvinyl alcohol, and polyethylene.

  — **Leather gloves** protect against sparks, moderate heat, blows, chips and rough objects.

  — **Aramid fiber gloves** protect against heat and cold, are cut - and abrasive – resistant, and wear well.

  — **Synthetic gloves** of various materials offer protection against heat and cold, are cut - and abrasive – resistant, and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

  — **Nitrile gloves** are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs

requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones, and acetates.

- Biological Hazards—Potential hazards may be present at the site due to bites from stray, domestic, and wild animals (including rodents), spiders, bees, and other venomous arthropods. Potential hazards may also be present at the site in the form of poisonous plant life, which can result in skin rashes or abrasions. In the case of an animal or insect bite that can be serious or fatal, workers must seek immediate medical attention and report the incident to the SHSO prior to leaving the site. An employee known to be allergic or sensitive to poisonous insects should alert the Site Manager and SHSO. The following are the main potential biological hazards at the site:

  — Deer ticks (*Ixodes scapularis*) or black-legged ticks are present throughout forested areas at the Site and can transmit Lyme disease to humans. The limiting of exposed skin and use of DEET and permethrin is the most effective means to avoid tick bites.

  — Poison ivy (*Toxicodendron radicans*) is present along Willetts Creek and may occur as a climbing vine or a rooted, singular plant. It can be identified by three shiny leaves that grow outward from a thick woody vine or thin pale stem. Urushiol, an oil that causes rash on human skin, is present on the entire plant. Proper identification and avoidance are the best options when conducting field work at the Site.

- The potential chemicals of concern present at the site include, but are not limited to, cadmium and chromium. Material safety data sheets for these chemicals are provided in Attachment I.

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5. STANDARD OPERATING PROCEDURES FOR SMALL BOATS

Transport by boat will be required to accomplish several of the tasks summarized in Section 3 of this HASP Addendum. Work conducted from a boat will be performed in accordance with EA's Corporate Vessel Operations Manual,[4] EA Standard Operating Procedure No. 035,[5] and applicable Occupational Safety and Health Administration standards. The Corporate Vessel Operations Manual and Standard Operating Procedure No. 035 have been provided as Attachment J. Vessel operators will be responsible for completing the equipment requirement, small craft, and trailer inspection checklists included in Section 11 of the Corporate Vessel Operations Manual.

In addition to the above, personnel will abide by the following requirements:

- Personnel will use the buddy system at all times.
- Swimming is prohibited, with the following exception: personnel entering the water to prevent injury or loss of life.
- All personnel will wear a U.S. Coast Guard-approved PFD of the type able to support an unconscious person (Type I with 32-pound [lb] floatation).
- At least one Type IV throwable device (ring buoy, horseshoe buoy) will be available on each boat. Throwable devices shall be U.S. Coast Guard-approved and equipped with 150 ft of 600-lb capacity rope.
- One fire extinguisher (minimum rating of 1-A:10-B:C) will be available for immediate use on each boat.

The vessel operator shall provide a list of crew duties for normal operations and emergencies. Emergencies that shall be covered include, but are not limited to, man-overboard, vessel-fire, and vessel emergency. The vessel operator shall provide an orientation and emergency drill.

All employees working on the water will wear a U.S. Coast Guard-certified personal PFD at all times and will use additional PPE such as lanyards and/or safety nets as necessary. PFDs shall meet the following requirements:

- Before and after each use, the PFD will be inspected for defects that would alter its strength or buoyancy.
- All PFDs will be equipped with retro reflective tape.

[4] EA. 2004. *Corporate Vessel Operations Manual*. December.
[5] EA. 2014. *Standard Operating Procedure No. 0.35 for Small Boat Operations*. Revision 1. December.

Throwable devices must be immediately available for use. Requirements for throwable device use are as follows:

- PFDs must be readily accessible.
- PFDs must be able to be deployed in a reasonable amount of time in an emergency (e.g., vessel sinking, on fire, etc.).
- PFDs should not be stowed in plastic bags or in locked or closed compartments, or have other gear stowed on top of them.

All personnel will know what to do if they fall overboard and what action staff on the boat will take to rescue someone in the water. If a person falls overboard, depending on the temperature of the water, hypothermia can set in rapidly. Precautionary measures will be taken to help slow down loss of body heat, including staying calm in the water, tucking legs into upper body, and keeping the head above water. If a person overboard is observed, the following procedures apply:

- Shout out "Man overboard, port side" (left) or "Man overboard, starboard side" (right).
- Throw throwable device (i.e., life ring) over the side of the boat as near as possible to the person.
- Make sure the vessel operator is notified by the quickest means possible.
- Make sure that a crew member keeps an eye on the overboard person at all times and points to the person with an extended arm so as to not lose track of the person and so the vessel operator can use the extended arm as a reference point to maneuver the boat for recovery.

The standard U.S. Coast Guard Float Plan will be adhered to at all times during vessel operation, and includes:

- Vessel information
- Personnel on-board
- Expected time of departure, route, and time of return
- Means of communication and contact information.

Mr. Marra, SHSO, will ensure that the U.S. Coast Guard Float Plan is properly completed prior to any boating activities and will ensure that all necessary safety precautions are taken while workers are on the boat.

6. PERSONAL PROTECTIVE EQUIPMENT

Based upon currently available information, it is anticipated that Level D PPE will be required for anticipated conditions and activities.

The PPE components for use during this project are detailed in the Generic HASP. The components of Level D PPE are summarized below. Level D will be worn for initial entry onsite and initially for all activities and will consist of the following:

- Coveralls or appropriate work clothing
- Steel-toe, steel-shank safety boots/shoes
- Hard hats (when overhead hazards are present or as required by the SHSO)
- Chemical resistant gloves (nitrile/neoprene) when contact with potentially contaminated soil or water is expected
- Sturdy work gloves when using cutting equipment or tools
- Safety glasses with side shields.

In addition to Level D PPE, all EA personnel will wear a U.S. Coast Guard-approved, Type I PFD when working over water. PFDs will meet the requirements described in Section 5 of this HASP Addendum.

PFDs must always be worn when working on smaller craft.

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7. SITE CONTROL AND SECURITY

Only authorized personnel will be permitted to conduct field activities. Authorized personnel include those who have completed hazardous waste operations initial training, as defined under Occupational Safety and Health Administration Regulation 29 CFR 1910.120/29 CFR 1926.65, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations.

7.1 SAFE WORK PRACTICES

Safe work practices that will be followed by site workers include, but are not limited to, the following rules:

- Working before or after daylight hours without special permission is prohibited.
- Entering restricted or posted areas without permission from the SHSO is prohibited.
- Smoking is limited to designated areas.
- Possessing, using, purchasing, distributing, or having controlled substances in their system throughout the day or during meal breaks is prohibited.
- Consuming or possessing alcoholic beverages is prohibited.
- Good housekeeping—employees will be instructed about housekeeping throughout field activities.
- Sitting or kneeling in areas of obvious contamination is prohibited.
- Overgrown vegetation and tall grass areas should be avoided.

7.2 DAILY STARTUP AND SHUTDOWN PROCEDURES

The following protocols will be followed daily prior to start of work activities:

- The SHSO will review site conditions to determine if modification of work and safety plans is needed.
- Personnel will be briefed and updated on new safety procedures as appropriate.
- Safety equipment will be checked for proper function.
- The SHSO will ensure that the first aid kit is adequately stocked and readily available.

- Onsite equipment and supplies will be locked and secure.

Appendix A

Worker Training and Physical Examination Record

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Appendix A

Worker Training and Physical Examination Record

SITE: Dzus Fastener Company, Inc., West Islip, New York

Name	OSHA 40-hour Hazardous Waste Operations Training		OSHA Hazardous Waste Supervisor Training	CPR (date of expiration)	First Aid (date of expiration)	Date of Last Physical Examination
	Initial	Annual				
EA PERSONNEL						
Robert Casey	11/1/01	7/8/14	7/28/09	5/28/11	5/28/11	4/27/06
Adam Etringer	12/6/02	6/6/18	---	1/14/21	1/14/21	5/25/17
Erica Thieleman	6/24/16	5/15/18		5/10/20	5/10/20	1/22/18
Hilary Williams	8/1/09	4/6/18	6/30/15	1/14/21	1/14/21	1/1/19
Justin Marra	8/14/15	8/6/18	---	1/14/21	1/14/21	3/30/18
SUBCONTRACTOR OR ADDITIONAL PERSONNEL						
---	---	---	---	---	---	---
---	---	---	---	---	---	---

NOTE: Prior to performing work at the site, this Health and Safety Plan Addendum must be reviewed and an agreement to comply with the requirements must be signed by all personnel, including contractors, subcontractors, and visitors. Contractors and subcontractors are ultimately responsible for ensuring that their own per0sonnel are adequately protected. In signing this agreement, the contractors and subcontractors acknowledge their responsibility for the implementation of the Health and Safety Plan Addendum requirements. All personnel onsite shall be informed of the site emergency response procedures and any potential safety or health hazards of the operations.

EA = EA Engineering, P.C. and its affiliate EA Science and Technology
OSHA = Occupational Safety and Health Administration
CPR = Cardiopulmonary resuscitation
P.E. = Professional Engineer

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Appendix B

Health and Safety Plan Addendum Review Record

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Appendix B

Health and Safety Plan Addendum Review Record

I have read the Health and Safety Plan Addendum for this site and have been briefed on the nature, level, and degree of exposure likely as a result of participation in this project. I agree to conform to all the requirements of this Plan.

SITE: Dzus Fastener Company, Inc., West Islip, New York			
Name	Signature	Affiliation	Date

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Appendix C
Site Entry and Exit Log

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Appendix C

Site Entry and Exit Log

SITE: Dzus Fastener Company, Inc., West Islip, New York

Name	Date	Time of Entry	Time of Exit	Initials

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Appendix D

Accident/Lost Report

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Appendix D

ACCIDENT/LOSS REPORT

This report must be completed by the injured employee or supervisor and **faxed** to EA corporate human resources within 24 hours of any accident. **The fax number is (410) 771-1780.**

Note: Whenever an employee is sent for medical treatment for a work-related injury or illness, **page 4 of this report**, must accompany that individual to ensure that all invoices, bills, and correspondence are sent to human resources for timely response.

A. DEMOGRAPHIC INFORMATION:

Name of injured employee:_____
Home address:_____
Home phone: _____ Date of Birth: _____
Age:_____ Sex: Male Female
Marital status:_____ Name of spouse (if applicable):_____
Social security number:_____ Date of Hire:_____
Number of dependents:_____
Employee's job title:_____
Department regularly employed:_____
Was the employee injured on the job? Yes No
Primary language of the employee:_____

B. ACCIDENT/INCIDENT INFORMATION:

Date of accident:_____ Time of accident:_____
Reported to whom:_____ Name of supervisor:_____
Exact location where accident occurred (including street, city, state and county): _____
_____
_____
Explain what happened (include what the employee was doing at the time of the accident and how the accident occurred):_____
_____
_____
_____
_____
Describe the injury and the specific part of the body affected (i.e., laceration, right hand, third finger):_____
_____
_____

Object or substance that directly injured employee:_____

_____

Number of days and hours employee usually works per week:_____
Is the employee expected to lose at least one full day of work?_____
Does the employee have a previous claim? Yes No If yes, status? Open Closed
Was the employee assigned to restricted duty?_____

C. ACCIDENT INVESTIGATION INFORMATION

Was safety equipment provided? Yes No If yes, was it used? Yes No
Was an unsafe act being formed? Yes No If yes, describe_____
Was a machine part involved? Yes No If yes, describe_____
Was the machine part defective? Yes No If yes, in what way_____
Was a third party responsible for the accident/incident? Yes No
If yes, list name, address, and phone number_____

_____

Was the accident/incident witnessed? Yes No
If yes, list name, address, and phone number:_____

_____

D. PROVIDER INFORMATION

Was first aid given onsite? Yes No
If yes, what type of medical treatment was given?_____
Physician Information (if medical attention was administered)
Name:_____
Address (include city, state, and zip):_____
Phone:_____

Hospital Address (include name, address, city, state, zip code, and phone)

_____

_____

Was the employee hospitalized? Yes No If yes, on what date_____
Was the employee treated as an outpatient, receive emergency treatment or ambulance service?__

_____

Please attach the physician's written return to work slip.

A physician's return to work slip is required prior to allowing the worker to return to work.

E. AUTOMOBILE ACCIDENT INFORMATION (complete if applicable)

Authority contacted and report #_____

EA employee vehicle year, make and model_____
V.I.N. _____Plate/tag#_____
Owner's name and address:_____

_____
Driver's name and address:_____

_____
Relation to insured:_____ Driver's License #_____
Describe damage to your property:_____

_____

_____
Describe damage to other vehicle or property:_____

_____

_____
Other driver's name and address:_____

_____
Other driver's phone:_____
Other driver's insurance company and phone:_____

_____
Location of other vehicle:_____
Name, address, and phone of other injured parties:_____

_____

_____

Witnesses

Name:_____Phone:_____
Address:_____
Statement:_____

_____
Signature:_____

Name:_____Phone:_____
Address:_____
Statement:_____

_____
Signature:_____

F. ACKNOWLEDGEMENT

Name of supervisor:_____

Date of this report:_____ Report prepared by:_____

I have read this report and the contents as to how the accident/loss occurred are accurate to the best of my knowledge.

Signature:_____ Date:_____

Injured employee

I am seeking medical treatment for a work-related injury/illness.

Please forward all bills/invoices/correspondence to:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Suite 400
Hunt Valley, Maryland 21031

Attention: Michele Bailey
Human Resources

(410) 584-7000

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Appendix E

Emergency Telephone Numbers and Hospital Directions

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Appendix E

Emergency Telephone Numbers and Hospital Directions

SITE: Dzus Fastener Company, Inc., West Islip, New York	
Police: Suffolk County Police Department	9-1-1 / (631) 854-8300
Fire: West Islip Fire Department	9-1-1 / (631)661-6440
Ambulance	9-1-1
Hospital: Good Samaritan Hospital Medical Center	(631) 376-3000
New York Regional Poison Control Center: 455 First Avenue, Room 123 New York, New York, 14222	(212) 689-9014 800-222-1222 (emergency)
Directions to Good Samaritan Hospital Medical Center (1000 Montauk Hwy, West Islip, New York 11795): Starting at 425 Union Boulevard, travel northeast 0.3 miles on Union Boulevard. Turn right onto Keith Lane/Union Boulevard and continue for 1.1 miles. Turn left to stay on Keith Lane for 217 feet. Total distance to Good Samaritan Hospital Medical Center is approximately 1.5 miles and 5 minutes.	
Program Safety and Health Officer: **Peter Garger, CIH, CSP**	(410) 584-7000 Office (732) 404-9370 Cell
Program Manager: **Donald Conan, P.E., P.G.**	(315) 877-7403
EA Project Manager **Adam Etringer**	(315) 565-6564 Office (518) 242-9773 Cell
In case of spill, contact **James Hayward**, P.E.	(315) 565-6555 Office (315) 645-0063 Cell
EA Medical Services (Physician) **All One Health Services**	(800) 229-3674
Field Manager/Site Health and Safety Officer: **Justin Marra**	(315) 565-6569 Office (315) 857-6406 Cell
Site Geologist/Scientist: **Erica Thieleman**	(315) 565-6562 (732) 779-0405
In case of accident or exposure incident, contact Corporate Health and Safety Officer **Peter Garger, CIH, CSP**	(410) 584-7000 Office (732) 404-9370 Cell

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Appendix F

Emergency Equipment Available Onsite

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Appendix F

Emergency Equipment Available Onsite

Type of Equipment	Location
Communications Equipment	
Mobile Telephone	EA vehicle
Medical Support Equipment	
First Aid Kits	EA vehicle
Eye Wash Station	EA vehicle
Firefighting Equipment	
Fire Extinguishers	EA vehicle

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Appendix G
Map to Hospital

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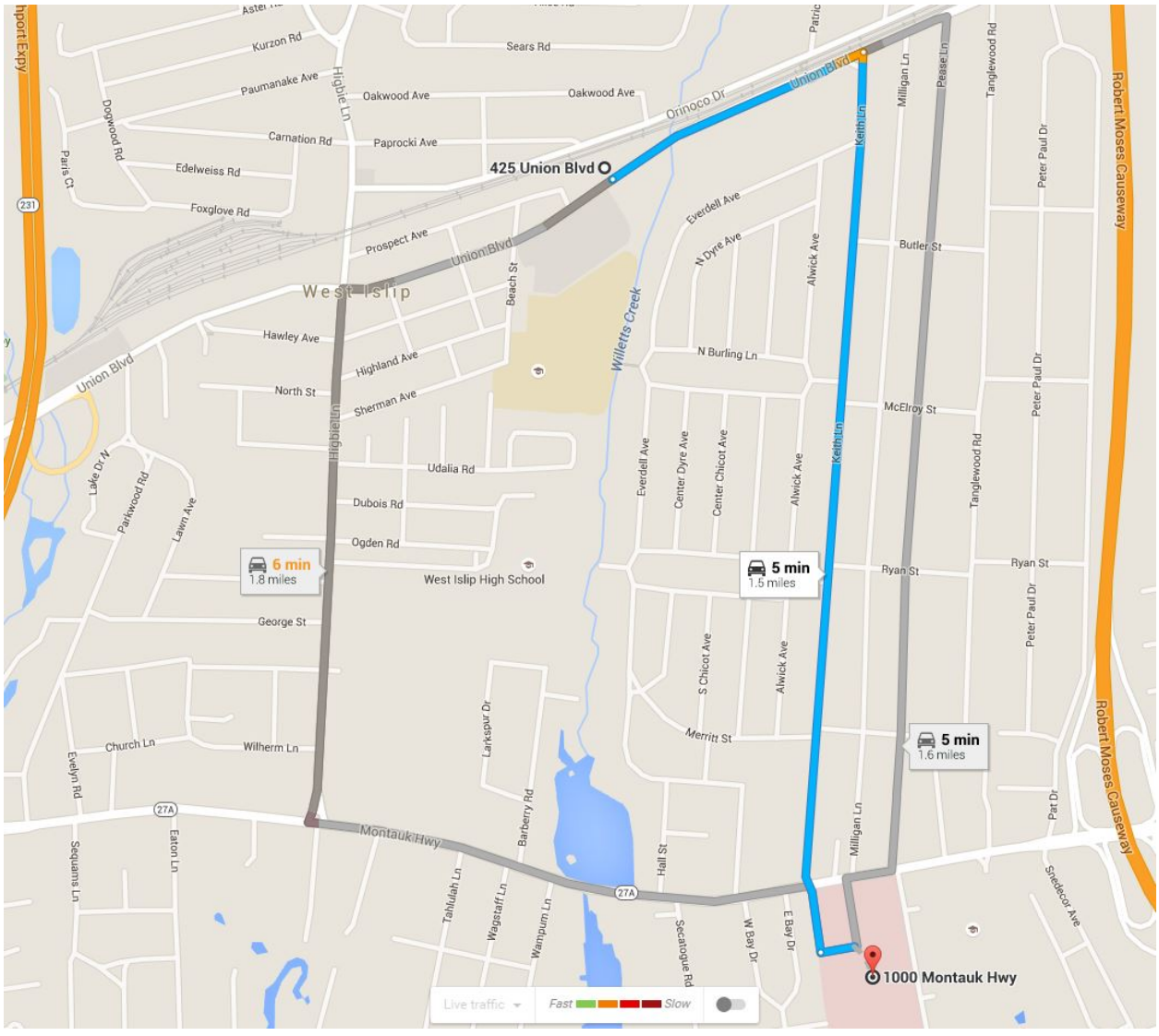
Appendix G

Map to Hospital

Directions to Good Samaritan Hospital Medical Center (1000 Montauk Hwy, West Islip, New York 11795)

Starting at 425 Union Boulevard, travel northeast 0.3 miles on Union Blvd. Turn right onto Keith Lane/Union Boulevard and continue for 1.1 miles. Turn left to stay on Keith Lane for 217 feet. Total distance to Good Samaritan Hospital Medical Center is approximately 1.5 miles and 5 minutes.



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Appendix H

Personal Protective Equipment Activity Record

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Appendix H

Personal Protective Equipment Activity Record

SITE: Dzus Fastener Company, Inc., West Islip, New York		
Weather Condition:		Onsite Hours: From To
Changes in Personal Protective Equipment Levels[(a)]	Work Operations	Reasons for Change
Site Health and Safety Plan Violations	Corrective Action Specified	Corrective Action Taken (yes/no)
Observations and Comments:		
Completed by: _____ Site Health and Safety Officer		Date
(a) Only the Site Health and Safety Officer may change personal protective equipment levels, using only criteria specified in the Health and Safety Plan Addendum.		

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Appendix I

Material Safety Data Sheets

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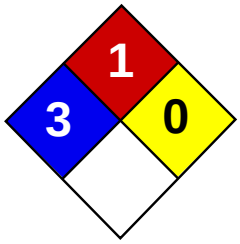

Health	3
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Cadmium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Cadmium

Catalog Codes: SLC3484, SLC5272, SLC2482

CAS#: 7440-43-9

RTECS: EU9800000

TSCA: TSCA 8(b) inventory: Cadmium

CI#: Not applicable.

Synonym:

Chemical Name: Cadmium

Chemical Formula: Cd

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Cadmium	7440-43-9	100

Toxicological Data on Ingredients: Cadmium: ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse]. DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 570°C (1058°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Appendix J

Corporate Vessel Operations Manual and Standard Operating Procedure No. 035 for Small Boat Operations

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Corporate
Vessel Operations Manual

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

www.eaest.com **EA Engineering, Science, and Technology, Inc., PBC** Offices Nationwide
IMPROVING THE QUALITY OF THE ENVIRONMENT IN WHICH WE LIVE, ONE PROJECT AT A TIME®

April 2017

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CONTENTS

NOTE: Prior to beginning any EA vessel-related activities, copies of the checklists (Chapter 11) should be made available for easy access.

Page

Page

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
EPIRB	Emergency Position Indicating Radio Beacon
FCC	Federal Communications Commission
ft	Foot (feet)
GPS	Global Positioning System
in.	Inch(es)
lb	Pound(s)
m	Meter(s)
MHz	Megahertz
mi	Mile(s)
MSD	Marine sanitation device
NA	Not applicable
NOS	National Ocean Service
PFD	Personal flotation device
USCG	U.S. Coast Guard
VHF	Very high frequency

1. INTRODUCTION

Personnel involved in activities associated with boating and watercraft are potentially exposed to a variety of hazards from activities including operations, maintenance, and transportation.

No person will be required or instructed to work in surroundings or under conditions that are unsafe or dangerous to his or her health.

Each individual employee is responsible for complying with applicable safety requirements, wearing prescribed safety equipment, and preventing avoidable accidents.

Safety and health programs, documents, signs, and tags will be communicated to employees in a language that they understand.

Adequate planning is needed before performing work at these sites to reduce the risk of employee injury or illness.

A partial listing of terms and phrases used during the operation of a vessel is provided in Appendix A. All members of the crew should be familiar with these terms.

1.1 PURPOSE

The purpose of this Manual is to communicate EA's basic policies and procedures regarding safety and health during the performance of work involving boating and watercraft activities. This Manual introduces the reader to EA's Boating and Watercraft Operations Program and critical references and definitions of terms used in this program.

1.2 APPLICABILITY

The procedures and requirements in this section apply to EA and subcontractor personnel involved in the boating and watercraft activities and operations. Visitors are required to follow these requirements.

1.3 DISCLAIMER

This Manual is not a comprehensive overview of all situations an operator may encounter, is not a substitute for common sense or experience, nor is it a substitute for a project- and/or site-specific Safety and Health Plan, as applicable.

1.4 REFERENCES

Maloney, E.S. 1981. Chapman Piloting, Seamanship and Small Boat Handling, 55th Edition. The Hearst Corporation, New York.

U.S. Coast Guard (USCG) safe boating website: www.uscgboating.org.

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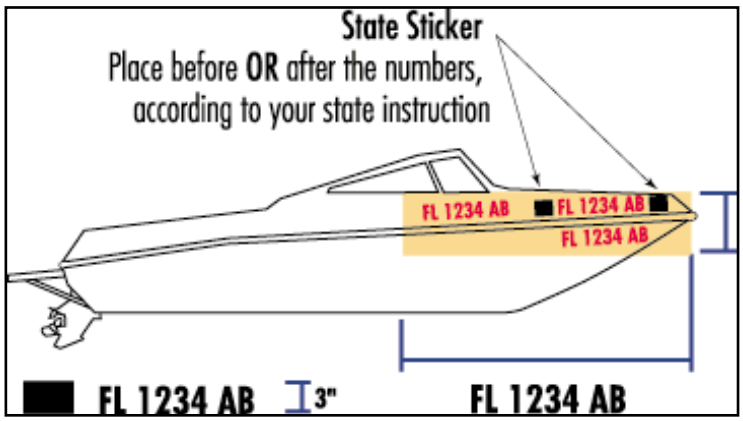
2. BOATING LAWS AND REGULATIONS

The purpose of this chapter is to acquaint the reader with different types of vessel registrations and numbering, according to the Federal Boat Safety Act of 1971, and adopted by Congress on 15 July 1997.

2.1 REGISTRATION, NUMBERING, AND DOCUMENTATION

All undocumented vessels equipped with propulsion machinery must be registered in the state of principal use. A Certificate of Number will be issued upon registering the vessel. These numbers must be displayed on your vessel. The owner/operator of a vessel must carry a valid Certificate of Number whenever the vessel is in use. When moved to a new state of principal use, the certificate is valid for 60 days. Check with your state boating authority for numbering requirements. Some states require all vessels to be numbered.



Some larger recreational vessels may be documented. The certificate of documentation MUST be on board a documented vessel at all times. A document serves as a certificate of nationality and an authorization for a specific trade. A documented vessel is not exempt from applicable state or federal taxes, nor is its operator exempt from compliance with federal or state equipment carriage requirements.

2.1.1 Display of Numbers

Numbers must be painted or permanently attached to each side of the forward half of the vessel. The validation stickers must be affixed within 6 inches (in.) of the registration number. With the exception of the vessel fee decal, no other letters or numbers may be displayed nearby.

2.1.2 Notification of Changes to a Numbered Vessel

The owner of a vessel must notify the agency that issued the Certificate of Number within 15 days if:

- The vessel is transferred, destroyed, abandoned, lost, stolen, or recovered
- The Certificate of Number is lost or destroyed, or the owner's address changes.

If the Certificate of Number becomes invalid for any reason, it must be surrendered in the manner prescribed to the issuing authority within 15 days.

A documented vessel must have the name of the vessel and hailing port plainly marked on the exterior part of the hull in clearly legible letters not less than 4 in. in height. In addition, the documented vessel must have the "Official Number" permanently affixed in block type, Arabic numerals, not less than 3 in. in height on some clearly visible interior structural part of the boat.

Table 2-1 provides a quick reference of vessel length and equipment requirements. The "Rules of the Water" are provided in Appendix B.

TABLE 2-1 QUICK REFERENCE

Vessel Length (in ft)				Equipment	Requirement
<16	16<26	26<40	40<65		
X	X	X	X	Certificate of Number (State Registration)	All undocumented vessels equipped with propulsion machinery must be State registered. Certificate of Number must be on board when vessel is in use. NOTE: Some states require all vessels to be numbered.
X	X	X	X	State Numbering	(a) Plain block letters/numbers not less than 3 in. in height must be affixed on each side of the forward half of the vessel (Contrasting color to boat exterior). (b) State validation sticker must be affixed within 6 in. of the registration number.
	X	X	X	Certificate of Documentation	Applies only to "Documented" vessels: (a) Original and current certificate must be on board. (b) Vessel name/hailing port marked on exterior part of hull – letters not less than 4 in. in height. (c) Official Number permanently affixed to interior structure – numbers not less than 3 in. in height.
X	X	X	X	Life Jackets (personal flotation devices)	(a) One Type I, II, III, or V wearable personal flotation device for each person on board (must be USCG approved).
	X	X	X		(b) In addition to Paragraph (a), must carry One Type IV (throwable) personal flotation device.
X				Visual Distress Signal	(a) One electric distress light or Three combination (day/night) red flares. NOTE: Only required to be carried on board when operating between sunset and sunrise.
	X	X	X		(b) One orange distress flag or one electric distress light; or three hand-held or floating orange smoke signals and one electric distress light; or three combination (day/night) red flares: hand -held, meteor, or parachute type.
X	X			Fire Extinguishers	(a) One B-I (when enclosed compartment).
		X			(b) One B-II or two B-I. NOTE: Fixed system equals one B-I.
			X		(c) One B-II and one B-I or three B-I. NOTE: Fixed system equals one B-I.
X	X	X	X	Ventilation	(a) All vessels built after 25 April 1940 that use gasoline as their fuel with enclosed engine and/or fuel tank compartments must have natural ventilation (at least two ducts fitted with cowls). (b) In addition to paragraph (a), a vessel built after 31 July 1980 must have rated power exhaust blower.
X	X	X	X	Backfire Flame Arrester	Required on gasoline engines installed after 25 April 1940, except outboard motors.
X	X	X	X	Sound Producing Devices	(a) Some means of making an "efficient" sound signal—audible for 0.5 mi/4-6 seconds (i.e., horn)
		X	X		(b) In addition to Paragraph (a), a vessel 39.4 feet (12 m) or greater, must carry on board a bell with clapper (bell size not less than-7.9 in.—based on the diameter of the mouth).
X	X	X	X	Navigational Lights	Required to be displayed from sunset to sunrise and in or near areas of reduced visibility.
NA	NA	NA	NA	FCC Radio License	Operator of a recreational vessel less than 65.6 ft (20 m) in length is not required to be licensed to operate VHF marine radios, emergency position indicating radio beacons, or any type of radar.

Vessel Length (in ft)				Equipment	Requirement
<16	16<26	26<40	40<65		
		X	X	Oil Pollution Placard	(a) Placard must be at least 5 × 8 in., made of durable material. (b) Placard must be posted in the machinery space or at the bilge station.
		X	X	Garbage Placard	(a) Placard must be at least 4 × 9 in., made of durable material. (b) Displayed in a conspicuous place notifying all on board the discharge restrictions.
X	X	X	X	Marine Sanitation Device	If installed toilet, vessel must have an operable Marine Sanitation Device Type I, II, or III.
		X	X	Navigational Rules (inland only)	The operator of a vessel 39.4 ft (12 m) or greater must have on board a copy of these rules.

NOTE: ft = Foot (feet).
in. = Inch(es)
m = Meter(s)
mi = Mile(s)
NA = Not applicable.

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3. FEDERAL MANDATED SAFETY EQUIPMENT

Federal mandated safety equipment is governed by the USCG Motor Boat Act of 1940 and retained by the Federal Boat Safety Act of 1971, which covers four classes of boats. Table 3-1 provides the minimum required equipment.

3.1 EQUIPMENT REQUIREMENTS – PERSONAL FLOTATION DEVICE

The USCG sets minimum safety standards for recreational boats and associated safety equipment. To meet these standards, some of the equipment must be USCG approved. "USCG-Approved Equipment" meets USCG specifications and regulations relating to performance, construction, or materials.

3.1.1 Personal Flotation Devices

All recreational boats must carry one wearable personal flotation device (PFD) (Type I, II, III, or V) for each person aboard. A Type V PFD provides performance of either a Type I, II, or III PFD (as marked on its label) and must be used according to the label requirements. Any boat 16 ft and longer (except canoes and kayaks) must also carry one throwable PFD (Type IV PFD).

PFDs must be USCG approved, in good and serviceable condition, and the appropriate size for the intended user.

Accessibility

- Wearable PFDs must be readily accessible.
- You must be able to put them on in a reasonable amount of time in an emergency (vessel sinking, on fire, etc.).
- They should not be stowed in plastic bags, in locked or closed compartments, or have other gear stowed on top of them.
- The best PFD is the one you will wear.
- Though not required, a PFD should be worn at all times when the vessel is underway; a wearable PFD may save your life, but only if you wear it.
- Throwable devices must be immediately available for use.

Inflatable Personal Flotation Devices

- Inflatable PFDs may be more comfortable to wear.
- The best PFD is the one you will wear.
- Inflatable PFDs require the user to pay careful attention to the condition of the device.
- Inflatable PFDs must have a full cylinder and all status indicators on the inflator must be green, or the device is NOT serviceable, and does NOT satisfy the requirement to carry PFDs.

USCG-approved inflatable PFDs are authorized only on recreational boats by a person at least 16 years of age.

Personal Flotation Device Requirements for Certain Boating Activities under State Laws

The USCG recommends, and many states require, wearing PFDs for the following activities:

- Water skiing and other towed activities (use a PFD marked for water skiing)
- While operating personal watercraft (use a PFD marked for water skiing or personal watercraft use)
- During white water boating activities
- While sailboarding (under federal law, sailboards are not "boats").

Check with your state boating safety officials.

Federal law does not require PFDs on racing shells, rowing sculls, and racing kayaks. State laws vary. Check with your state boating safety officials.

If you are boating in an area under the jurisdiction of the U.S. Army Corps of Engineers, or a federal, state, or local park authority, other rules may apply.

Remember, PFDs will keep you from sinking, but not necessarily from drowning.

- Select a properly-sized PFD to ensure a safe and proper fit.
- Test your PFD by wearing it in shallow water or guarded swimming pool to see how it will float you.

U.S. Coast Guard Auxiliary U.S. Power Squadrons Vessel Safety Check Requirements for Personal Flotation Devices

- All boats must be equipped with a wearable PFD for each person on board.
- Boats 16 ft and over are required to have a minimum of two PFDs on board, one wearable PFD (Type I, II, III, or V) and one throwable (Type IV); in addition, a wearable PFD is required for each person on board.

Personal Flotation Device Flotation

There are three basic kinds of PFD flotation in the five types of PFDs with the following characteristics:

- **Inherently Buoyant (primarily Foam)**
  - The *most* reliable
  - Adult, youth, child, and infant sizes
  - For swimmers and non-swimmers

— Wearable and throwable styles
— Some designed for water sports

Minimum Buoyancy		
Wearable Size	**Type**	**Inherent Buoyancy (Foam)**
Adult	I II and III V	22 lb 15.5 lb 15.5-22 lb
Youth	II and III V	11 lb 11-15.5 lb
Child and Infant	II	7 lb
Throwable: Cushion Ring Buoy	IV	 20 lb 16.5 and 32 lb
NOTE: lb = Pound(s).		

- **Inflatable**

— The most compact
— Sizes only for adults
— Only recommended for swimmers
— Wearable styles only
— Some with the best in-water performance

Minimum Buoyancy		
Wearable Size	**Type**	**Inherent Buoyancy**
Adult	I and II III V	34 lb 22.5 lb 22.5-34 lb

- **Hybrid (Foam and Inflation)**

— Reliable
— Adult, youth, and child sizes
— For swimmers and non-swimmers
— Wearable styles only
— Some designed for water sports

Hybrid (Foam and Inflation)			
Wearable Size	**Type**	**Inherent Buoyancy**	**Inflated Total Buoyancy**
Adult	II and III V	10 lb 7.5 lb	22 lb 22 lb
Youth	II and III V	9 lb 7.5 lb	15 lb 15 lb
Child	II	7 lb	12 lb

Types of Personal Flotation Devices

A Type I PFD, or offshore life jacket, provides the most buoyancy. It is effective for all waters, especially open, rough, or remote waters where rescue may be delayed. It is designed to turn most unconscious wearers in the water to a face-up position.

A Type II PFD, or near-shore buoyancy vest, is intended for calm, inland water or where there is a good chance of quick rescue. Inherent buoyant PFDs of this type will turn *some* unconscious wearers to a face-up position in the water, but the turning is not as pronounced as a Type I. This type of inflatable turns as well as a Type I foam PFD.

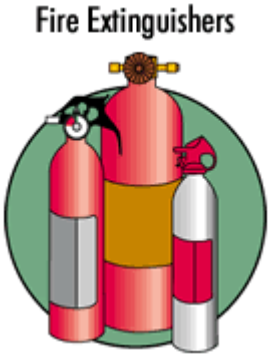
A Type III PFD, or flotation aid, is good for conscious users in calm, inland water, or where there is a good chance of quick rescue. It is designed so wearers can place themselves in a face-up position in the water. The wearer may have to tilt their head back to avoid turning face down in the water. The Type III foam vest has the same minimum buoyancy as a Type II PFD. It comes in many styles, colors, and sizes and is generally the most comfortable type for continuous wear. Float coats, fishing vests, and vests designed with features suitable for various sports activities are examples of this type PFD. This type inflatable turns as well as a Type II foam PFD.

A Type IV PFD, or throwable device, is intended for calm, inland water with heavy boat traffic, where help is always present. It is designed to be thrown to a person in the water and grasped and held by the user until rescued—it is *not* designed to be worn. Type IV devices include buoyant cushions, ring buoys, and horseshoe buoys. There are no inflatable Type IV devices.

A Type V PFD, or special use device, is intended for specific activities and may be carried instead of another PFD only if used according to the approval condition(s) on its label. A Type V PFD provides performance of either a Type I, II, or III PFD (as marked on its label). If the label says the PFD is "approved only when worn," the PFD must be worn, except for persons in enclosed spaces and used in accordance with the approval label, to meet carriage requirements. Some Type V devices provide significant hypothermia protection. Varieties include deck suits, work vests, and board sailing vests.

3.2 EQUIPMENT REQUIREMENTS – FIRE EXTINGUISHERS

USCG-approved fire extinguishers are required on boats where a fire hazard could be expected from the motors or the fuel system. Extinguishers are classified by a letter and number symbol. The letter indicates the type of fire the unit is designed to extinguish (Type B, for example, is designed to extinguish flammable liquids such as gasoline, oil, and grease fires). The number indicates the relative size of the extinguisher. The higher the number, the larger the extinguisher.



USCG-approved extinguishers required for boats are hand portable, either B-I or B-II classification, and have a specific marine type mounting bracket. The special bracket is required to securely hold the extinguisher in a moving boat. It is recommended the extinguishers be mounted in a readily accessible position, away from the areas where a fire could likely start such as the galley or the engine compartment.

Extinguisher markings can be confusing because extinguishers can be approved for several different types of hazards. For instance, an extinguisher marked "Type A, Size II, Type B:C, Size I" is a B-I extinguisher.

Look for the part of the label that reads "Marine Type USCG."

- Make sure Type B is indicated.
- Portable extinguishers will be either Size I or II. Size III and larger are too big for use on most recreational boats.

Classes	Foam (gal)	Carbon Dioxide (lb)	Dry Chemical (lb)	Halon (lb)
B-I (Type B, Size I)	1.25	4	2	2.5
B-II (Type B, Size II)	2.5	15	10	10

Fire extinguishers are required on boats if any of the following conditions exist:

- Inboard engines are installed.
- There are closed compartments and compartments under seats where portable fuel tanks may be stored.
- There are double bottoms not sealed to the hull or which are not completely filled with flotation materials.
- There are closed living spaces.
- There are closed stowage compartments in which combustible or flammable materials are stored.
- There are permanently installed fuel tanks (fuel tanks secured so they cannot be moved in case of fire or other emergency are considered permanently installed). There are no gallon capacity limits to determine if a fuel tank is portable. If the weight of a fuel tank is such that persons on board cannot move it, the USCG considers it permanently installed.

3.2.1 Fire Extinguisher Maintenance

Inspect extinguishers monthly to make sure that:

- Seals and tamper indicators are not broken or missing.
- Pressure gauges or indicators read in the operable range (NOTE: Carbon dioxide extinguishers do not have gauges).

- There is no obvious physical damage, corrosion, leakage, or clogged nozzles.
- Weigh extinguishers annually to assure that the minimum weight is as stated on the extinguisher label.

Fire extinguishers that do not satisfy the above requirements or that have been partially emptied must be replaced or taken to a qualified fire extinguisher servicing company for recharge.

3.2.2 Required Number of Fire Extinguishers

The number of fire extinguishers required on a recreational boat is based on the overall length of the boat. The following chart lists the number of extinguishers that are required. In the case where a USCG-approved pre-engineered fire extinguishing system is installed for the protection of the engine compartment, the required number of units may be reduced in accordance with the chart.

Minimum number of hand portable fire extinguishers required:

Vessel Length	No Fixed System	With Approved Fixed Systems
Less than 26 ft	1 B-1	0
26 ft to less than 40 ft	2 B-1 or 1 B-II	1 B-I
40-65 ft	3 B-I or 1 B-II and 1 B-I	2 B-1 or 1 B-II

The pressure gauge alone is not an accurate indicator that Halon extinguishers are full. The weight of the units should be checked regularly. It is recommended that portable extinguishers be mounted in a readily accessible position.

3.3 EQUIPMENT REQUIREMENTS – VENTILATION

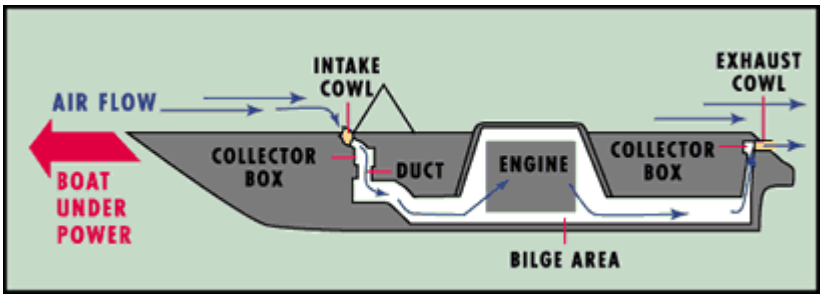
All boats that use gasoline for electrical generation, mechanical power, or propulsion are required to be equipped with a ventilation system. A natural ventilation system is required for each compartment in a boat that:

- Contains a permanently installed gasoline engine
- Has openings between it and a compartment that requires ventilation
- Contains a permanently installed fuel tank and an electrical component that is not ignition-protected
- Contains a fuel tank that vents into that compartment (including a portable tank)
- Contains a non-metallic fuel tank.

A natural ventilation system consists of:

- A supply opening (duct/cowl) from the atmosphere (located on the exterior surface of the boat) or from a ventilated compartment or from a compartment that is open to the atmosphere

- An exhaust opening into another ventilated compartment or an exhaust duct to the atmosphere.



All blower motors installed in exhaust ducts must be in working condition of date of manufacture.

Each exhaust opening or exhaust duct must originate in the lower one-third of the compartment. Each supply opening or supply duct and each exhaust opening or duct in a compartment must be above the normal accumulation of bilge water.

A powered ventilation system is required for each compartment in a boat that has a permanently installed gasoline engine with a cranking motor for remote starting.

A powered ventilation system consists of one or more exhaust blowers. Each intake duct for an exhaust blower must be in the lower one-third of the compartment and above the normal accumulation of bilge water.

For boats built prior to 1980, there was no requirement for a powered ventilation system; however, some boats were equipped with a blower.

The USCG Ventilation Standard, a manufacturer requirement, applies to all boats built on or after 1 August 1980. Some builders began manufacturing boats in compliance with the Ventilation Standard as early as August 1978. If your boat was built on or after 1 August 1978, it might have been equipped with either: (1) a natural ventilation system, or (2) both a natural ventilation system and a powered ventilation system. If your boat bears a label containing the words "This boat complies with USCG safety standards," etc., you can assume that the design of your boat's ventilation system meets applicable regulations.

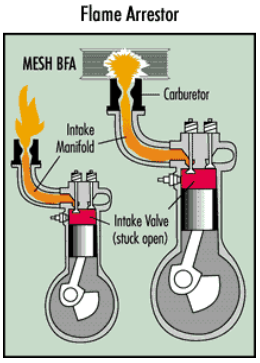
Manufacturers of boats built after 1980 with remote starters are required to display a label that contains the following information:

WARNING
Gasoline vapors can explode. Before starting engine, operate blower at least 4 minutes and check engine compartment bilge for gasoline vapors.

All owners of boats equipped with exhaust blowers are strongly encouraged to take the same precautions before starting a gasoline engine.

All owners are responsible for keeping their boat's ventilation systems in operating condition. This means making sure openings are free of obstructions, ducts are not blocked or torn, blowers operate properly, and worn components are replaced with equivalent marine type equipment.

3.4 EQUIPMENT REQUIREMENTS – BACKFIRE FLAME ARRESTOR



Gasoline engines installed in a vessel after 25 April 1940, except outboard motors, must be equipped with an acceptable means of backfire flame control. The device must be suitably attached to the air intake with a flame tight connection and is required to be USCG-approved or comply with SAE J-1928 or UL 1111 standards and marked accordingly.

3.5 EQUIPMENT REQUIREMENTS – SOUND-PRODUCING DEVICES

The navigation rules require sound signals to be made under certain circumstances. Meeting, crossing, and overtaking situations described in the Navigation Rules section are examples of when sound signals are required. Recreational vessels are also required to sound signals during periods of reduced visibility.

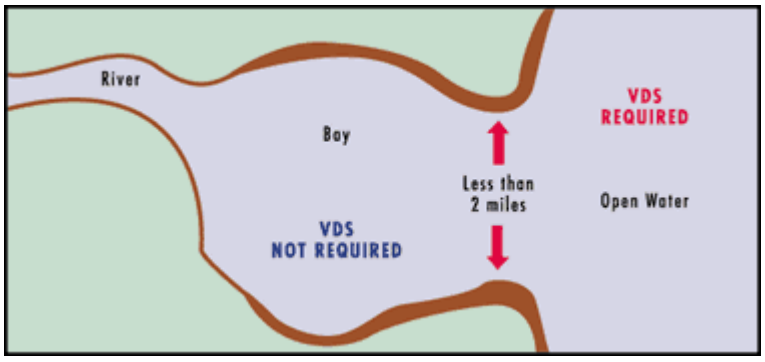
Vessels 39.4 ft/12 m or more in length are required to carry on board a whistle or horn, and a bell.

Any vessel less than 39.4 ft/12 m in length may carry a whistle or horn, or some other means to make an efficient sound signal to signal your intentions and to signal your position in periods of reduced visibility.

Therefore, any vessel less than 39.4 ft/12 m in length is required to make an efficient sound signal to signal intentions and to signal your position in periods of reduced visibility.

Vessel operators are required to carry some type of horn or whistle capable of a 4-second blast audible for 0.5 mi for all boats (athletic whistles are not acceptable on boats over 39.4 ft/12 m).

3.5.1 Visual Distress Signals



All vessels used on coastal waters, the Great Lakes, territorial seas, and those waters connected directly to them, up to a point where a body of water is less than 2 mi wide, must be equipped with USCG-approved visual distress signals. Vessels owned in the United States operating on the high seas must be equipped with USCG-approved visual distress signals.

The following vessels are not required to carry day signals but must carry night signals when operating from sunset to sunrise:

- Recreational boats less than 16 ft in length
- Boats participating in organized events such as races, regattas, or marine parades
- Open sailboats less than 26 ft in length not equipped with propulsion machinery
- Manually propelled boats.

3.5.2 Pyrotechnic Devices

Pyrotechnic visual distress signals must be USCG-approved, in serviceable condition, and readily accessible.

- They are marked with an expiration date. Expired signals may be carried as extra equipment, but cannot be counted toward meeting the visual distress signal requirement, since they may be unreliable.

- Launchers manufactured before 1 January 1981, intended for use with approved signals, are not required to be USCG-approved.

- If pyrotechnic devices are selected, a minimum of three is required; that is, three signals for day use and three signals for night. Some pyrotechnic signals meet both day and night use requirements.

- Pyrotechnic devices should be stored in a cool, dry location, if possible.

- A watertight container painted red or orange and prominently marked “DISTRESS SIGNALS” or “FLARES” is recommended.

USCG-approved pyrotechnic visual distress signals and associated devices include:

- Pyrotechnic red flares (hand-held or aerial)
- Pyrotechnic orange smoke (hand-held or floating)
- Launchers for aerial red meteors or parachute flares.

Each of these devices has a different operating (burning) time x seconds to y seconds. Check the label to see how long each pyrotechnic device will actually be illuminated. This will allow you to select a warning device better suited to the conditions where your boat will operate.

3.5.3 Non-Pyrotechnic Devices

Non-pyrotechnic visual distress signals must be in serviceable condition, readily accessible, and certified by the manufacturer as complying with USCG requirements. They include the following:

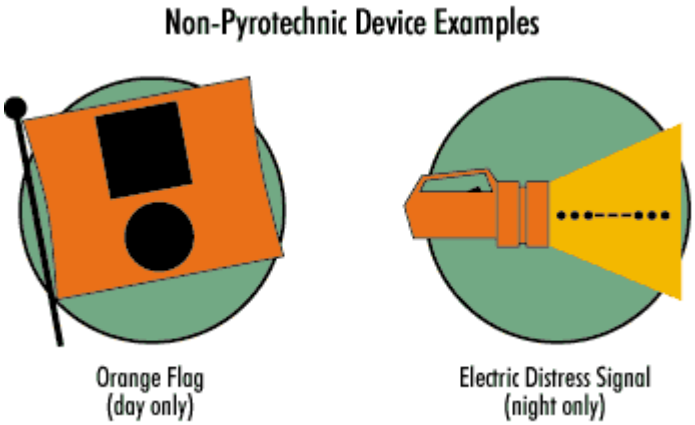
Orange Distress Flag

- Day signal only
- Must be at least 3 × 3 ft with a black square and ball on an orange background

- Must be marked with an indication that it meets USCG requirements in 46 Code of Federal Regulations (CFR) 160.072

- Most distinctive when attached and waved on a paddle, boathook, or flown from a mast

- May also be incorporated as part of devices designed to attract attention in an emergency, such as balloons, kites, or floating streamers.



Electric Distress Light

- Accepted for night use only
- Automatically flashes the international SOS distress signal (... --- ...)
- Must be marked with an indication that it meets USCG requirements in 46 CFR 161.013.

Under Inland Navigation Rules, a high intensity white light flashing at regular intervals from 50 to 70 times per minute is considered a distress signal. However, such devices do NOT count toward meeting the visual distress signal requirement.

Regulations prohibit display of visual distress signals on the water under any circumstances except when assistance is required to prevent immediate or potential danger to persons on board a vessel.

All distress signals have distinct advantages and disadvantages. No single device is ideal under all conditions or suitable for all purposes. Pyrotechnics are universally recognized as excellent distress signals. However, there is potential for injury and property damage if not properly handled. These devices produce a very hot flame and the residue can cause burns and ignite flammable materials.

Pistol launched and hand-held parachute flares and meteors have many characteristics of a firearm and must be handled with caution. In some states, they are considered a firearm and prohibited from use.

The following are just a few of the variety and combination of devices which can be carried in order to meet the requirements:

- Three hand-held red flares (day and night)

- One hand-held red flare and two parachute flares (day and night)

- One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only).

All boaters should be able to signal for help. Boaters must have current dated USCG-approved day and night signals for all boats operating on coastal and open bodies of water.

3.6 EQUIPMENT REQUIREMENTS – POLLUTION REGULATIONS

The Refuse Act of 1899 prohibits throwing, discharging, or depositing any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States.

The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances that may be harmful into United States navigable waters. Vessels 26 ft in length and over must display a placard at least 5 × 8 in., made of durable material, fixed in a conspicuous place in the machinery spaces, or at the bilge pump control station, stating the following:

Discharge of Oil Prohibited
The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste upon or into any navigable waters of the United States. The prohibition includes any discharge that causes a film or discoloration of the surface of the water or causes a sludge or emulsion beneath the surface of the water. Violators are subject to substantial civil and/or criminal sanctions including fines and imprisonment.

Regulations issued under the Federal Water Pollution Control Act require all vessels with propulsion machinery to have a capacity to retain oil mixtures on board. A fixed or portable means to discharge oily waste to a reception facility is required. A bucket or bailer is suitable as a portable means of discharging oily waste on recreational vessels. No person may intentionally drain oil or oily waste from any source into the bilge of any vessel. You must immediately notify the USCG if your vessel discharges oil or hazardous substances in the water. Call toll-free 800-424-8802 (in Washington, D.C. [202] 267-3675).

Report the following information:

- Location
- Color
- Source
- Substances
- Size
- Time observed.

The Act to Prevent Pollution from Ships (MARPOL ANNEX V) places limitations on the discharge of garbage from vessels. It is illegal to dump plastic trash anywhere in the ocean or navigable waters of the United States. It is also illegal to discharge garbage in the navigable waters of the United States, including the Great Lakes. The discharge of other types of garbage is permitted outside of specific distances offshore as determined by the nature of that garbage.

Garbage Type	Discharge
Plastics- including synthetic ropes, fishing nets, and plastic bags	Prohibited in all areas
Floating dunnage, lining, and packing materials	Prohibited less than 25 mi from nearest land
Food waste, paper, rags, glass, metal, bottles, crockery, and similar refuse	Prohibited less than 12 mi from nearest land
Comminuted or ground food waste, paper, rags, glass, etc.	Prohibited less than 3 mi from nearest land

United States vessels of 26 ft or longer must display, in a prominent location, a durable placard at least 4 × 9 in. notifying the crew and passengers of the discharge restrictions.

United States oceangoing vessels of 40 ft or longer that are engaged in commerce or are equipped with a galley and berthing must have a written Waste Management Plan describing the procedures for collecting, processing, storing, and discharging garbage, and designate the person who is in charge of carrying out the plan.

3.7 EQUIPMENT REQUIREMENTS – MARINE SANITATION DEVICES

All recreational boats with installed toilet facilities must have an operable marine sanitation device (MSD) on board. Vessels 65 ft and under may use a Type I, II, or III MSD. Vessels over 65 ft must install a Type II or III MSD. All installed MSDs must be USCG certified. USCG-certified devices are so labeled, except for some holding tanks, which are certified by definition under the regulations.

When operating a vessel on a body of water where the discharge of treated or untreated sewage is prohibited, the operator must secure the device in a manner that prevents any discharge. Some acceptable methods are: padlocking overboard discharge valves in the closed position, using non-releasable wire tie to hold overboard discharge valves in the closed position, closing overboard discharge values and removing the handle, and locking the door with padlock or keylock to the space enclosing the toilets (for Type I and Type II only.)

3.8 ADDITIONAL RECOMMENDED EQUIPMENT

Besides meeting the legal requirements, prudent boaters should carry additional safety equipment. The following additional items of equipment are suggested depending on the size, location, and use of your boat:

• Very high frequency (VHF) radio	• Chart and compass
• Boat hook	• Visual distress signals
• Spare anchor	• Spare propeller
• Heaving line	• Mooring line
• Fenders	• Food and water
• First aid kit	• Binoculars
• Flashlight	• Spare batteries
• Mirror	• Sunglasses
• Searchlight	• Marine hardware
• Sunburn lotion	• Extra clothing
• Tool kit	• Spare parts
• Ring buoy	• Alternate propulsion (paddles)
• Whistle or horn	• Dewatering device (pump or bailer)
• Fuel tanks	• Spare fuel
• Anchor	• Pumps must work or have manual bailer
• AM/FM radio	

TABLE 3-1 MINIMUM REQUIRED EQUIPMENT

Equipment	Class A (Less than 16 ft)	Class 1 (16 ft to less than 26 ft)	Class 2 (26 ft to less than 40 ft)	Class 3 (40 ft to not more than 65 ft)
PFDs	One Type I, II, III, or IV for each person.	One Type I, II, or III for each person on board or being towed on water skis, etc., plus one Type IV available to be thrown.		
Fire Extinguisher-Portable When NO fixed fire extinguishing system is installed in machinery space(s)	At least one B-1 type approved hand portable fire extinguisher (Not required on outboard motorboat less than 26 ft in length and not carrying passengers for hire if the construction of such motorboats will not permit the entrapment of explosive or flammable gases or vapors.)		At least two B-I type approved hand portable fire extinguishers; OR at least one B-II type approved hand portable fire extinguisher.	At least three B-I type approved hand portable fire extinguishers; OR at least one B-I type *Plus* one B-II type approved hand portable fire extinguisher.
Backfire Flame Arrestor	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, except outboard motors.			
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel-tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110 degrees Fahrenheit. Boats built after 31 July 1981 must have operable power blowers.			
Whistle	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal" audible 0.5 mi.	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal" audible 0.5 mi.	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal" audible 0.5 mi.	Boats 12-20 m (39.4-65.7 ft) – device meeting technical specifications of Inland Rules Annex III audible 0.5 mi.
Bell	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal."	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal."	Boats up to 12 m (39.4 ft) – any device capable of making an "efficient sound signal."	Boats 12-20 m (39.4-65.7 ft) – bell meeting technical specifications of Inland Rules Annex III; mouth diameter of at least 200 m (7.9 in.).
When fixed fire extinguishing system is installed in machinery space(s).	None	None	At least one B-I type approved hand portable fire extinguisher.	At least two B-I type approved hand portable fire extinguishers; OR at least one B-II type approved hand portable fire extinguisher.
	NOTE: Dry chemical and carbon dioxide are the most widely used types, in that order. The others, while acceptable, are seldom seen on boats.			

(a) Not required by the Motorboat Act of 1940; however, the "Rules of the Water" require these vessels to sound proper signals (Appendix B).

NOTE: Fire extinguishers manufactured after 1 January 1965 will be marked, "Marine Type, Size, Approval No. 162.028/EX." Toxic vaporizing-liquid type fire extinguishers, such as those containing carbon tetrachloride or chlorobromomethane, are not accepted as required approved extinguishers on uninspected vessels (private pleasure craft).

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4. NAVIGATION RULES

Navigation rules require vessels to display lights and shapes under certain conditions.

4.1 NAVIGATION LIGHTS

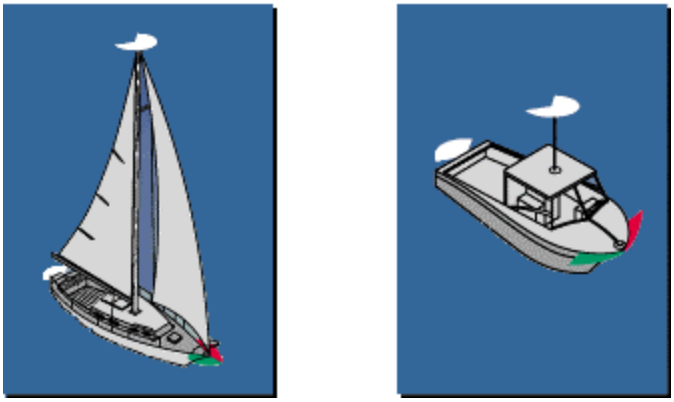
Recreational vessels are required to display navigation lights between sunset and sunrise and other periods of reduced visibility (fog, rain, hazy, etc.). The USCG Navigation Rules, International-Inland, specifies lighting requirements for every description of water craft. The information provided here is intended for power-driven and sailing vessels less than 65.5 ft/20 m in length.

4.2 POWER-DRIVEN VESSELS

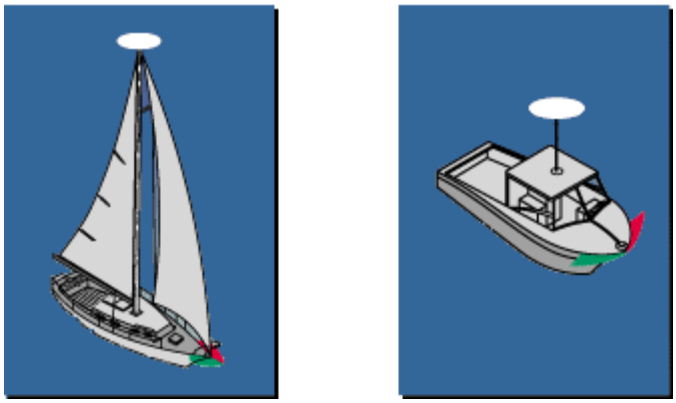
If your vessel is less than 65.5 ft/20 m in length, then it must display navigation lights per Photograph 4-1.

If your vessel is less than 39.4 ft/12 m in length, then it may display navigation lights per Photograph 4-2.

Photograph 4-1.



Photograph 4-2.



If your vessel is less than 23 ft/7 m in length and its maximum speed cannot exceed 7 knots, then it may display an all-around white light, and if practicable, sidelights instead of the lights prescribed previously (for international rules only).

For vessels less than 39.4 ft/12 m in length, the masthead or all-around white light must be at least 1 m above the sidelights.

Sidelights may be a combination light instead of two separate lights.

4.3 SAILING VESSELS

If your vessel is less than 65.6 ft/20 m in length, then it must display navigation lights shown on Photographs 4-3, 4-4, or 4-5.

Photograph 4-3.

Photograph 4-4.

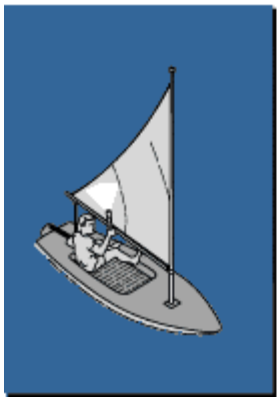
Photograph 4-5.

If your vessel is less than 23 ft/7 m in length, then it should display lights for a sailboat (Photograph 4-3), if practicable. As an option, your vessel may carry a flashlight or lighted lantern that can show a white light in sufficient time to prevent collision (Photograph 4-6).

4.3.1 Vessel under Oars

If your vessels is under oars, then it should display lights for a sailboat (Photographs 4-3, 4-4, or 4-5), if practicable. As an option, your vessel may carry an electric torch (flashlight) or lighted lantern that can show a white light in sufficient time to prevent collision (Photograph 4-7).

Photograph 4-6.



Photograph 4-7.

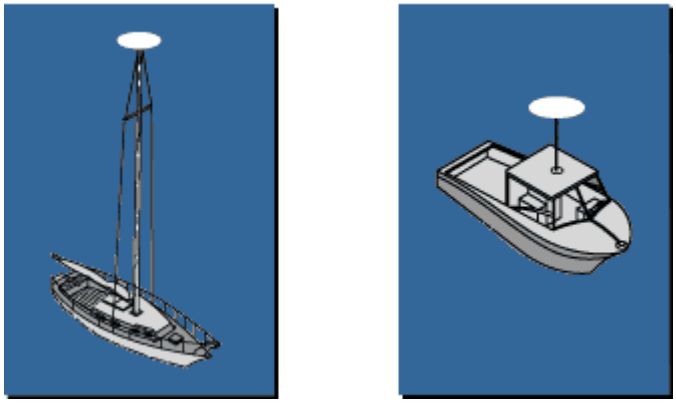
4.3.2 Lights and Shapes

To alert other vessels of conditions that may be hazardous, there are requirements to display lights at night and shapes during the day.

4.3.3 Anchored Vessels

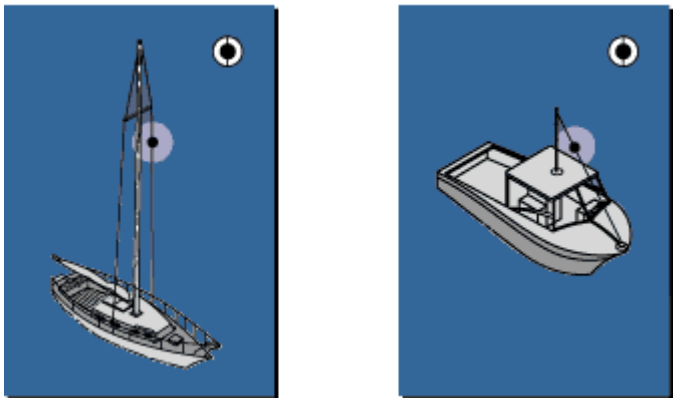
AT NIGHT: All vessels at anchor must display anchor lights. If your vessel is less than 164 ft/50 m in length, then its anchor light is an all-around white light visible where it can best be seen from all directions (Photograph 4-8).

Photograph 4-8.



DURING THE DAY: All vessels at anchor must display, forward where it can be best seen, a black ball shape conditions (Photograph 4-9).

Photograph 4-9.



EXCEPTIONS: If your vessel is less than 23 ft/7 m in length, then it is not required to display an anchor light or shape unless it is anchored in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate. If your vessel is less than 65.6 ft/20 m in length, then it is not required to display an anchor light if it is anchored in Inland Waters in a special anchorage designated by the Secretary of Transportation.

4.3.4 Sailing Vessels under Power (Machinery)

Photograph 4-10.

During the day, vessels under sail also being propelled by machinery must exhibit forward, where best seen, a black conical shape with the apex pointing down (Photograph 4-10).

EXCEPTION: If your vessel is less than 39.4 ft/12 m in length, then it is not required to display the shape in Inland Waters.

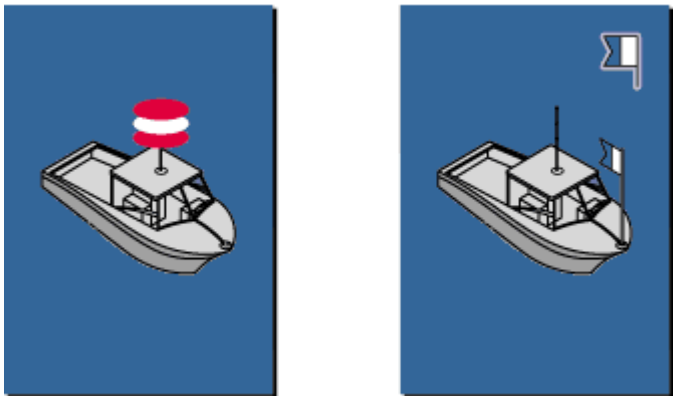
REMINDER: If you are operating your sail vessel at night using machinery or sail and machinery, then your vessel must display lights required for a power-driven vessel (Photographs 4-1 or 4-2).

4.3.5 Restricted Maneuverability

The Navigation Rules require vessels restricted in their ability to maneuver to display appropriate day shapes or lights. To meet this requirement, if your vessel is engaged in diving activities during the day, then it must exhibit a rigid replica of the international code flag "Alpha" not less than 3.3 ft/1 m above deck.

If diving activities are at night, then your vessel must display the navigation lights shown on Photograph 4-11. This requirement does not affect the use of a red and white divers flag which may be required by state or local law to mark a diver's location. The "A" flag is a navigation signal indicating the vessel's restricted maneuverability and does not pertain to the diver.

Photograph 4-11.



All vessels 16 ft or greater must have operable navigation lights and an all around anchor light. Sailboats capable of both power and sail must be able to display navigation lights for both systems.

Tables 4-1 and 4-2 provide the required lights for various types of vessels for inland and international rules, respectively.

TABLE 4-1 LIGHTS FOR VARIOUS TYPES OF VESSELS – 1980 INLAND RULES

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
1	Power-driven vessel 12 m but less than 20 m in length	White, 225 degrees, visibility 3 mi; at least 2.5 m above gunwale[a]	Separate red and green 112 ½ degrees or combination, visibility 2 mi; above hull at least 1 m below masthead light[b]	White 135 degrees, visibility 2 mi	---
2	Power-driven vessel less than 12 m in length	White, 225 degrees, visibility 2 mi; can be less than 2.5 m above gunwale, but at least 1 m above side lights[a],[c]	Separate red and green 112 ½ degrees or combination, visibility 1 mi; above hull at least 1 m below masthead light[b],[c]	White 135 degrees, visibility 2 mi	---
3	Sailing vessel under 20 m in length	None	Separate red and green, 112 ½ degrees or combination, visibility 2 mi [b],[d]	White 135 degrees, visibility 2 mi	Optional—two all-round lights at or near top of mast, red over green, separated at least 1 m, visibility 2 mi
4	Sailing vessel under 12 m in length	None	Separate red and green, 112 ½ degrees or combination, visibility 1 mi[b],[d],[e]	White 135 degrees, visibility 2 mi[d],[e]	---
5	Vessel propelled by oars	None	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi[f]	May show white, 135 degrees, visibility 2 mi[f]	---
6	Power-driven vessel 20 but less than 50 m in length	White, 225 degrees, visibility 5 mi; not more than ½ of length aft from stem; 6 m or beam (up to 10 m) above hull	Red and green, 112 ½ degrees, visibility 2 mi; at or near sides of vessel; above hull at least 1 m below masthead light	White, 135 degrees, visibility 2 mi	After masthead light may be shown; at least 4.5 m higher than forward masthead light
7	Power-driven vessel 50 m or more in length	White, 225 degrees, visibility 6 mi; not more than ½ of length aft from stem; 6 m or beam (up to 10 m) above hull	Red and green, 112 ½ degrees, visibility 3 mi; at or near sides of vessel; above hull at least 1 m below masthead light	White, 135 degrees, visibility 3 mi	After masthead light required; at least 4.5 m higher and ¼ of vessel length (up to 50 m) aft of forward masthead light
8	Vessel towing: tow less than 200 m overall from stern of towing vessel; (also towing alongside or pushing ahead)	Two white, arranged vertically, 225 degrees, visibility determined by length of vessel (not required pushing ahead or towing alongside on western rivers)	Normal for size of vessel	Normal for size of vessel	Towing astern: towing light[g] over stern light; pushing ahead or towing alongside: two towing lights[g] vertically
9	Vessel towing: tow 200 m or more overall length	Three white, arranged vertically, 225 degrees, visibility determined by length of vessel	Normal for size of vessel	Normal for size of vessel	Towing light: yellow, 135 degrees, above sternlight[g]
10	Vessel being towed astern, if manned	None	Normal for size of vessel	Normal for size of vessel	
11	Vessel being towed alongside or pushed ahead	None	Normal for size of vessel; at forward end	Normal for size of vessel (not used for pushed ahead)	Also "special flashing light" at center or forward end; a group of vessels is lighted as a single vessel

(a) After masthead light may be shown but not required (exception allowed on Great Lakes).
(b) Fitted with inboard screens if necessary to prevent being seen across bow.
(c) Less than 12 m in length, need only have all-round white light, visibility 2 mi but should have side lights.
(d) May be combined into triple combination light at masthead.
(e) Less than 7 m, need only have flashlight or lantern to show.
(f) Need only have flashlight or lantern to show white light.
(g) Visibility 3 mi for vessels 50 m or more in length; 2 mi for shorter vessels.

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
12	Vessel engaged in trolling or drift fishing	(h)	(h)	(h)	---
13	Vessel engaged in trawling	None(a)(b)	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, green over white(g),(i),(j),(k)
14	Vessel engaged in fishing, other than trawling (or trolling)	None(l)	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, red over white(g),(i),(j),(k)(l); when not actually fishing, show normal masthead lights for vessel its size
15	Vessel at anchor, less than 50 m in length	None	None	None	White, all-round light where can best be seen; visibility 2 mi (not required if less than 7 m in length and not anchored in a narrow channel or where vessels normally navigate)
16	Vessel at anchor; 50 m or more in length	None	None	None	White, all-round light in fore part of vessel not less than 6 m above hull; a second white, all-round light in after part, not less than 4.5 m lower than forward anchor light; visibility 3 mi
17	Vessel aground	None	None		Anchor light(s) as line 15 or 16 plus two red all-round lights of same visibility range(g),(i),(j) (not required if less than 12 m in length)
18	Pilot vessel	None if on pilot duty; normal if underway and not on pilot duty	When underway, normal for size of vessel	When underway, normal for size of vessel	Two all-round lights, white over red, at masthead(g),(i),(j); if at anchor, normal anchor light(s); line 15 or 16
19	Vessel not under command	None	If making way through the water, normal for size of vessel	If making way through the water, normal for size of vessel	Two red all-round lights vertically where best can be seen(g),(i),(j)
20	Vessel restricted in ability to maneuver	None	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Three all-round lights vertically, red-white-red.(g),(i); if at anchor, normal anchor light(s) (not required if less than 12 m in length)

(h) Show only normal lights of power-driven or sailing vessel.
(i) Vertical spacing 1 m.
(j) Lower light not less than 4 m (2 m if under 20 m in length) above hull.
(k) Lower light above sidelights at least twice vertical spacing.
(l) When not actually fishing, show normal masthead lights for vessel its size.

TABLE 4-2 LIGHTS FOR VARIOUS TYPES OF VESSELS –1972 INTERNATIONAL RULES

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
A	Power-driven vessel 12 m but less than 20 m in length	White, 225 degrees, visibility 3 mi. At least 2.5 m above gunwale[(a)]	Separate red and green, 112 ½ degrees, or combination, visibility 2 m; above hull at least 1 m below masthead light[(b)]	White, 135 degrees, visibility 2 mi	---
B	Power-driven vessel less than 12 m in length	White, 225 degrees, visibility 2 mi. Can be less than 2.5 m above gunwale, but at least 1 m above side lights[(c)]	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi; above hull at least 1 m below masthead light[(b)]	White, 135 degrees, visibility 2 mi	---
C	Sailing vessel under 20 m in length	None	Separate red and green, 112 ½ degrees, or combination, visibility 2 mi	White, 135 degrees, visibility 2 mi	Optional – two all-round lights at or near top of mast, red over green, separated at least 1 m, visibility 2 mi.
D	Sailing vessel under 12 m in length	None	Separate red and green, 112 ½ degrees, or combination, visibility 1 mi[(b)(d)]	White, 135 degrees, visibility 2 mi[(d)(e)]	---
E	Vessel propelled by oars	None	May show separate red and green, 112 ½ degrees, or combination, visibility 1 mi[(f)]	May show white, 135 degrees, visibility 2 mi[(f)]	---
F	Power-driven vessel 20 m but less than 50 m in length	White, 225 degrees, visibility 5 mi. Not more than ¼ of length aft from stem; 6 m or beam (up to 12 m) above hull.	Red and green, 112 ½º, visibility 2 mi. At or near sides of vessel; not more than ¾ height of masthead light	White, 135 degrees, visibility 2 mi	After masthead light may be shown; at least 4.5 m higher than forward masthead light
G	Power-driven vessel 50 m or more in length	White, 225 degrees, visibility 6 mi. Not more than ¼ of length aft from stem; 6 m or beam (up to 12 m) above hull.	Red and green, 112 ½ degrees, visibility 3 mi. At or near sides of vessel; not more than ¾ height of forward masthead light	White, 135 degrees, visibility 3 mi	After masthead light required; at least 4.5 m higher and half of vessel length (up to 100 m) aft of forward masthead light
H	Vessel towing; tow from stern of towing less than 200 m overall vessel. (also towing alongside or pushing ahead)	Two white, arranged vertically, 225 degrees, visibility determined by length of vessel.	Normal for size of vessel	Normal for size of vessel	Towing light[(g)] over sternlight (not shown when towing alongside or pushing ahead)
I	Vessel towing; tow 200 m or more overall length	Three white, arranged vertically, 225 degrees, visibility determined by length of vessel	Normal for size of vessel	Normal for size of vessel	Towing light[(g)] over stern light

(a) After masthead light may be shown but not required.
(b) Fitted with inboard screens if necessary to prevent being seen across bow.
(c) Less than 7 m and less than 7 knots maximum speed need only have all-round white light, visibility 2 mi but should have sidelights.
(d) May be combined into triple combination light at masthead.
(e) Less than 7 m need only have flashlight or lantern to show.
(f) Need only have flashlight or lantern to show white light.
(g) Visibility 3 mi for vessels 50 m or more in length; 2 mi for shorter vessels.

No.	Vessel	Masthead (Forward)	Side	Stern	Additional Lights or Remarks
J	Vessel being towed astern, if manned	None	Normal for size of vessel	Normal for size of vessel	
K	Vessel being towed alongside or pushed ahead	None	Normal for size of vessel; at forward end	Normal for size of vessel (not used for pushed ahead)	A group of vessels is lighted as a single vessel
L	Vessel engaged in trolling or drift fishing	(h)	(h)	(h)	---
M	Vessel engaged in trawling	None(i)	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all- round lights, green over white(g)(j)(k)(l)
N	Vessel engaged in fishing, other than trawling (or trolling)	None(i)	When making way through the water, normal for size of vessel	When making way through the water, normal for size of vessel	Underway or at anchor, two all-round lights, red over white(g)(j)(k)(l)
O	Vessel at anchor, less than 50 m in length	None	None	None	White, all-round light where can best be seen; visibility 2 mi (not required if less than 7 m in length and not anchored in a narrow channel or where vessels normally navigate)
P	Vessel at anchor; 50 m or more in length	None	None	None	White, all-round light in fore part of vessel not less than 6 m above hull; a second white all-round light in after part, not less than 4.5 m lower than forward anchor light; visibility 3 mi.
Q	Vessel aground	None	None		Normal anchor light(s) plus two red all-round lights of same visibility range
R	Pilot vessel	None if on pilot duty; normal if underway and not on pilot duty	When underway, normal for size of vessel	When underway, normal for size of vessel	Two all-round lights, white over red, at masthead(g)(j)(k); if at anchor, normal anchor light(s)
S	Vessel not under command	None	If making way through the water, normal for size of vessel	If making way through the water, normal for size of vessel	Two red all-round lights vertically where best can be seen(g)(j)(k)
T	Vessel constrained by her draft	Normal for size of vessel	Normal for size of vessel	Normal for size of vessel	Three red all-round lights, arranged vertically and equally spaced.(g)(j)(k)

(h) Show only normal lights of power-driven or sailing vessel.
(i) When not actually fishing, show normal masthead lights for vessel its size.
(j) Vertical spacing 2 m for vessels 20 m or more in length, 1 m for shorter vessels.
(k) Lower light not less than 4 m (2 m if under 20 m in length) above hull.
(l) Lower light above sidelights at least twice vertical spacing.

5. INLAND "RULES OF THE WATER"

5.1 MEETING SITUATIONS

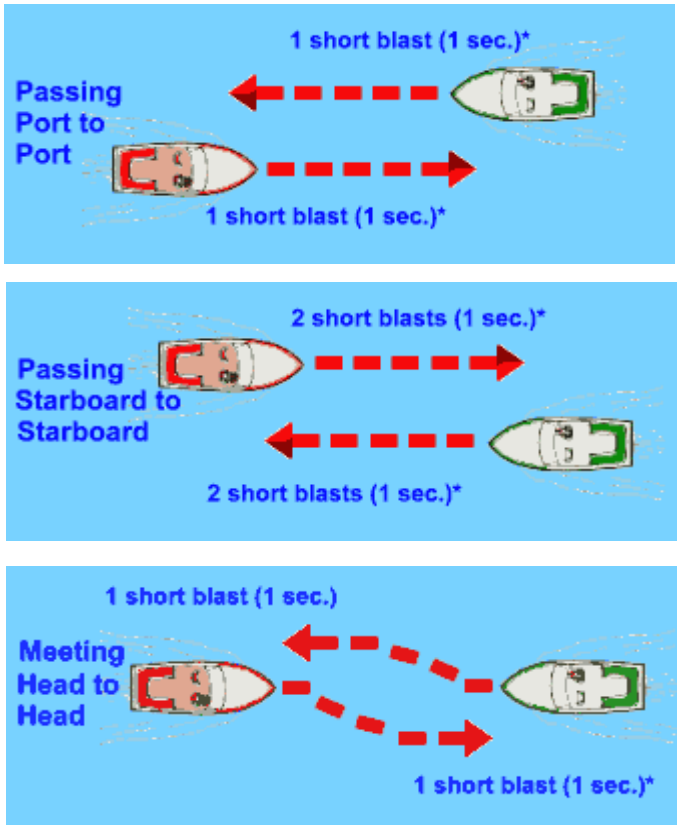
In the following situations, the give-way vessel must take action to keep well clear. The stand-on vessel should maintain its course and speed. If it becomes apparent that the actions taken (or not taken) by the give-way vessel are dangerous or insufficient, you should take action to avoid collision.

5.1.1 Meeting Head-On

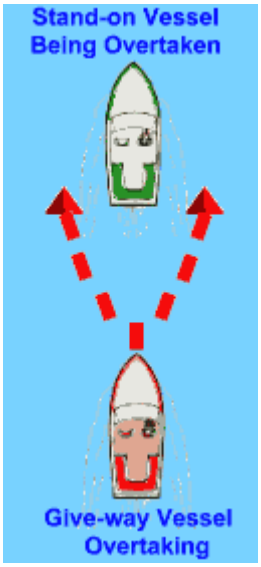
When two power-driven vessels are approaching head-on or nearly so, either vessel will indicate its intent, which the other vessel will answer promptly. In a meeting situation, neither vessel is the stand-on vessel.

It is generally accepted that you should alter course to starboard and pass port-to-port. The accompanying sound signal is one short blast. If you cannot pass port-to-port due to an obstruction or other vessels, you should sound two short blasts to indicate your intention to pass starboard-to-starboard. Make sure the other vessel understands your intent before proceeding. The other vessel should return your two-short-blast signal.

- Not sounded on International Waters



5.1.2 Overtaking

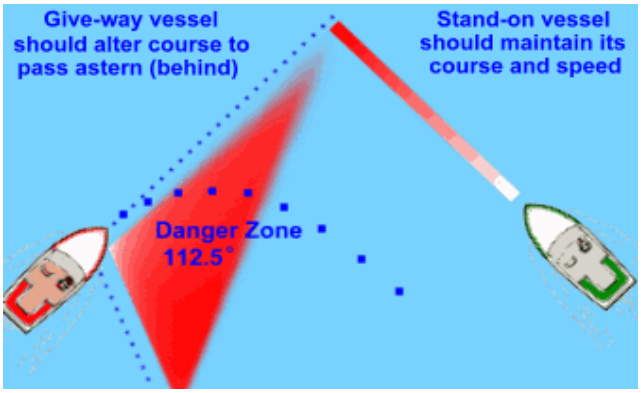


When two vessels are moving in the same direction, and the astern vessel wishes to pass, it must initiate the signal to pass as shown in the diagram. The vessel passing is the give-way vessel and should keep out of the way of the vessel being passed. The vessel being passed is the stand-on vessel and must maintain its course and speed. If the stand-on vessel realizes that the course intended by the give-way vessel is not safe, it should sound the danger or doubt signal.

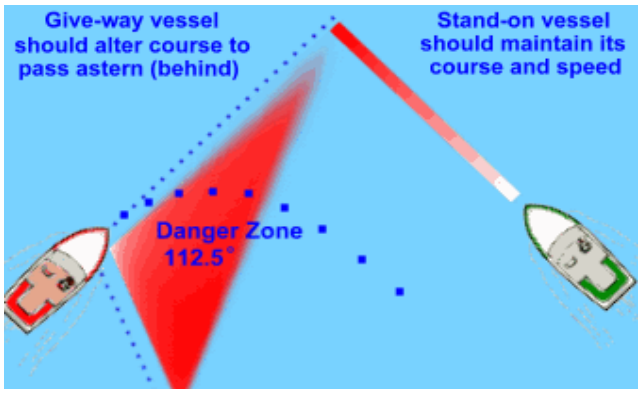
If you are the overtaking vessel, remember that you are the give-way vessel until well past, and safely clear of, the passed vessel. Do not cut in front, impede, or endanger another vessel.

Inland Rules: "I intend to pass you on your port side" *2 short blasts (1 second)* "Agreement" *2 short blasts (1 second)*	**Inland Rules:** "I intend to pass you on your starboard side" *1 short blast (1 second)* "Agreement" *1 short blast (1 second)*
International Rules: "I intend to pass you on your port side" *2 prolonged blasts/2 short* "Agreement" *1 prolonged/1 short/1 prolonged/1 short*	**International Rules:** "I intend to pass you on your starboard side" *2 prolonged blasts/1 short* "Agreement" *1 prolonged/1 short/1 prolonged/1 short*

5.1.3 Crossing

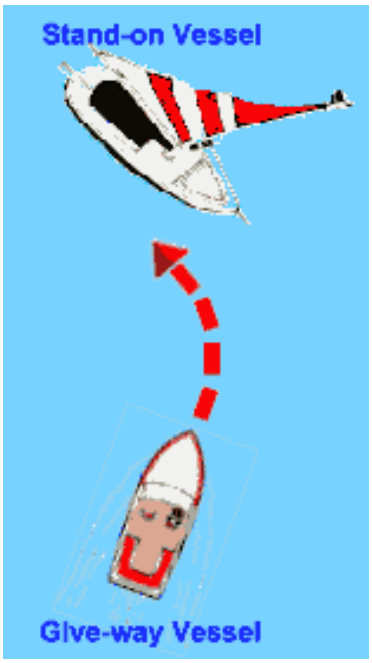


When two power-driven vessels are approaching at right angles or nearly so, and risk of collision exists, the vessel on the right is the stand-on vessel and must hold its course and speed. The other vessel, the give-way vessel, will maneuver to keep clear of the stand-on vessel and will pass it by its stern. If necessary, slow or stop or reverse until the stand-on vessel is clear.



In the example above, the red vessel is the give-way vessel and should alter course and speed to pass behind the green vessel. If the skipper of the green vessel does not observe the red vessel taking action to avoid collision, then he/she must take the required action to avoid a collision.

5.1.4 Sailing Craft and Vessels Propelled by Oars or Paddles



Sailing craft and boats propelled by oars or paddles have the right-of-way over power-driven vessels. An exception to this is if the sailing craft or self-propelled vessel is passing a power-driven vessel. In an overtaking situation, the overtaking vessel is the give-way vessel, even if it is not propelled by an engine.

5.1.5 Navigating Narrow Channels

The rules tell you to stay to the starboard side of narrow channels. Make sure that you do not impede a vessel that is constrained by draft (i.e., a large vessel that must operate within the channel in order to make way safely). When crossing a channel, do so at a right angle and in such a way as to avoid causing the traffic in the channel to make course or speed changes. Do not anchor in a channel unless you cannot make way (broken down, etc.).

When operating on the Great Lakes, Western rivers, and other designated rivers, the down bound vessel (going with the current) has the right of way over a vessel going upstream. This is because a vessel going upstream can maneuver better than a vessel going downstream.

If you approach a bend in a river around which you cannot see, sound one prolonged blast to alert vessels approaching from the other side of the bend that you are there. If another vessel is around the bend, it should answer with one prolonged blast. Conversely, if you hear a prolonged blast as you approach the bend, answer with a prolonged blast.

5.1.6 Commercial Vessel Situations

If at all possible, stay out of areas where there is commercial vessel traffic such as shipping lanes or traffic separation zones. Large ships and barges have special problems in maneuvering and **cannot and will not** get out of your way.

If you must operate around commercial vessels, take heed of the following:

- Avoid ship channels; if you must cross, do so at right angles and as quickly as possible.
- Be alert; watch for traffic.
- Be seen, especially at night.
- Know the sound signals, especially the danger or doubt signal.
- Keep your VHF radio tuned to Channel 16 and listen carefully.
- Order all aboard to wear PFDs.
- Be familiar with the area and have current navigation charts.
- Do not be a non-survivor of a collision with a large ship.

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6. SEAMANSHIP

Seamanship is defined as "the knowledge of and skill in all things pertaining to the operation, navigation, and maintenance of a ship." This knowledge may include; handling and working with rope, wire, and various boat hardware. Basic engine and boat electrical layout maintenance and troubleshooting. Piloting including boat handling, engine operation, proper use of charts, and use of navigation equipment (i.e., depth finders, compass, Global Positioning System [GPS] or loran units, speedometer). A fundamental knowledge of weather (wind, fronts, and cloud types) and the water environment (wave action, tides, and currents). Proper emergency preparation training, basic first aid knowledge, and survival techniques are an integral part of seamanship.

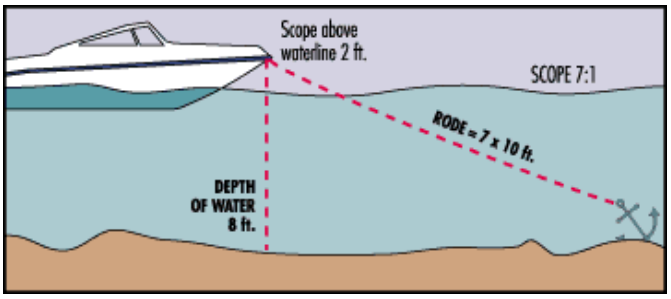
Seamanship skills are developed through training courses, such as the USCG Auxiliary Training course, through training manuals, regulatory handbooks, instructional guides and videos, and most importantly through actual hands on experience and working with people who have developed the skills.

6.1 ANCHORING

Anchoring is done for two principal reasons: first, to stop for fishing, lunch, or an overnight stay and second, to keep you from running aground in bad weather or as a result of engine failure. Anchoring can be a simple task if you follow these guidelines:

- Make sure you have the proper type of anchor (danforth/plow/mushroom).
- A 3- to 6-ft length of galvanized chain should be attached to the anchor. The chain will stand up to the abrasion of sand, rock, or mud on the bottom much better than a fiber line.
- A suitable length of nylon anchor line should be attached to the end of the chain (this combination is called the "Rode"). The nylon will stretch under heavy strain cushioning the impact of the waves or wind on the boat and the anchor.
- Select an area that offers maximum shelter from wind, current, and boat traffic.
- Determine depth of water and type of bottom (preferably sand or mud).
- Calculate the amount of anchor line you will need. General rule: 5-7 times as much anchor line as the depth of water plus the distance from the water to where the anchor will attach to the bow. For example, if the water depth is 8 ft and it is 2 ft from the top of water to your bow cleat, you would multiply 10 ft by 5-7 to get the amount of anchor line to put out (Photograph 6-1).

Photograph 6-1.



- Secure the anchor line to the bow cleat at the point you want it to stop.
- Bring the bow of the vessel into the wind or current.

- When you get to the spot you want to anchor, place the engine in neutral.
- When the boat comes to a stop, slowly lower the anchor. Do not throw the anchor over, as it will tend to entangle the anchor.
- When all anchor line has been let out, back down on the anchor with engine in idle reverse to help set the anchor.
- When anchor is firmly set, use reference points (landmarks) in relation to the boat to make sure you are not drifting. Check these points frequently.
- Maximum anchoring is achieved at an angle of less than 8 degrees.

The following table provides anchor weights:

Boat Length (Maximum)	Lunch Hook	Working Anchor	Storm Anchor
20 ft	**4** (10)	**5** (20)	**12** (40)
30 ft	**5** (15)	**12** (30)	**18** (60)
40 ft	**12** (20)	**18** (40)	**28** (80)

NOTES: lb = Pound(s).
Bold indicates figures based on modern lightweight burial-type anchors of efficient design. Figures in parentheses show how weights would be increased, using a formula of 0.5 lb, 1 lb, and 2 lb per foot for certain kedges.

Table 6-1 provides suggested rode and anchor sizes.

6.2 WEATHER

You should never leave the dock without first checking the local weather forecast. You can get the weather information from the TV, radio, local, newspaper, on-line, or from one of the weather channels on your VHF radio.

At certain times of the year weather can change rapidly and you should continually keep a “weather eye” out. While you are out in a boat, here are a few signs you can look for that indicate an approaching weather change:

- Weather changes generally come from the west. Scan the sky with your weather eye, especially to the west.
- Watch for cloud to build up, especially rapid vertically rising clouds.
- Sudden drop in temperature.
- Sudden change in wind direction and/or speed.
- If you have a barometer on your boat, check it every 2-3 hours. A rising barometer indicates fair weather and rise in wind velocity; a falling barometer indicates stormy or rainy weather.

TABLE 6-1 SUGGESTED RODE AND ANCHOR SIZES[(a)]

Length Overall	Beam		Rode		Anchor		
	Sail	Power	Nylon	Chain	Northill	Standard	Hi-Tensile
FOR STORM ANCHOR (WINDS UP TO 60 KNOTS)							
10 ft	5 ft	5 ft	100 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
15 ft	7 ft	7 ft	125 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
20 ft	8 ft	9 ft	150 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H
25 ft	9 ft	10 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	22-S	12-H
30 ft	10 ft	11ft	250 ft-7/16 in.	5 ft-5/16 in.	46 lb (20-R)	22-S	20-H
35 ft	12 ft	13 ft	300 ft-1/2 in.	6 ft-3/8 in.	46 lb (20-R)	40-S	35-H
40 ft	13 ft	14 ft	400 ft-5/8 in.	8 ft-7/16 in.	80 lb (30-R)	65-S	60-H
50 ft	14 ft	16 ft	500 ft-5/8 in.	8 ft-7/16 in.	105 lb (50-R)	130-S	60-H
60 ft	16 ft	19 ft	500 ft-3/4 in.	8 ft-1/2 in.	105 lb (50-R)	180-S	90-H
FOR WORKING ANCHOR (WINDS UP TO 30 KNOTS)							
10 ft	5 ft	5 ft	80 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
15 ft	7 ft	7 ft	100 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	8-S	5-H
20 ft	8 ft	9 ft	120 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
25 ft	9 ft	10 ft	150 ft-3/8 in.	3 ft-3/16 in.	12 lb (6-R)	8-S	5-H
30 ft	10 ft	11ft	180 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H
35 ft	12 ft	13 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	22-S	12-H
40 ft	13 ft	14 ft	250 ft-7/16 in.	5 ft-5/16 in.	46 lb (20-R)	22-S	20-H
50 ft	14 ft	16 ft	300 ft-1/2 in.	6 ft-3/8 in.	46 lb (20-R)	40-S	35-H
60 ft	16 ft	19 ft	300 ft-1/2 in.	6 ft-3/8 in.	80 lb (30-R)	65-S	35-H
FOR LUNCH HOOK							
10 ft	5 ft	5 ft	70 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
15 ft	7 ft	7 ft	80 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
20 ft	8 ft	9 ft	90 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	2 ½ -S	5-H
25 ft	9 ft	10 ft	100 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
30 ft	10 ft	11ft	125 ft-1/4 in.	3 ft-3/16 in.	6 lb (3-R)	4-S	5-H
35 ft	12 ft	13 ft	150 ft-1/4 in.	3 ft-3/16 in.	12 lb (6-R)	4-S	5-H
40 ft	13 ft	14 ft	175 ft-3/8 in.	4 ft-1/4 in.	12 lb (6-R)	8-S	5-H
50 ft	14 ft	16 ft	200 ft-3/8 in.	4 ft-1/4 in.	12 lb (6-R)	8-S	12-H
60 ft	16 ft	19 ft	200 ft-3/8 in.	4 ft-1/4 in.	27 lb (12-R)	13-S	12-H

(a) Suggested sizes assume fair holding ground, scope of at least 7-to-1 and moderate shelter from heavy seas.

NOTES: **Plow Anchors**—Woolsey, manufacturer of the Plowright anchor, makes the following recommendations for winds up to 30 knots: for *working anchors*, 10-21 ft, 6 lb; 22-32 ft, 12 lb; 32-36 ft, 18 lb; 36-39 ft, 22 lb; and 39-44 ft, 35 lb. For *lunch hooks*, they advise stepping down one size. For *storm anchors*, up one size.
Kedges—Holding powers vary widely with the type. Best to consult manufacturer for individual recommendations.

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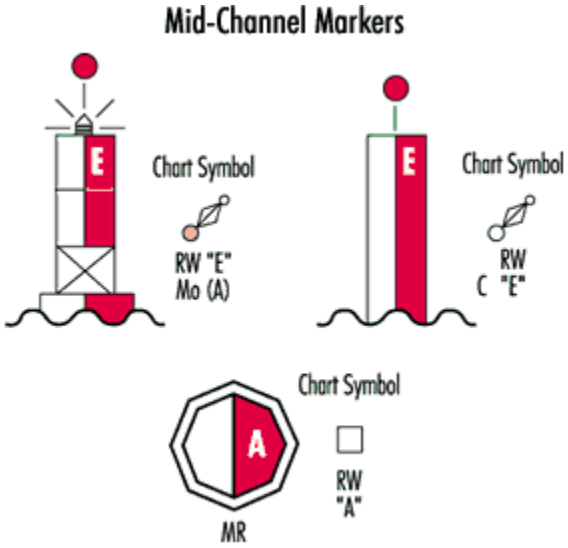
7. AIDS TO NAVIGATION

Aids to navigation are placed along coasts and navigable waters as guides to mark safe water and to assist mariners in determining their position in relation to land and hidden dangers. Each aid to navigation is used to provide specific information.

Several aids to navigation are usually used together to form a local aid to navigation system that helps the mariner follow natural and improved channels. Such aids to navigation also provide a continuous system of charted marks for coastal piloting. Individual aids to navigation are used to mark landfall from seaward, and to mark isolated dangers.

Lateral markers are buoys or beacons that indicate the port and starboard sides of a route to be followed. Virtually all U.S. lateral marks follow the traditional 3R rule of "red, right, returning." This means, when returning from sea, keep red marks on the right-hand (starboard) side of the vessel.

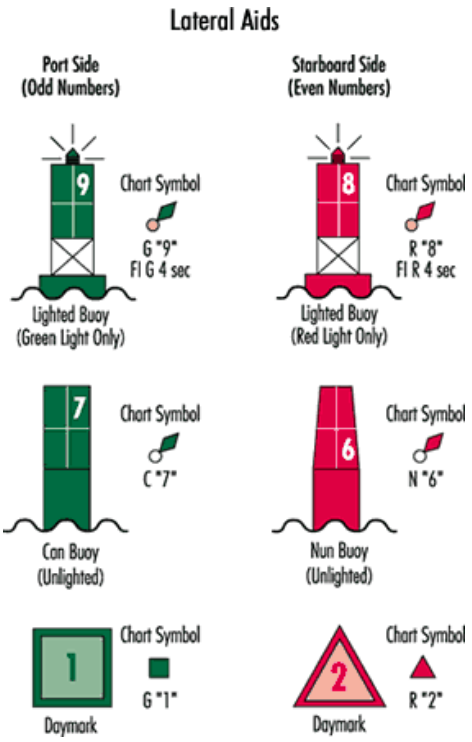


Mariners must NOT rely on buoys alone for determining their position. Storms and wave action can cause buoys to move.

7.1 LATERAL AIDS

Lateral aids marking the sides of channels as seen when entering from seaward.

Do not tie up to Aids to Navigation; it is dangerous and illegal.



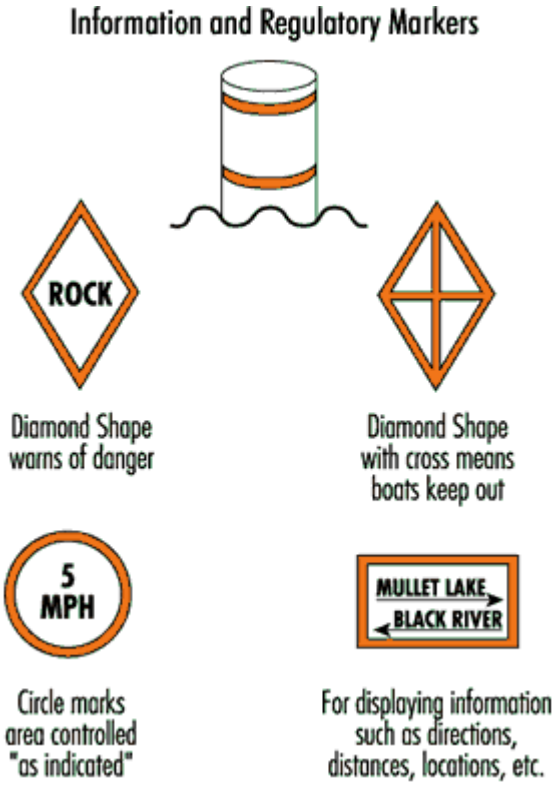
7.2 NAUTICAL CHARTS

One of the most important tools used for safely navigating waterways are Nautical Charts. Nautical Charts show the nature and shape of the coast, depths of water, general configuration and character of the bottom, prominent landmarks, port facilities, aids to navigation, marine hazards, and other pertinent information. Changes brought about by people and nature require that nautical charts be constantly maintained and updated to aid safe navigation.

To meet the needs of the boaters, the National Ocean Service (NOS) produces a variety of nautical charts and chart products. The date of a nautical chart is critical to the boater. Only up-to-date charts should be used for navigation. Nautical charts vary in scale and format. For coastal navigation, for instance, boaters should use the largest chart scale available. Chart updating information can be obtained from "Local Notice to Mariners" published by the USCG.

NOS nautical charts may be purchased either directly by mail from the NOS Distribution Branch or through an authorized agent. There are more than 1,700 nautical chart agents that sell NOS charts.

Other charts available consist of tide and current charts for various localities and a local notice to mariners. These local charts should be used with NOS Charts.



8. ELECTRONICS

8.1 EQUIPMENT REQUIREMENTS – RADIO REGULATIONS

8.1.1 Carrying a Radio

Most recreational vessels under 65.6 ft/20 m in length do not have to carry a marine radio. Any vessel that carries a marine radio must follow the rules of the Federal Communications Commission (FCC).

8.1.2 Radio Licenses

The FCC does not require operators of recreational vessels to carry a radio or to have an individual license to operate VHF marine radios (with or without digital selective calling capability), Emergency Position Indicating Radio Beacons (EPIRBs), or any type of radar. Operators must, however, follow the procedures and courtesies that are required of licensed operators specified in FCC Rules. You may use the name or registration number of your vessel to identify your ship station.

Users of a VHF marine radio equipped with digital selective calling will need to obtain a maritime mobile service identity number from the FCC. It is unlawful to use digital selective calling without obtaining this identity.

The following vessels are still required to be licensed:

- Vessels that use medium frequency/high frequency single side-band radio, satellite communications, or telegraphy
- Power driven vessels over 65.6 ft/20 m in length
- Vessels used for commercial purposes including:
  - Vessels documented for commercial use, including commercial fishing vessels
  - USCG-inspected vessels carrying more than 6 passengers
  - Towboats more than 7.8 m in length
  - Vessels of more than 100 tons certified to carry at least 1 passenger
  - Cargo ships over 300 tons
- Any vessel, including a recreational vessel, on an international voyage.

8.1.3 Radio Listening Watch

Vessels not required to carry a marine radio (e.g., recreational vessels less than 20-m length), but which voluntarily carry a radio, must maintain a watch on Channel 16 (156.800 megahertz [MHz]) whenever the radio is operating and not being used to communicate. Such vessels may alternatively maintain a watch on VHF Channel 9 (156.450 MHz), the boater calling channel.

U.S. vessels required to carry a VHF marine radio, such as commercial fishing vessels, must maintain a watch on Channel 16 (156.800 MHz) while underway whenever the radio is not being used for exchanging communications.

False Distress Alerts

It is unlawful to intentionally transmit a false distress alert, or to unintentionally transmit a false distress alert without taking steps to cancel that alert.

Very High Frequency Marine Radio Channels

The chart below contains a partial listing of channels recreational boaters should be familiar with:

Channel	Type of Message and Use
06	***Intership Safety***—Used for ship-to-ship safety messages and search messages and ships and aircraft of the USCG.
09	***Boater Calling***—FCC has established this channel as a supplementary calling channel for non-commercial vessels (recreational boaters). The purpose is to relieve congestion on VHF Channel 16. The USCG announces urgent marine information broadcasts and storm warnings on Channel 9 in the First USCG District (waters off the coast of northern New Jersey, New York, and New England) and USCG Group Grand Haven, Milwaukee and Sault Ste. Maria (Lake Michigan). For that reason, EA strongly urges boaters to use Channel 9 in these waters. Use of Channel 9 in other waters is optional, and EA recommends boaters keep turned to and use Channel 16 in those waters unless otherwise notified by the USCG.
13,67	***Navigation Safety (also known as Bridge-to-Bridge channel)***—Ships greater than 20 m in length maintain a listening watch on this channel in United States waters. This channel is available to all ships. Messages must be about ship navigation (i.e., passing or meeting other ships). You must keep your messages short. Your power output must not be more than 1 watt. This is also the main working channel at most locks and drawbridges. Channel 67 is for lower Mississippi River only.
16	***International Distress, Safety and Calling***—Use this channel to get the attention of another station (calling) or in emergencies. Ships required to carry a radio maintain a listening watch on this channel. USCG and most coast stations also maintain a listening watch on this channel.
21A, 23A, 83A	USCG only.
22A	***USCG Liaison and Maritime Safety Information Broadcasts***—Announcements of urgent marine information broadcasts and storm warnings (Broadcasts announced on Channel 16).
24,25,26, 27,28,84, 85,86,87	***Public Correspondence (Marine Operator)***—Use these channels to call the marine operator at a public station. By contacting a public coast station, you can make and receive calls from telephones on shore. Except for distress calls, public coast stations usually charge for this service.
70	***Digital Selective Calling***—Use this channel for distress and safety calling and for general purpose calling using only digital selective calling techniques. Voice communications not allowed. NOTE: The USCG will not be equipped to respond to digital selective calling distress calls on Channel 70 until 2006 – use Channel 16.

Distress Calls

The radiotelephone distress call consists of:

- Distress signal MAYDAY spoken three times
- Words THIS IS
- Call sign (or vessel registration number or name if no call sign is assigned) of the mobile station in distress, spoken three times.

Other electronic gear available is GPS, fathometer, and radar. The user should refer to individual operator manuals for proper orientation in the use of the gear.

9. TOWING AND LAUNCHING

9.1 TRAILERING YOUR BOAT

Choose the proper trailer for your boat. More damage can be done to a boat by the stress of road travel than by normal water operation. A boat hull is designed to be supported evenly by water. When transported on a trailer, your boat should be supported structurally as evenly across the hull as possible. This will allow for even distribution of the weight of the hull, engine and equipment. It should be long enough to support the whole length of the hull but short enough to allow the lower unit of the boat's engine to extend freely.

- Rollers and bolsters must be kept in good condition to prevent scratching and gouging of the hull.

- Tie-downs and lower unit supports must be adjusted properly to prevent the boat from bouncing on the trailer. The bow eye on the boat should be secured with either rope, chain or turnbuckle in addition to the winch cable. Additional straps may be required across the beam of the boat.

- The capacity of the trailer should be greater than the combined weight of the boat, motor, and equipment.

- The tow vehicle must be capable to handling the weight of the trailer, boat, equipment, as well as weight of the passengers and equipment which will be carried inside. This may require that the tow vehicle may need to be specially equipped with an:

  — Engine of adequate power
  — Transmission designed for towing
  — Larger cooling systems for the engine and transmission
  — Heavy duty brakes
  — Load bearing hitch attached to the frame, not the bumper.

Check your vehicle owner's manual for specific information.

9.1.1 Check Before You Go Out on the Highway

- The tow ball and coupler are the same size and bolts with washers are tightly secured. (The vibration of road travel can loosen them.)

- The coupler is completely over the ball and the latching mechanism is locked down.

- The trailer is loaded evenly from front to rear as well as side to side. Too much weight on the hitch will cause the rear wheels of the tow vehicle to drag and may make steering more difficult. Too much weight on the rear of the trailer will cause the trailer to "fishtail" and may reduce traction or even lift the rear wheels of the tow vehicle off the ground. The safety chains are attached crisscrossing under the coupler to the frame of the tow vehicle. If the ball were to break, the trailer would follow in a straight line and prevent the coupler from dragging on the road.

- The lights on the trailer function properly.

- Check the brakes. On a level parking area, roll forward and apply the brakes several times at increasing speeds to determine a safe stopping distance.

- The side view mirrors are large enough to provide an unobstructed rear view on both sides of the vehicle.

- Check tires (including spare) and wheel bearings. Improper inflation may cause difficulty in steering. When trailer wheels are immersed in water (especially salt water), the bearings should be inspected and greased after each use.

- Make certain that water from rain or cleaning has been removed from the boat. Water weighs approximately 8 lb per gallon and can add weight that will shift with the movement of the trailer.

9.1.2 Towing Precautions

- Allow more time to brake, accelerate, pass, and stop.

- Remember the turning radius is also much greater; curbs and roadside barriers must be given a wide berth when negotiating corners.

- Prior to operating on the road, practice turning, backing up, etc. on a level, uncongested parking area.

9.1.3 Pre-Launching Preparations

- For the courtesy of others and to prevent rushing, prepare your boat for launching away from the ramp.

- Check the boat to ensure that no damage was caused by the trip.

- Raise the lower unit (remove supports) to proper height for launching so that it will not hit bottom.

- Remove tie-downs and make sure that the winch is properly attached to the bow eye and locked in position.

- Put the drain plug in securely.

- Disconnect the trailer lights to prevent shorting of electrical system or burning out a bulb.

- Attach a line to the bow and the stern of the boat so that the boat cannot drift away after launching and it can be easily maneuvered to a docking area.

- Visually inspect the launch ramp for hazards such as a steep drop off, slippery area, and sharp objects.

- When everything has been double checked, proceed slowly to the ramp remembering that your boat is just resting on the trailer and attached only at the bow. The ideal situation is to have one person in the boat and one observer at the water's edge to help guide the driver of the tow vehicle.

- Keep the rear wheels of the tow vehicle out of the water. This will generally keep the exhaust pipes out of the water. If the exhaust pipes become immersed in the water, the engine may stall.

- Set the parking brake and place tire chocks behind the rear wheels.

- Make sure someone else on shore is holding the lines attached to the boat.

- Lower the motor and prepare to start the engine (after running blowers and checking for fuel leaks).

- Start the boat motor and make sure that water is passing through the engine cooling system.

- Release the winch and disconnect the winch line from the bow when the boat operator is ready.

- At this point, the boat should be able to be launched with a light shove or by backing off the trailer under power. Finish loading your boat at a sufficient distance from the ramp so that others may use it.

9.1.4 Retrieval

The steps for removing your boat from the water are basically the reverse of those taken to launch it. However, keep in mind that certain conditions may exist during retrieval that did not exist during launching. As you approach the takeout ramp, take special care to note such factors as:

- Change in wind direction and/or velocity
- Change in current and/or tide
- Increase in boating traffic
- Visibility, etc.

First, unload the boat at a dock or mooring if possible. Next, maneuver the boat carefully to the submerged trailer, and raise the lower unit of the engine. Then, winch the boat onto the trailer and secure it. Finally, drive the trailer with the boat aboard carefully out of the ramp to a designated parking area for cleanup, reloading, and an equipment safety check. Practice will make launch and retrieval a simple procedure. The best advice is just, “do it cautiously with safety as your main concern.”

9.1.5 Storage

Since your boat may be sitting on its trailer for quite some time before it is used again, it is important that it be stored properly. To avoid damage from sun and weather, cover the boat with a tarp. To remove weight from the wheels, put cinderblocks or wood beams under the tongue and all four corners of the trailer frame.

The safety chains are attached crisscrossing under the coupler to the frame of the tow vehicle. If the ball were to break, the trailer would follow in a straight line and prevent the coupler from dragging on the road.

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10. OFFSHORE OPERATION SAFETY EQUIPMENT

10.1 EQUIPMENT REQUIREMENTS – VESSEL OPERATING OFFSHORE

If you operate offshore, you should seriously consider carrying additional equipment beyond the minimum federal requirements. This equipment should include appropriate communications gear, an EPIRB, a means of accurately determining your location, and an inflatable life raft. In cold waters, an immersion suit should be carried for everyone on board.

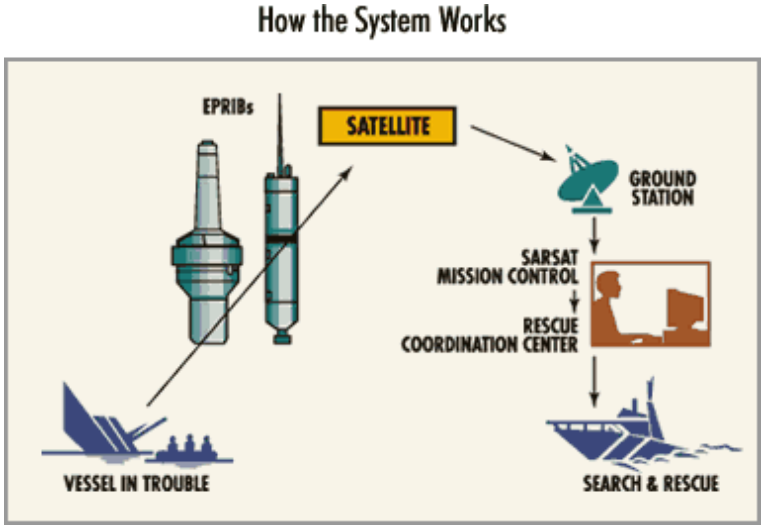
10.1.1 Communications

Carry communications gear, marine VHF-FM, and/or HF transceiver(s) appropriate to your operating area. Cellular phone coverage is available in many coastal areas. However, cellular phones should not be considered a substitute for VHF-FM marine band radios for emergency purposes.

10.1.2 Satellite Emergency Position Indicating Radio Beacons

Satellite EPIRBs (406 MHz) are designed to quickly and reliably alert rescue forces, indicate an accurate distress position, and guide rescue units to the distress scene, even when all other communications fail.

Satellite EPIRBs operate as part of a worldwide distress system. An international satellite constellation maintains a vigilant, global "listening" watch for satellite EPIRB distress signals. The National Oceanic and Atmospheric Administration operates satellites, ground stations, and an alert distribution system serving the United States and a wide segment of the international community.



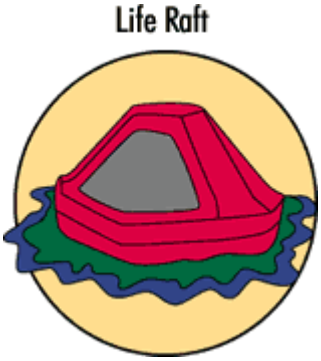
When activated, the satellite EPIRB transmits a distress signal with a beacon-unique identifying code. The system detects the signal, calculates an accurate distress position, checks the unique identifying code against the EPIRB registration database (vessel and point-of-contact information supplied by the owner), and routes the distress alert with registration information to the responsible USCG (or international) Rescue Coordination Center; 406 MHz EPIRBs with GPS (internal or attached) also provide an immediate GPS position in the information passed to the Rescue Coordination Center.

Geostationary satellites make detection almost immediate. If the EPIRB does not have the ability to provide a GPS position, the process to determine a position takes about an hour on average and almost always less than 2 hours. Satellite EPIRBs also include a homing beacon and strobe to help rescue forces quickly locate the distress scene.

Satellite beacons have significant coverage, alerting timeliness, position accuracy, and signaling advantages over other types of EPIRBs (121.5 MHz). Before purchasing or using an other-than-406 MHz EPIRB, be sure you understand its capabilities and limitations.
Mount the EPIRB to float free according to the manufacturer's instructions, if possible. Otherwise, make

sure it is **readily accessible**. Register the EPIRB with the National Oceanic and Atmospheric Administration, according to the instructions provided with the beacon. Registration is mandatory, improves response, and reduces false alarms.

10.1.3 Inflatable Life Rafts



An inflatable life raft can provide a survival platform for an extended period of time. Make sure the life raft is large enough for everyone on board when the boat operates offshore. It should have the appropriate emergency equipment pack, and should be professionally serviced periodically, according to the manufacturer's instructions. USCG-approved life rafts must meet a number of stringent material and performance standards.

10.1.4 Immersion Suits

Immersion suits will delay the effects of hypothermia in cold water. They should be stored and maintained according to the manufacturer's instructions. Table 10-1 provides the required or recommended equipment for the vessel safety check decal.

10.2 ELECTROFISHING FIELD MANUAL

The electrofishing field manual and a checklist for a safety and health audit are provided in Appendix C.

TABLE 10-1 REQUIRED OR RECOMMENDED EQUIPMENT FOR THE VESSEL SAFETY CHECK DECAL

Numbering	Proper spacing, contrasting color, minimum 3-in. block letters.
Registration/Documentation	Must be on board.
Navigation Lights	Must operate and show proper configuration.
Sound Producing Device	Horn, whistle, or other; bell on boats over 12 m (39.4 ft) or longer.
Personal Flotation Device	One wearable for each passenger, Type IV on boats 16 ft or longer.
Fire Extinguishers	Minimum for size of boat, HALON, FE241/CO_2-current tag.
Visual Distress Signals	***Inland***—Visual Distress Signals, Flag, Signal Light, etc.; ***International***—Minimum flares, aerial rockets, or approved signals, not expired.
Backfire Flame Arrestor	Approved, tight, and clean.
Ventilation	For closed compartments with potential for explosive vapors and an ignition source. Blower must work. Warning Posted. Fuel System tanks secure, over 7 gal considered permanent and must be grounded/vented. Hoses in good condition, no leaks.
Anchor and Tackle	Suitable to boat and the area.
Alternate Propulsion	Under 16 ft, paddle or oar; if mechanical, separate fuel tank and starting source.
Dewatering Device	Pumps must work, extra manual bailer.
Overall Vessel Condition	Bilge and equipment area clean, well maintained. Not overloaded, overpowered, or no automotive parts.
Electrical System	Batteries secure, terminals covered, well organized wiring, proper fuses/circuit breakers.
Galley/Heating Systems	Secure system, proper tank installation. No flammable material nearby.
State Requirements	Compiles with state safety requirements. Contact state boating regulators for current state boating regulations.
Marine Sanitation Device	Approved device, overboard discharge sealed.
MARPOL Trash Placard	Boats 26 ft and longer, written plan over 40 ft.
Pollution Placard	Boats 26 ft and longer with machinery compartment.
Navigation Rules	Boats 12 m (39.4 ft) and longer.

11. CHECKLISTS

11.1 EQUIPMENT REQUIREMENTS – SAFETY AND SURVIVAL TIPS

Boater's Checklist	Yes	No
State Numbering Displayed		
Certificate of Number (State Registration)		
Certificate of Documentation/Display		
Official Number Displayed		
Personal Flotation Devices		
Throwable Personal Flotation Device		
Visual Distress Signals		
Fire Extinguishers		
Ventilation		
Backfire Flame Arrester		
Sound Producing Device		
Bell		
Navigation/Anchor Lights		
Oil Pollution Placard		
Garbage Placard		
Marine Sanitation Device		
Ring Buoy[(a)]		
VHF Radio[(a)]		
Heaving Line[(a)]		
Fenders[(a)]		
First Aid Kit[(a)]		
Flashlight[(a)]		
Mirror[(a)]		
Search Light[(a)]		
Tool Kit[(a)]		
Chart and Compass[(a)]		
Boat Hook[(a)]		
Spare Propeller[(a)]		
Mooring Line[(a)]		
Food and Water[(a)]		
Binoculars[(a)]		
Spare Batteries[(a)]		
Marine Hardware[(a)]		
Sunscreen (SPF 30+)[(a)]		
Extra Clothing[(a)]		
Spare Parts[(a)]		
Spare Fuel[(a)]		
AM-FM Radio[(a)]		
Anchor and Tackle[(a)]		
Dewatering Device[(a)]		
Alternate Propulsion[(a)]		
Overall Boat Condition[(a)]		
Electrical Systems[(a)]		
Fuel Systems[(a)]		
Galley/Heating Systems[(a)]		
State Safety Requirements[(a)]		
File Float Plan[(a)]		
Weather Forecast[(a)]		
(a) Recommended.		

11.2 SMALL CRAFT INSPECTION LIST

Boater's Checklist	Yes	No
Maintenance Records		
Hull Soundness		
Metal Visual Cracks/Date of Last Ultrasound		
Wood Rot and Loose Planking		
Fiberglass Stress Cracks and Delamination		
Soundness of Deck and Superstructure		
Standing Rigging and Frames		
Stays		
Cleats		
Bits		
Shackles		
Thimbles		
Lines		
Running Rigging		
Lines		
Shackles		
Blocks		
Thimbles		
Engine Compartment		
Belts		
Hoses		
Fuel Lines		
Seacocks		
Bilge Blowers		
Deck Machinery		
Hydraulics		
Wire		
Winches		
Occupational Safety and health Administration and EA		

11.3 TRAILER CHECKLIST

Trailer Checklist	Yes	No
Prior to On-Road/Boat Retrieval		
Vehicle is appropriate for trailering weight of trailer and boat (e.g., pickup, suburban, or similar)		
Trailer is appropriate for boat		
Tow ball and light system are in good working order		
Safety chains are in good working order		
Vessel tie-downs (if needed) are attached to trailer		
Trailer lights operate (brake and turn signals)		
If outboard engine, engine is in secured up position		
Trailer tires are inflated and suspension in good working order		
Pre-Launch		
Ensure drain plugs are in position		
Trailer lights are disconnected		
Tie-downs removed		
Line attached to bow and is tended		
Inspect ramp for hazards, steep drops, etc.		
Ensure engine starts and cooling system are properly working		

Appendix A

Nautical Terms

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APPENDIX A

NAUTICAL TERMS

A	
ABAFT	Toward the rear (stern) of the boat; behind.
ABEAM	At right angles to the keel of the boat, but not on the boat.
ABOARD	On or within the boat.
ABOVE DECK	On the deck (not over it – see ALOFT).
AFT	Toward the stern of the boat.
AGROUND	Touching or fast to the bottom.
AHEAD	In a forward direction.
AIDS TO NAVIGATION	Artificial objects to supplement natural landmarks to indicate safe and unsafe waters.
ALOFT	Above the deck of the boat.
AMIDSHIPS	In or toward the center of the boat.
ANCHOR	A heavy metal device, fastened to a chain or line, to hold a vessel in position, partly because of its weight, but chiefly because the designed shape digs into the bottom.
ANCHORAGE	A place suitable for anchoring in relation to the wind, seas, and bottom.
ASTERN	In back of the boat, opposite of ahead.
ATHWARTSHIPS	At right angles to the centerline of the boat; rowboat seats are generally athwartships.
B	
BATTEN DOWN	Secure hatches and loose objects both within the hull and on deck.
BEACON	A lighted or unlighted fixed aid to navigation attached directly to the earth's surface (lights and day beacons both constitute "beacons").
BEAM	The greatest width of the boat.
BEARING	The direction of an object expressed either as a true bearing as shown on the chart, or as a bearing relative to the heading of the boat.
BELOW	Beneath the deck.
BIGHT	The part of the rope or line between the end and the standing part on which a knot is formed. A shallow bay.
BILGE	The interior of the hull below the floor boards.
BITTER END	The last part of a rope or chain. The inboard end of the anchor rode.
BLOCK	A wooden or metal case enclosing one or more pulleys and having a hook, eye, or strap by which it may be attached.
BOAT	A fairly indefinite term. A waterborne vehicle smaller than a ship. One definition is a small craft carried aboard a ship.
BOAT HOOK	A short shaft with a fitting at one end shaped to facilitate use in putting a line over a piling, recovering an object dropped overboard, or in pushing or fending off.
BOW	The forward part of a boat.
BOW LINE	A docking line leading from the bow.
BOW SPRING LINE	A bow pivot line used in docking and undocking, or to prevent the boat from moving forward or astern while made fast to a pier.
BOWLINE KNOT	A knot used to form a temporary loop in the end of a line.
BOWSPRIT	A spar extending forward from the bow.

BRIDGE	The location from which a vessel is steered and its speed controlled. "Control Station" is really a more appropriate term for small craft.
BULKHEAD	A vertical partition separating compartments.
BUOY	An anchored float used for marking a position on the water or a hazard or a shoal and for mooring.
C	
CABIN	A compartment for passengers or crew.
CAPSIZE	To turn over.
CAST OFF	To let go.
CATAMARAN	A twin-hulled boat, with hulls side-by-side.
CHAFING GEAR	Tubing or cloth wrapping used to protect a line from chafing on a rough surface.
CHANNEL	1. That part of a body of water deep enough for navigation through an area otherwise not suitable. It is usually marked by a single or double line of buoys and sometimes by range markers. 2. The deepest part of a stream, bay, or strait through which the main current flows. 3. A name given to a large strait, for example, the English Channel.
CHART	A map for use by navigators.
CHINE	The intersection of the bottom and sides of a flat or v-bottomed boat.
CHOCK	A fitting through which anchor or mooring lines are led. Usually U-shaped to reduce chafe.
CLEAT	A fitting to which lines are made fast. The classic cleat to which lines are belayed is approximately anvil-shaped.
CLOVE HITCH	A knot for temporarily fastening a line to a spar or piling.
COAMING	A vertical piece around the edge of a cockpit, hatch, etc. to prevent water on deck from running below.
COCKPIT	An opening in the deck from which the boat is handled.
COIL	To lay a line down in circular turns.
COMPASS	Navigation instrument, either magnetic (showing magnetic north) or gyro (showing true north).
COMPASS CARD	Part of a compass, the card is graduated in degrees, to conform with the magnetic meridian-referenced direction system inscribed with direction which remains constant; the vessel turns, not the card.
COMPASS ROSE	The resulting figure when the complete 360° directional system is developed as a circle with each degree graduated upon it, and with the 000° indicated as True North. True North is also known as true rose. This is printed on nautical charts for determining direction.
CURRENT	The horizontal movement of water.
D	
DAYBEACON	A fixed navigation aid structure used in shallow waters upon which is placed one or more daymarks.
DAYMARK	A signboard attached to a daybeacon to convey navigational information presenting one of several standard shapes (square, triangle, rectangle) and colors (red, green, orange, yellow, or black). Daymarks usually have reflective material indicating the shape, but may also be lighted.
DEAD AHEAD	Directly ahead.
DEAD ASTERN	Directly aft or behind.
DEAD RECKONING	A plot of courses steered and distances traveled through the water.

DECK	A permanent covering over a compartment, hull, or any part of a ship serving as a floor.
DISPLACEMENT	The weight of water displaced by a floating vessel.
DISPLACEMENT HULL	A type of hull that plows through the water, displacing a weight of water equal to its own weight, even when more power is added.
DOCK	A protected water area in which vessels are moored. The term is often used to denote a pier or a wharf.
DRAFT	The depth of water a boat draws.
E	
EASE	To slacken or relieve tension on a line.
EBB TIDE	A receding tide.
EVEN KEEL	When a boat is floating on its designed waterline, it is said to be floating on an even keel.
EYE OF THE WIND	The direction from which the wind is blowing.
EYE SPLICE	A permanent loop spliced in the end of a line.
F	
FAST	Said of an object that is secured to another.
FATHOM	6 ft.
FENDER	A cushion, placed between boats, or between a boat and a pier, to prevent damage.
FIGURE EIGHT KNOT	A knot in the form of a figure eight, placed in the end of a line to prevent the line from passing through a grommet or a block.
FLAME ARRESTER	A safety device, such as a metal mesh protector, to prevent an exhaust backfire from causing an explosion; operates by absorbing heat.
FLARE	The outward curve of a vessel's sides near the bow. A distress signal.
FLYING BRIDGE	An added set of controls above the level of the normal control station for better visibility. Usually open, but may have a collapsible top for shade.
FOLLOWING SEA	An overtaking sea that comes from astern.
FORE AND AFT	In a line parallel to the keel.
FORWARD	Toward the bow of the boat.
FOULED	Any piece of equipment that is jammed or entangled, or dirtied.
FOUNDER	When a vessel fills with water and sinks.
FREEBOARD	The minimum vertical distance from the surface of the water to the gunwale.
G	
GAFF	A spar to support the head of a gaff sail.
GALLEY	The kitchen area of a boat.
GANGWAY	The area of a ship's side where people board and disembark.
GEAR	A general term for ropes, blocks, tackle, and other equipment.
GIVE-WAY VESSEL	A term, from the Navigational Rules, used to describe the vessel which must yield in meeting, crossing, or overtaking situations.
GRAB RAILS	Hand-hold fittings mounted on cabin tops and sides for personal safety when moving around the boat.
GROUND TACKLE	Anchor, anchor rode (line or chain), and all the shackles and other gear used for attachment.
GUNWALE	The upper edge of a boat's sides.
H	
HARBOR	A safe anchorage, protected from most storms; may be natural or man-made, with breakwaters and jetties; a place for docking and loading.
HATCH	An opening in a boat's deck fitted with a watertight cover.
HEAD	A marine toilet. Also the upper corner of a triangular sail.

HEADING	The direction in which a vessel's bow points at any given time.
HEADWAY	The forward motion of a boat. Opposite of sternway.
HEAVE TO	To bring a vessel up in a position where it will maintain little or no headway, usually with the bow into the wind or nearly so.
HEEL	To tip to one side.
HELM	The wheel or tiller controlling the rudder.
HITCH	A knot used to secure a rope to another object or to another rope, or to form a loop or a noose in a rope.
HOLD	A compartment below deck in a large vessel, used solely for carrying cargo.
HULL	The main body of a vessel.
HYPOTHERMIA	A life-threatening condition in which the body's warming mechanisms fail to maintain normal body temperature and the entire body cools.
I	
INBOARD	More toward the center of a vessel; inside; a motor fitted inside the boat.
J	
There are no boating terms under this heading.	
K	
KEDGE	To use an anchor to move a boat by hauling on the anchor rode; a basic anchor type.
KEEL	The centerline of a boat running fore and aft; the backbone of a vessel.
KETCH	A two-masted sailboat with the smaller after mast stepped ahead of the rudder post.
KNOT	A measure of speed equal to one nautical mile (6,076 ft) per hour. A fastening made by interweaving rope to form a stopper, to enclose or bind an object, to form a loop or a noose, to tie a small rope to an object, or to tie the ends of two small ropes together.
L	
LEEWARD	The direction away from the wind. Opposite of windward.
LEEWAY	The sideways movement of the boat caused by either wind or current.
LINE	Rope and cordage used aboard a vessel.
LOG	A record of courses or operation. Also, a device to measure speed.
LUBBER'S LINE	A mark or permanent line on a compass indicating the direction forward; parallel to the keel when properly installed.
M	
MAST	A spar set upright to support rigging and sails.
MONOHULL	A boat with one hull.
MOORING	An arrangement for securing a boat to a mooring buoy or a pier.
MOORING BUOY	A buoy secured to a permanent anchor sunk deeply into the bottom.
N	
NAUTICAL MILE	One minute of latitude; approximately 6,076 ft – about 1/8 longer than the statute mile of 5,280 ft.
NAVIGATION	The art and science of conducting a boat safely from one point to another.
O	
OUTBOARD	Toward or beyond the boat's sides. A detachable engine mounted on a boat's stern.
OUTDRIVE	A propulsion system for boats with an inboard engine operating an exterior drive, with drive shaft, gears, and propeller; also called stern-drive and inboard/outboard.
OVERBOARD	Over the side or out of the boat.

P	
PAINTER	A line attached to the bow of a boat for use in towing or making fast.
PAY OUT	To ease out a line, or let it run in a controlled manner.
PENNANT (sometimes PENDANT)	The line by which a boat is made fast to a mooring buoy.
PERSONAL FLOTATION DEVICE	Personal flotation device (PFD) is official terminology for life jacket. When properly used, the PFD will support a person in the water. Available in several sizes and types.
PIER	A loading/landing platform extending at an angle from the shore.
PILOTING	Navigation by use of visible references, the depth of the water, etc.
PITCH	1. The alternate rise and fall of the bow of a vessel proceeding through waves. 2. The theoretical distance advanced by a propeller in one revolution. 3. Tar and resin used for caulking between the planks of a wooden vessel.
PITCHPOLING	A small boat being thrown end-over-end in very rough seas.
PLANING HULL	A type of hull shaped to glide easily across the water at high speed.
PORT	The left side of a boat looking forward. A harbor.
PROPELLER	A rotating device, with two or more blades, that acts as a screw in propelling a vessel.
Q	
QUARTER	The sides of a boat aft of amidships.
QUARTERING SEA	Sea coming on a boat's quarter.
R	
REEF	To reduce the sail area.
RIGGING	The general term for all the lines of a vessel.
RODE	The anchor line and/or chain.
ROLL	The alternating motion of a boat, leaning alternately to port and starboard; the motion of a boat about its fore-and-aft axis.
ROPE	In general, cordage as it is purchased at the store. When it comes aboard a vessel and is put to use, it becomes a line.
RUDDER	A vertical plate or board for steering a boat.
RUNNING LIGHTS	Lights required to be shown on boats underway between sundown and sunup.
S	
SCOPE	The ratio of the length of an anchor line, from a vessel's bow to the anchor, to the depth of the water.
SCREW	A boat's propeller.
SEA ANCHOR	Any device used to reduce a boat's drift before the wind.
SECURE	To make fast.
SHACKLE	A U-shaped connector with a pin or bolt across the open end.
SHEAR PIN	A safety device used to fasten a propeller to its shaft; it breaks when the propeller hits a solid object, thus preventing further damage.
SHEET BEND	A knot used to join two ropes. Functionally different from a square knot in that it can be used between lines of different diameters.
SHIP	A larger vessel usually used for ocean travel. A vessel able to carry a "boat" on board.
SHOAL	An offshore hazard to navigation at a depth of 16 fathoms (30 meters or 96 ft) or less, composed of unconsolidated material.
SLACK	Not fastened; loose. Also, to loosen.
SLOOP	A single masted vessel with working sails (main and jib) set fore and aft.
SPLICE	To permanently join two ropes by tucking their strands alternately over and under each other.

SPRING LINE	A pivot line used in docking, undocking, or to prevent the boat from moving forward or astern while made fast to a dock.
SQUALL	A sudden, violent wind often accompanied by rain.
SQUARE KNOT	A knot used to join two lines of similar size. Also called a reef knot.
STANDING PART	That part of a line which is made fast. The main part of a line as distinguished from the bight and the end.
STAND-ON VESSEL	That vessel which continues its course in the same direction at the same speed during a crossing or overtaking situation, unless a collision appears imminent (was formerly called "the privileged vessel").
STARBOARD	The right side of a boat when looking forward.
STERN	The after part (back) of the boat.
STERN LINE	A docking line leading away from the stern.
STOW	To pack or store away; especially, to pack in an orderly, compact manner.
SWAMP	To fill with water, but not settle to the bottom.
T	
TACKLE	A combination of blocks and line to increase mechanical advantage.
THWART	A seat or brace running laterally across a boat.
TIDE	The periodic rise and fall of water level in the oceans.
TILLER	A bar or handle for turning a boat's rudder or an outboard motor.
TOPSIDES	The sides of a vessel between the waterline and the deck; sometimes referring to onto or above the deck.
TRANSOM	The stern cross-section of a square-sterned boat.
TRIM	Fore and aft balance of a boat.
TRIMARAN	A boat with three hulls.
TRIPLINE	A line fast to the crown of an anchor by means of which it can be hauled out when dug too deeply or fouled; a similar line used on a sea anchor to bring it aboard.
TRUE NORTH POLE	The north end of the earth's axis. Also called North Geographic Pole. The direction indicated by 000° (or 360°) on the true compass rose.
TRUE WIND	The actual direction from which the wind is blowing.
TURNBUCKLE	A threaded, adjustable rigging fitting, used for stays, lifelines, and sometimes other rigging.
U	
UNDERWAY	Vessel in motion, i.e., when not moored, at anchor, or aground.
V	
V BOTTOM	A hull with the bottom section in the shape of a "V."
VARIATION	The angular difference between the magnetic meridian and the geographic meridian at a particular location.
VHF RADIO	A very high frequency electronic communications and direction finding system.
W	
WAKE	Moving waves, track, or path that a boat leaves behind when moving across the waters.
WATERLINE	A line painted on a hull which shows the point to which a boat sinks when it is properly trimmed.
WAY	Movement of a vessel through the water, such as headway, sternway, or leeway.
WHARF	A man-made structure bonding the edge of a dock and built along or at an angle to the shoreline, used for loading, unloading, or tying up vessels.
WINCH	A device used to increase hauling power when raising or trimming sails.
WINDWARD	Toward the direction from which the wind is coming. Opposite of leeward.

X	
There are no boating terms under this heading.	
Y	
YAW	To swing off course, as when due to the impact of a following or quartering sea.
YAWL	A two-masted sailboat with the small mizzen mast stepped abaft the rudder post.
Z	
There are no boating terms under this heading.	

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Appendix B

“Rules of the Water”

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APPENDIX B

"RULES OF THE WATER"

PART A – GENERAL

Rule 1 – Application

(a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.

(b) Nothing in these Rules shall interfere in the operation of special rules made by an appropriate authority for roadsteads, harbors, rivers, lakes, or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.

(c) Nothing in these Rules shall interfere with the operation of any special rules made by the Government of any State with respect to additional station or signal lights or shapes or whistle signals for ships of war and vessels proceeding under convoy, or with respect to additional station or signal lights for fishing vessels fishing as a fleet. These additional station or signal lights or whistle signals shall, so far as possible, be such that they cannot be mistaken for any light, shape, or signal authorized elsewhere under these Rules.

(d) Traffic separation schemes may be adopted by the Organization for the purpose of these Rules.

(e) Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to number, position, range, or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, such vessel shall comply with such other provisions in regard to number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signaling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect to that vessel.

Rule 2 – Responsibility

(a) Nothing in these Rules shall exonerate any vessel, or the owner, master, or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

(b) In construing and complying with these Rules, due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Rule 3 – General Definitions

For the purpose of these Rules, except where the context otherwise requires:

(a) The word "vessel" includes every description of watercraft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water.

(b) The term "power driven vessel" means any vessel propelled by machinery.

(c) The term "sailing vessel" means any vessel under sail provided that propelling machinery, if fitted, is not being used.

(d) The term "vessel engaged in fishing" means any vessel fishing with nets, lines, trawls, or other fishing apparatus which restrict maneuverability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manageability.

(e) The term "seaplane" includes any aircraft designed to maneuver on the water.

(f) The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to maneuver as required by these Rules and is, therefore, unable to keep out of the way of another vessel.

(g) The term "vessel restricted in her ability to maneuver" means a vessel which from the nature of her work is restricted in her ability to maneuver as required by these Rules and is, therefore, unable to keep out of the way of another vessel. The term "vessel restricted in her ability to maneuver" shall include but not be limited to:

(i) A vessel engaged in laying, servicing, or picking up a navigational mark, submarine cable, or pipeline

(ii) A vessel engaged in dredging, surveying, or underwater operations

(iii) A vessel engaged in replenishment or transferring persons, provisions, or cargo while underway

(iv) A vessel engaged in the launching or recovery of aircraft

(v) A vessel engaged in mine clearance operations

(vi) A vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.

(h) The term "vessel constrained by her draft" means a power-driven vessel which because of her draft in relation to the available depth and width of navigable water is severely restricted in her ability to deviate from the course she is following.

(i) The word "underway" means a vessel is not at anchor, or made fast to the shore, or aground.

(j) The words "length" and "breadth" of a vessel mean her length overall and greatest breadth.

(k) Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.

(l) The term "restricted visibility" means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms, and any other similar causes.

PART B – STEERING AND SAILING RULES

Section I – Conduct of Vessels in any Condition of Visibility

Rule 4 – Application

Rules in this section apply to any condition of visibility.

Rule 5 – Look-Out

Every vessel shall at all times maintain a proper look-out by sight as well as by hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

Rule 6 – Safe Speed

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed, the following factors shall be among those taken into account:

(a) By all vessels:

(i) The state of visibility

(ii) The traffic density including concentrations of fishing vessels or any other vessels

(iii) The manageability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions

(iv) At night the presence of background light such as from shore lights or from back scatter from her own lights

(v) The state of wind, sea, and current, and the proximity of navigational hazards

(vi) The draft in relation to the available depth of water.

(b) Additionally, by vessels with operational radar:

(i) The characteristics, efficiency, and limitations of the radar equipment

(ii) Any constrains imposed by the radar range scale in use

(iii) The effect on radar detection of the sea state, weather, and other sources of interference

(iv) The possibility that small vessels, ice, and other floating objects may not be detected by radar at an adequate range

(v) The number location and movement of vessels detected by radar

(vi) The more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

Rule 7 – Risk of Collision

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt, such risk shall be deemed to exist.

(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

(c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

(d) In determining if risk of collision exists, the following considerations shall be among those taken into account:

(i) Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.

(ii) Such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

Rule 8 – Action to Avoid Collision

(a) Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed shall be avoided.

(c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

(d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.

(e) If necessary to avoid collision or allow more time to assess the situation, a vessel may slacken her speed or take all the way off by stopping or reversing her means of propulsion.

(f) (i) A vessel which, by any of these rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel.

(ii) A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the rules of this part.

(iii) A vessel, the passage of which is not to be impeded, remains fully obliged to comply with the rules of this part when the two vessels are approaching one another so as to involve risk of collision.

Rule 9 – Narrow Channels

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

(b) A vessel of less than 20 meters (m) in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.

(c) A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow passage or fairway.

(d) A vessel shall not cross a narrow passage or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.

(e) (i) In a narrow channel or fairway when overtaking can take place only when the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt, she may sound the signals prescribed in Rule 34(d).

(ii) This rule does not relieve the overtaking vessel of her obligation under Rule 13.

(f) A vessel nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34(e).

(g) Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.

Rule 10 – Traffic Separation Schemes

(a) This rule applies to traffic separation schemes adopted by the Organization and does not relieve any vessel of her obligation under any other rule.

(b) A vessel using a traffic separation scheme shall:

(i) Proceed in the appropriate traffic lane in the general direction of traffic flow for that lane.

(ii) So far as is practicable keep clear of a traffic separation line or separation zone.

(iii) Normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.

(c) A vessel shall so far as practicable avoid crossing traffic lanes, but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

(d) (i) A vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme. However, vessels of less than 20 m in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone.

(ii) Notwithstanding subparagraph (d)(i), a vessel may use an inshore traffic Zone when en route to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone, or to avoid immediate danger.

(e) A vessel, other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:

(i) in cases of emergency to avoid immediate danger
(ii) to engage in fishing within a separation zone.

(f) A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.

(g) A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations.

(h) A vessel not using a traffic separating scheme shall avoid it by as wide a margin as is practicable.

(i) A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

(j) A vessel of less than 20 m in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.

(k) A vessel restricted in her ability to maneuver when engaged in an operation for the maintenance of safety of navigation in a traffic separating scheme is exempted from complying with this Rule to the extent necessary to carry out the operation.

(l) A vessel restricted in her ability to maneuver when engaged in an operation for the laying, servicing or picking up a submarine cable, within a traffic separating scheme, is exempted from complying with this Rule to the extent necessary to carry out the operation.

Section II – Conduct of Vessels in Sight of One Another

Rule 11 – Application

Rules in this section apply to vessels in sight of one another.

Rule 12 – Sailing Vessels

(a) When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows:

(i) When each of them has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other

(ii) When both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward

(iii) If the vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or the starboard side, she shall keep out of the way of the other.

(b) For the purposes of this Rule the windward side shall be deemed to be the side opposite that on which the mainsail is carried or, in the case of a square rigged vessel, the side opposite to that on which the largest fore-and-aft sail is carried.

Rule 13 – Overtaking

(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.

(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5 degrees abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.

(c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.

(d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

Rule 14 – Head-On Situation

(a) When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision, each shall alter her course to starboard so that each shall pass on the port side of the other.

(b) Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights in line or nearly in line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.

(c) When a vessel is in any doubt as to whether such a situation exists, she shall assume that it does exist and act accordingly.

Rule 15 – Crossing Situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

Rule 16 – Action by Give-way Vessel

Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.

Rule 17 – Action by Stand-on Vessel

(a) (i) Where one of two vessels is to keep out of the way of the other shall keep her course and speed.

(ii) The latter vessel may, however, take action to avoid collision by her maneuver alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in accordance with these Rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

(c) A power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side.

(d) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

Rule 18 – Responsibilities between Vessels

Except where Rules 9, 10, and 13 otherwise require:

(a) A power-driven vessel underway shall keep out of the way of a:

(i) Vessel not under command
(ii) Vessel restricted in her ability to maneuver
(iii) Vessel engaged in fishing
(iv) Sailing vessel

(b) A sailing vessel under way shall keep out of the way of a:

(i) Vessel not under command
(ii) Vessel restricted in her ability to maneuver
(iii) Vessel engaged in fishing

(c) A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of a:

(i) Vessel not under command
(ii) Vessel restricted in her ability to maneuver.

(d) (i) Any vessel other than a vessel not under command or a vessel restricted in her ability to maneuver shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draft, exhibiting the signals in Rule 28.

(ii) A vessel constrained by her draft shall navigate with particular caution having full regard to her special condition.

(e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this Part.

Section III – Conduct of Vessels in Restricted Visibility

Rule 19 – Conduct of Vessels in Restricted Visibility

(a) This rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

(b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and condition of restricted visibility. A power-driven vessel shall have her engines ready for immediate maneuver.

(c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of Section I of this Part.

(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration in course, so far as possible the following shall be avoided:

(i) An alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken

(ii) An alteration of course toward a vessel abeam or abaft the beam.

(e) Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to be the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.

PART C – LIGHTS AND SHAPES

Rule 20 – Application

(a) Rules in this part shall be complied with in all weathers.

(b) The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights which cannot be mistaken for the lights specified in

these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.

(c) The lights prescribed by these rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.

(d) The Rules concerning shapes shall be complied with by day.

(e) The lights and shapes specified in these Rules shall comply with the provisions of Annex I to these Regulations.

Rule 21 – Definitions

(a) "Masthead light" means a white light placed over the fore and aft centerline of the vessel showing an unbroken light over an arc of horizon of 225 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on either side of the vessel.

(b) "Sidelights" means a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of horizon of 112.5 degrees and so fixed as to show the light from right ahead to 22.5 degrees abaft the beam on the respective side. In a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore and aft centerline of the vessel.

(c) "Stern light," means a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of horizon of 135 degrees and so fixed as to show the light 67.5 degrees from right aft on each side of the vessel.

(d) "Towing light" means a yellow light having the same characteristics as the "stern light" defined in paragraph (c) of this Rule.

(e) "All round light" means a light showing an unbroken light over an arc of horizon of 360 degrees.

(f) "Flashing light" means a light flashing at regular intervals at a frequency of 120 flashes or more per minute.

Rule 22 – Visibility of Lights

The lights prescribed in these Rules shall have an intensity as specified in Section 8 of Annex I to these Regulations so as to be visible at the following minimum ranges:

(a) In vessels of 50 m or more in length:

- A masthead light, 6 miles (mi)
- A sidelight, 3 mi
- A towing light, 3 mi
- A white, red, green, or yellow all-around light, 3 mi.

(b) In vessels of 12 m or more in length but less than 50 m in length

- A masthead light, 5 mi; except that where the length of the vessel is less than 20 m, 3 mi
- A sidelight, 2 mi
- A stern light, 2 mi, A towing light, 2 mi
- A white, red, green or yellow all-round light, 2 mi.

(c) In vessels of less than 12 m in length:

- A masthead light, 2 mi
- A sidelight, 1 mi
- A towing light, 2 mi
- A white, red, green, or yellow all-around light, 2 mi.

(d) In inconspicuous, partly submerged vessels or objects being towed

- A white all-round light; 3 mi.

Rule 23 – Power-Driven Vessels Underway

(a) A power-driven vessel underway shall exhibit:

(i) A masthead light forward

(ii) A second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so;

(iii) Sidelights

(iv) A stern light.

(b) An air-cushion vessel when operating in non-displacement mode shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit an all-round flashing yellow light.

(c) (i) A power-driven vessel of less than 12 m in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights.

(ii) A power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights.

(iii) The masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore and aft centerline of the vessel if centerline fitting is not practicable, provided the sidelights are combined in one lantern which shall be carried on the fore and aft centerline of the vessel or located as nearly as practicable in the same fore and aft line as the masthead light or all-round white light.

Rule 24 – Towing and Pushing

(a) A power-driven vessel when towing shall exhibit:

(i) Instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow measuring from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line

(ii) Sidelights

(iii) A stern light

(iv) A towing light in a vertical line above the stern light

(v) When the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(b) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23.

(c) A power-driven vessel when pushing ahead or towing alongside, except in the case of a composite unit, shall exhibit:

(i) Instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow measuring from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line

(ii) Sidelights

(iii) A stern light.

(d) A power-driven vessel to which paragraph (a) or (c) of this Rule apply shall also comply with rule 23(a)(ii).

(e) A vessel or object being towed, other than those mentioned in paragraph (g) of this Rule, shall exhibit:

(i) Sidelights
(ii) A stern light
(iii) When the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(f) Provided that any number of vessels being towed alongside or pushed in a group shall be lighted as one vessel:

(i) A vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, sidelights

(ii) A vessel being towed alongside shall exhibit a stern light and at the forward end, sidelights.

(g) An inconspicuous, partly submerged vessel or object, or combination of such vessels or objects being towed, shall exhibit:

(i) If it is less than 25 m in breadth, one all-round white light at or near the front end and one at or near the after end except that dracones need not exhibit a light at or near the forward end

(ii) If it is 25 m or more in breadth, two or more additional all-round white lights at or near the extremities of its breadth

(iii) If it exceeds 100 m in length, additional all-round white lights between the lights prescribed in subparagraphs (i) and (ii) so that the distance between the lights shall not exceed 100 m.

(iv) A diamond shape at or near the aftermost extremity of the last vessel or object being towed and if the length of the tow exceeds 200 m an additional diamond shape where it can best be seen and located as far forward as is practicable.

(h) When from any sufficient cause it is impracticable for a vessel or object being towed to exhibit the lights or shapes prescribed in paragraph (e) or (g) of this Rule, all possible measures shall be taken to light the vessel or object being towed or at least indicate the presence of such vessel or object.

(i) Where from any sufficient cause it is impracticable for a vessel not normally engaged in towing operations to display the lights prescribed in paragraph (a) or (c) of this Rule, such vessel shall not be required to exhibit those lights when engaged in towing another vessel in distress or otherwise in need of assistance. All possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorized by Rule 36, in particular by illuminating the towline.

Rule 25 – Sailing Vessels Underway and Vessels Under Oars

(a) A sailing vessel underway shall exhibit:

(i) Sidelights
(ii) A stern light.

(b) In a sailing vessel of less than 20 m in length the lights prescribed in paragraph (a) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen.

(c) A sailing vessel underway may, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower Green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule.

(d) (i) A sailing vessel of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(ii) A vessel under oars may exhibit the lights prescribed in this rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(e) A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.

Rule 26 – Fishing Vessels

(a) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed by this rule.

(b) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:

(i) Two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other; a vessel of less than 20 m in length may instead of this shape exhibit a basket

(ii) A masthead light abaft of and higher than the all-round green light; a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so

(iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.

(c) A vessel engaged in fishing, other than trawling, shall exhibit:

(i) Two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other; a vessel of less than 20 m in length may instead of this shape exhibit a basket

(ii) When there is outlying gear extending more than 150 m horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear

(iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.

(d) A vessel engaged in fishing in close proximity to other vessels engaged in fishing may exhibit the additional signals described in Annex II to these Regulations.

(e) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

Rule 27 – Vessels Not Under Command or Restricted in Their Ability to Maneuver

(a) A vessel not under command shall exhibit:

(i) Two all-round red lights in a vertical line where they can best be seen

(ii) Two balls or similar shapes in a vertical line where they can best be seen

(iii) When making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a stern light.

(b) A vessel restricted in her ability to maneuver, except a vessel engaged in mine clearance operations, shall exhibit:

(i) Three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white

(ii) Three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond.

(iii) When making way through the water, a masthead light, sidelights and a stern light in addition to the lights prescribed in subparagraph (i)

(iv) When at anchor, in addition to the lights or shapes prescribed in subparagraphs(i) and (ii), the light, lights, or shape prescribed in Rule 30.

(c) A power-driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course shall, in addition to the lights or shapes prescribed in Rule 24(a), exhibit the lights or shapes prescribed in subparagraph (b)(i) and (ii) of this Rule.

(d) A vessel engaged in dredging or underwater operations, when restricted in her ability to maneuver, shall exhibit the lights and shapes prescribed in subparagraphs (b)(i),(ii) and (iii) of this Rule and shall in addition when an obstruction exists, exhibit:

(i) Two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists

(ii) Two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass

(iii) When at anchor, the lights or shapes prescribed in this paragraph instead of the lights or shapes prescribed in Rule 30.

(e) Whenever the size of a vessel engaged in diving operations makes it impracticable to exhibit all lights and shapes prescribed in paragraph (d) of this Rule, the following shall be exhibited:

(i) Three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white

(ii) a rigid replica of the code flag "A" not less than 1 m in height. Measures shall be taken to ensure its all-round visibility.

(f) A vessel engaged in mine clearance operations shall in addition to the lights prescribed for a power-driven vessel in Rule 23 or to the light or shape prescribed for a vessel at anchor in Rule 30 as appropriate, exhibit three all-round green lights or three balls. One of these lights or shapes shall be exhibited near the foremast head and one at each end of the fore yard. These lights or shapes indicate that it is dangerous for another vessel to approach within 1,000 m of the mine clearance vessel.

(g) Vessels of less than 12 m in length, except those engaged in diving operations, shall not be required to exhibit the lights prescribed in this Rule.

(h) The signals prescribed in this Rule are not signals of vessels in distress and requiring assistance. Such signals are contained in Annex IV to these Regulations.

Rule 28 – Vessels Constrained by their Draft

A vessel constrained by her draft may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen three all-round red lights in a vertical line, or a cylinder.

Rule 29 – Pilot Vessels

(a) A vessel engaged on pilotage duty shall exhibit:

(i) At or near the masthead, two all-round lights in a vertical line, the upper being white and the lower red

(ii) When underway, in addition, sidelights and a stern light

(iii) When at anchor, in addition to the lights prescribed in subparagraph (i), the light, lights, or shape prescribed in Rule 30 for vessels at anchor.

(b) A pilot vessel when not engaged on pilotage duty shall exhibit the lights or shapes prescribed for a similar vessel of her length.

Rule 30 – Anchored Vessels and Vessels Aground

(a) A vessel at anchor shall exhibit where it can best be seen:

(i) In the fore part, an all-round white light or one ball

(ii) At or near the stern and at a lower level than the light prescribed in subparagraph (i), an all-round white light.

(b) A vessel of less than 50 m in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (a) of this Rule.

(c) A vessel at anchor may, and a vessel of 100 m and more in length shall, also use the available working or equivalent lights to illuminate her decks.

(d) A vessel aground shall exhibit the lights prescribed in paragraph (a) or (b) of this Rule and in addition, where they can best be seen

(i) Two all-round red lights in a vertical line
(ii) Three balls in a vertical line.

(e) A vessel of less than 7 m in length, when at anchor not in or near a narrow channel, fairway or where other vessels normally navigate, shall not be required to exhibit the shape prescribed in paragraphs (a) and (b) of this Rule.

(f) A vessel of less than 12 m in length, when aground, shall not be required to exhibit the lights or shapes prescribed in subparagraphs (d)(i) and (ii) of this Rule.

Rule 31 – Seaplanes

Where it is impracticable for a seaplane to exhibit lights or shapes of the characteristics or in the positions prescribed in the Rules of this Part she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.

PART D – SOUND AND LIGHT SIGNALS

Rule 32 – Definitions

(a) The word "whistle" means any sound signaling appliance capable of producing the prescribed blasts and which complies with the specifications in Annex III to these Regulations.

(b) The term "short blast" means a blast of about one second's duration.

(c) The term "prolonged blast" means a blast from four to six seconds' duration.

Rule 33 – Equipment for Sound Signals

(a) A vessel of 12 m or more in length shall be provided with a whistle and a bell and a vessel of 100 m or more in length shall, in addition be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell and gong shall comply with the specifications in Annex III to these Regulations. The bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the prescribed signals shall always be possible.

(b) A vessel of less than 12 m in length shall not be obliged to carry the sound signaling appliances prescribed in paragraph (a) of this Rule but if she does not, she shall be provided with some other means of making an efficient signal.

Rule 34 – Maneuvering and Warning Signals

(a) When vessels are in sight of one another, a power-driven vessel under way, when maneuvering as authorized or required by these Rules, shall indicate that maneuver by the following signals on her whistle:

- One short blast to mean "I am altering my course to starboard"
- Two short blasts to mean "I am altering my course to port"
- Three short blasts to mean "I am operating astern propulsion."

(b) Any vessel may supplement the whistle signals prescribed in paragraph (a) of this Rule by light signals, repeated as appropriate, whilst the maneuver is being carried out:

(i) These signals shall have the following significance:

- One flash to mean "I am altering my course to starboard"
- Two flashes to mean "I am altering my course to port"
- Three flashes to mean "I am operating astern propulsion."

(ii) The duration of each flash shall be about one second, the interval between flashes shall be about 1 second, and the interval between successive signals shall not be less than 10 seconds.

(iii) The light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 mi, and shall comply with the provisions of Annex I to these Regulations.

(c) When in sight of one another in a narrow channel or fairway:

(i) A vessel intending to overtake another shall in compliance with Rule 9 (e)(i) indicate her intention by the following signals on her whistle.

- Two prolonged blasts followed by one short blast to mean "I intend to overtake you on your starboard side"

- Two prolonged blasts followed by two short blasts to mean "I intend to overtake you on your port side"

(ii) The vessel about to be overtaken when acting in accordance with 9(e)(i) shall indicate her agreement by the following signal on her whistle:

- One prolonged, one short, one prolonged and one short blast, in that order.

(d) When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by at least five short and rapid flashes.

(e) A vessel nearing a bend or an area of a channel or fairway where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

(f) If whistles are fitted on a vessel at a distance apart of more than 100 m, one whistle only shall be used for giving maneuvering and warning signals.

Rule 35 – Sound Signals in Restricted Visibility

In or near an area of restricted visibility, whether by day or night the signals prescribed in this Rule shall be used as follows:

(a) A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.

(b) A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of no more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.

(c) A vessel not under command, a vessel restricted in her ability to maneuver, a vessel constrained by her draft, a sailing vessel, a vessel engaged in fishing and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraph (a) or (b) of this Rule, sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts.

(d) A vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to maneuver when carrying out her work at anchor, shall instead of the signals prescribed in paragraph (g) of this Rule sound the signal prescribed in paragraph (c) of this Rule.

(e) A vessel towed or if more than one vessel is being towed the last vessel of the tow, if manned, shall at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts. When practicable, this signal shall be made immediately after the signal made by the towing vessel.

(f) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) of this Rule.

(g) A vessel at anchor shall at intervals of not more than 1 minute ring the bell rapidly for ten seconds. In a vessel 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor may in addition sound three blasts in succession, namely one short, one long and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel.

(h) A vessel aground shall give the bell signal and if required the gong signal prescribed in paragraph (g) of this Rule and shall, in addition, give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell. A vessel aground may in addition sound an appropriate whistle signal.

(i) A vessel of less than 12 m in length shall not be obliged to give the above mentioned signals but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.

(j) A pilotage vessel when engaged on pilotage duty may in addition to the signals prescribed in paragraph (a), (b) or (g) of this Rule sound an identity signal consisting of four short blasts.

Rule 36 – Signals to Attract Attention

If necessary to attract the attention of another vessel, any vessel may make light or sound signals that cannot be mistaken for any signal authorized elsewhere in these Rules, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation. For the purpose of this Rule the use of high intensity intermittent or revolving lights, such as strobe lights, shall be avoided.

Rule 37 – Distress Signals

When a vessel is in distress and requires assistance, she shall use or exhibit the signals described in Annex IV to these Regulations.

PART E – EXEMPTIONS

Rule 38 – Exemptions

Any vessel (or class of vessel) provided that she complies with the requirements of the International Regulations for the Preventing of Collisions at Sea, 1960, the keel of which is laid or is at a corresponding stage of construction before the entry into force of these Regulations may be exempted from compliance therewith as follows:

(a) The installation of lights with ranges prescribed in Rule 22, until 4 years after the date of entry into force of these regulations.

(b) The installation of lights with color specifications as prescribed in Section 7 of Annex I to these Regulations, until 4 years after the entry into force of these Regulations.

(c) The repositioning of lights as a result of conversion from Imperial to metric units and rounding off measurement figures, permanent exemption.

(d) (i) The repositioning of masthead lights on vessels of less than 150 m in length, resulting from the prescriptions of Section 3 (a) of Annex I to these regulations, permanent exemption.

(ii) The repositioning of masthead lights on vessels of 150 m or more in length, resulting from the prescriptions of Section 3 (a) of Annex I to these regulations, until 9 years after the date of entry into force of these Regulations.

(e) The repositioning of masthead lights resulting from the prescriptions of Section 2(b) of Annex I to these Regulations, until 9 years after the date of entry into force of these Regulations.

(f) The repositioning of sidelights resulting from the prescriptions of Section 2(g) and 3(b) of Annex I to these Regulations, until 9 years after the date of entry into force of these Regulations.

(g) The requirements for sound signal appliances prescribed in Annex II to these Regulations, until 9 years after the date of entry into force of these Regulations.

(h) The repositioning of all-round lights resulting from the prescription of Section 9(b) of Annex I to these Regulations, permanent exemption.

Appendix C

Electrofishing Field Manual

C.1 Checklist for Electrofishing Safety and Health Audit

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1. INTRODUCTION

This Electrofishing Field Manual describes basic concepts and safety issues of electrofishing systems. The information in this document should also increase an understanding of how the systems work and how to properly operate them to increase their effectiveness and reduce unnecessary harm to fish.

2. BASIC CONCEPTS

2.1 ELECTROFISHING

In many cases, electrofishing is the most effective means of collecting fish for scientific purposes. Electrical current is placed in the water to immobilize fish, allowing them to be collected with dipnets. It involves the use of either alternating current (AC) or direct current (DC) to immobilize fish for capture. These two types of current have very different effects on fish. The choice of current to use is dependent on the type of study being performed and the importance of returning healthy fish to the water.

2.2 ALTERNATING AND DIRECT CURRENT

AC current typically has the most violent effect on fish. Once in the electrical field, a fish will immediately "take a posture transverse to the current in such a way as to receive a minimum of voltage" (Coffelt Electronics). This action is called **oscillotaxis**. Fish will be immobilized quickly and the effect will last longer than that of DC current. Great care must be taken in the collection of fish in this manner. If AC current is applied for too long of a period, the fish may not recover. Another drawback to this type of collection is that since fish usually become immobilized almost immediately when hit by the current, some may be missed because they are shocked while several feet below the surface and out of sight.

DC current, in most cases, will be the preferred method of collection. Fish react in three ways to DC current. First, they line up with the direction of the electrical current, then swim toward the anode (positive electrode). This reaction is called **galvanotaxis**. Finally, when fish near the anode, they are stunned, roll belly up, and collection becomes possible. The effects of DC current do not last as long as those of AC current. When the power is turned off, the fish recover quickly. Mortality is far more limited than with the use of AC. This, along with the fact that fish swim to the anode, makes DC current the more effective means of electrofishing.

2.3 CONTROL BOX

AC or DC current can be selected with electrofishing control boxes. In addition to controlling the type of current, a control box allows adjustments to how the current acts. Most equipment will allow you to select for standard or pulsed output and to vary the pulse width and frequency of pulses, which allows for more efficient collections and limits the risk and stress to fish.

The control box also allows selection of voltage output. Depending on the electrofishing system used (i.e., Smith-Root or Coffelt), this selector should be positioned at the lowest possible setting that allows 5-10 amps to be obtained by adjusting the pulse width and rate, or a minimum of 190 volts.

Pulsed output means that the electrical current going from the system into the water comes in pulses or waves. When the pulse rate is low and the width of the field is narrow, less current is required to collect fish. This results in less stress to fish. Since conductivity of water (the ease with which an electrical

charge passes through it) varies, it is necessary to have the ability to adjust the pulse rate and width for optimum collection with minimum harm to the fish being collected.

2.4 CONDUCTIVITY

Electrofishing works by passing electrical current through a fish's body causing the effects described above. Several factors affect the amount of current passing through the fish's body and, thus, the effectiveness of electrofishing. If the conductivity of the fish's body is equal to or slightly above the conductivity of the surrounding water, the electricity will choose the path of least resistance and pass through the fish. The greater the conductivity of the fish's body in relation to the surrounding water, the greater the effect of the electricity on the fish. The conductivity of fish flesh differs among species. When shocking, you may observe catfish floating up as far as 50 feet from the anode. At the same time, scaled fish may not succumb to the current until they pass within a few feet of the anode. Due to increased surface area, larger fish, particularly large and deep-bodied fish, tend to receive a larger charge of electricity than do smaller fish.

Another factor that influences the effectiveness of electroshocking is the conductivity of the water. Pure distilled water will act as an insulator in an electrical current. This is because there are few electrolytes or dissolved solids to conduct the electricity. It would take a great deal of current to pass through this type of water. Conversely, the water of a typical lake or river may be very high in dissolved solids. This water will readily conduct very low amounts of current. In all cases, the conductivity of the water must be equal to or below the conductivity of the fish's body for electrofishing to be effective. It is not effective to shock in salt water because it is an electrolyte solution. The conductivity of the water is so much higher than that of a fish that an electrical current will find that the path of least resistance is around the fish rather than through it.

Conductivity of the water being surveyed should always be checked before attempting electrofishing. If it is very low (<50 microsiemens per centimeter [µS/cm]) or extremely high (>4,500 µS/cm), a different type of collection should be considered. When backpack, pram (tow barge), or long line (bank unit) shocking small streams, it may be possible to increase the conductivity of the water by placing a block of salt upstream of the study area several hours before beginning the survey. This, however, should only be considered in controlled conditions.

2.5 TYPES OF EQUIPMENT

There are several types of electrofishing equipment available. EA typically uses boat, backpack, pram, or long line units. These units differ in the type of power source used and in their application.

Boat electrofishing is utilized where water depths and characteristics make maneuvering the boat possible. EA primarily uses this type of electroshocking in lakes, reservoirs, and navigable rivers. Boat electrofishing usually involves the use of a large generator (i.e., 5,000 watt+) as an electrical power source. The generator sends electricity through a control box, which allows the operator to adjust the type of electrical current being placed in the water.

Pram, long line, and backpack electrofishing are designed for use in areas where boat electrofishing may not be possible or practical. Backpack units consist of a power source (a small generator or battery) and a control box mounted on a backpack frame. A hand-held positive electrode (anode) and trail behind negative electrode (cathode) are utilized by the operator to place electrical current in the water. The user is protected from the current by rubber waders and electrical gloves.

Pram shocking involves the use of a power source and electroshocking unit placed in a barge or small boat. Like backpack electrofishing, the operator utilizes a hand-held anode and trail behind cathode to place current in the water. The methods differ in that the operator is not required to carry the power source.

Long line electrofishing involves the use of a power source and electroshocking unit deployed on the bank. Like the other wadeable methods, the operator utilizes a hand-held anode. However, the cathode is stationary, typically deployed in the middle of an electrofishing zone near the control box and power source, to place current in the water. As with the pram unit, the operator is not required to carry the power source and control box. Cables up to 100 meters long allow mobility over a large section of water.

In all types of electrofishing, current is passed through the water between a positive electrode (anode) and a negative electrode (cathode). EA typically uses a boom-mounted anode and the boat hull as a cathode when boat electrofishing. You may, however, see different arrangements. In backpack electrofishing, the anode is a hand-held probe or dipnet and the cathode is a trail behind cable. In pram shocking, the cathode may be the hull of either the barge or boat carrying the equipment; and, in long line shocking, the cathode is a cable or plate deployed from a bank-mounted power source.

2.6 EQUIPMENT OPERATION

A typical boat shocking survey would be comprised of two or three team members. The team leader or an experienced technician will operate the boat and shocking system while the other crew member(s) will stand at a bow-mounted railing and collect fish with properly insulated dipnets. Either the operator or the netter will operate a foot switch that will immediately cut the power output if released. This is a very important safety feature and no electroshocking boat should be operated without a safety switch.

Backpack, pram, and long line shocking are slightly more hazardous than boat shocking because of the user's position in the water with the electrical charge. Field training sessions should be completed with an experienced wadeable electrofishing operator before attempting this technique. Basically, a wadeable system is a miniaturized version of the boat electrofishing system. At least two operators are required for backpack and pram electrofishing while three operators are preferable when using the long line method. For backpack and pram shocking, the operator handles the anode, which consists of a probe or a combination of probe and dipnet, depending on conditions. The second person monitors the equipment while assisting with the collection, transfer, and care of fish. For long line electrofishing, a third person typically maintains the cable and manages the live car.

The operator wades in an upstream direction through the water sweeping the anode 2-3 feet ahead. A thumb switch on the handle of the probe serves the same safety function as the foot switch on the boat. With a net probe, when a fish is shocked, the operator collects it with the dipnet, releases (i.e., turns off) the switch on the handle, and places the fish in a bucket, live-well, or live car. If the anode is not operated with an attached net, the second person will closely follow the operator and anode with a dipnet to collect fish. When pram shocking, special attention should be paid by all crew members to the size of the electrical field. If the cathode is mounted on a barge, boat, or bank, the electrical field will reach from that point to the anode held by the operator. When backpack shocking, this field is concentrated only around two probes.

3. SAFETY

3.1 SAFETY AWARENESS

When performed by trained field crews, with well-maintained equipment, electrofishing can be a very safe means to collect fish for biological study. Nonetheless, attention to safety must be paramount for all crew members in order to conduct a successful electrofishing survey. The amount of current in the water may be in excess of 250 volts. The amount of amperage generated during typical shocking operations averages 8 amps. This is enough to **kill** you if you come in direct skin contact with an electrical source such as a cathode, anode, or improperly grounded boat or generator. This hazard is compounded by the fact that the boat and other equipment may be wet.

3.2 HAZARD AWARENESS

Various physical hazards will potentially be present during electrofishing activities. These physical hazards may include, but not be limited to:

- Working over, near, or in the water
- Slip, trip, and fall
- Weather
- Material handling, moving, lifting
- Fire/explosion
- Exposure (e.g., cold stress, heat stress, sun burn)
- Noise
- Electrical
- Biological (e.g., fish spine puncture wounds, poisonous insects, and plants).

3.3 SAFETY RULES

Always follow the manufacturer's instructions when installing or operating electrical equipment. It is each crew leader's responsibility to familiarize crew members with the equipment and how to operate it. Furthermore, it is the responsibility of each crew member to assure that others are following proper procedures. If you are asked to do something that you feel is improper or unsafe, you have the authority to refuse. Don't depend on someone else to look out for you. Look out for yourself.

Despite all of this, as mentioned above, electroshocking surveys can be conducted in a safe manner. All that is required is proper attention to detail and the use of the safety equipment provided to you.

The following are the primary common sense rules that **must** be followed by all crew members at all times:

1. Prior to initiating a survey, the crew leader will conduct a safety briefing to instruct support personnel on basic operation, safety, and hazard awareness. Prior to electrofishing at a given site, the crew will survey the study zone for potential hazards.

2. Wear rubber gloves when operating/touching electroshocking equipment.

3. Rubber boots will be worn when boat electrofishing and non-breathable chest waders will be worn by all crew members for wadeable electrofishing.

4. When conducting wadeable electrofishing, all equipment in the water (e.g., nets, live cars, live wells, buckets) must be non-conductive, insulated, and/or isolated.

5. Due to the conductive nature and added weight, steel-toed boots and/or weight belts must never be worn while electrofishing.

6. Lug-soled boots are appropriate when wading in soft and or fine substrates (e.g., silt, much, gravel, cobble). However, large and firm substrates (e.g., bedrock, boulder, large cobble) may be especially slippery and may require felt-soled wading boots or corkers to safely wade.

7. Never touch a loose wire or make an adjustment while the unit is in operation. Rubber gloves must be worn, safety switches must be released, and the control box turned off before making any output adjustments. For all other system adjustments, beyond source, output, and other fine tuning at the control box, the power source and system must be shut down, completely.

8. Always use safety switches. Never disable a safety switch or use equipment with an inoperable safety switch.

9. Never over-extend yourself when netting fish.

10. When wading, walk deliberately and carefully with a shuffling, wide stance to avoid unseen trip hazards.

11. Communicate hazards to boat operator or fellow wading crew members. Each crew member has limits to their view. Don't assume everyone sees what you see. If noise level restricts normal conversation, establish hand signals.

12. Never place your bare hand in the water.

13. Keep the boat deck as dry and clear of obstacles as possible.

14. Look up from the water from time to time to assure that overhanging branches or other items do not pose a risk.

15. If necessary, particularly for boat or pram operated equipment, wear hearing protection.

16. Maintain the equipment through routine maintenance checks. If repairs are needed, get them fixed immediately. Don't wait for the next person to do it.

17. For boat electrofishing, a personal floatation device (PFD) must be worn by all crew members at all times when dockside or aboard the vessel. PFDs are not recommended for wadeable electrofishing in water primarily less than waist deep as they restrict movement and, in certain conditions, may contribute to heat stress. In doing so, PFDs with wadeable electrofishing present a greater hazard than wading without a PFD. Waters greater than waist deep should be boat electrofished.

18. In cold weather, dress warmly in layers of reasonably tight-fitting materials. Additional protections may include glove liners, hats, and hand and foot warmers. For warm weather, light colored and light weight fabrics should be worn. Hydrate constantly and use sunscreen to protect from sun burn.

Appendix C.1

Checklist for Electrofishing Safety and Health Audit

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APPENDIX C.1

CHECKLIST FOR ELECTROFISHING SAFETY AND HEALTH AUDIT

Item	Remarks	Yes	No
Safety Equipment	• Life preservers on board for each individual		
	• Leak-free electrical insulating gloves and boots available for each individual (NOTE: Gloves and boots should extend above the knees and elbows)		
	• Radio available for emergency contacts		
	• Radio property charged		
	• First aid kit in boat		
	• Burn Jel bandages available in first aid kit		
	• Personnel trained in first aid/cardiopulmonary resuscitation		
	• Fire extinguisher in boat (Type ABC 5 pounds)		
	• Emergency air horn on board		
	• Funnel available for adding gasoline to generate or pump (NOTE: Gasoline should not be added to a hot motor)		
	• Polarized sun glasses		
Boat Safety	Lights available and working for night-time fishing		
	Boat equipped with an anchor		
	Boat in good repair free from sharp edges and weak or broken areas		
	Fuel tanks positioned a safe distance from the generator and battery (NOTE: Gasoline vapor cannot be allowed to contact hot surfaces or sparks)		
	Fuel tanks property capped and lines leak-free		
	Generator/pump shut-off switch available to eliminate grounding the spark plug		
	Generator/pump muffler facing outside the boat and shielded to prevent contact in rough seas		
	Foot pedal “dead man” switch controlling the flow of electricity in place in bow of boat (NOTE: Device must be operating for netter[s] to control)		
	If no netter foot pedal exists, is there another means of emergency generator shut off?		
	Probes used to extend the electrodes to the water made of non-conducting material		
	Electrical connections weather-proof and water tight		
	Electrical conducting surfaces connected to create one circuit on board (NOTE: Separate circuits create “floating metal” that can cause electrocution)		
	Surfaces checked with an OHM meter prior to launching the boat		

Item	Remarks	Yes	No
Trailer	• Trailer frame free of significant rust and structurally sound		
	• Hitch on trailer solid and working properly with locking hasp		
	• Two safety chains present that can be properly connected to the towing vehicle hitch		
	• Training stand secured properly and can be locked in the vertical and horizontal position		
	• Trailer stand and winch handles present and working property		
	• Safety chains present to secure boat to trailer during transportation (other than winch)		
	• Winch secure and in good working order		
	• Winch cable or rope free of broken strands		
	• Winch hook a locking type		
	• Trailer tires in good shape with adequate tread		
	• Trailer wheel bearings were greased (if not sealed)		
	• Lights on trailer working properly (brake and turning indicator)		
	• Trailer brakes working properly		
Motor	• Motor bolted to boat with four bolts		
	• Motor equipped with proper handles		
	• Motor can be properly locked in the “up” or travel position		
	• Emergency motor shut-off connected to operator in case operator falls from boat		
Post-Fishing Checklist	• Generator shut off during rain		
	• Boat operated free of sudden turns or changes in direction		
	• Comments and items needed for next trip		

Standard Operating Procedure No. 035
for
Small Boat Operations

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision: 1
December 2014

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CONTENTS

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1. BACKGROUND

The threat from working on or near surface water bodies comes from both chemical hazards and physical hazards such as drowning. When there is a need for sampling to be conducted using small boats, EA will provide necessary safety gear, i.e., life vests, nets, and other floating devices and appropriate training.

1.1 PURPOSE

This Standard Operating Procedure (SOP) establishes the operating requirements for small boats conducting inland and coastal marine work.

1.2 SCOPE

This SOP applies to the operation of small boats, including launches, motorboats, working platforms, and skiffs, for inland (rivers, lakes, and bays) and coastal marine work. This SOP applies to EA personnel operating a small boat or working on a subcontractor-operated small boat. This SOP covers small boat requirements, work over or near bodies of water, personal floatation devices (PFDs), lifesaving and safety skiffs, severe weather precautions, and cold water and drowning hazards. This SOP is mandatory for EA personnel. Subcontractors are responsible for analyzing the hazards of activities they control and for preparing job hazard analysis and maintaining equivalent safety requirements.

1.3 DEFINITIONS

Small Boat—Includes dinghies, 1- or 2-man rowboats, up to and including larger vessels typically up to 50 ft in length, and work barges.

Float Plan—A written summary of the details of the trip, including route, type of vessel, persons aboard, and other salient information which may be useful in the event of an emergency.

Job Hazard Analysis—A concise analysis of the specific task considering the body of water, vessel, unique job requirements, training and experience of crew, and other circumstances as may be appropriate.

1.4 REFERENCES

EA Corporate Vessel Operations Manual. 2004. December.

Federal Requirements and Safety Tips for Recreational Boats. 1994. Boating Education Branch. April.

U.S. Army Corps of Engineers. 2003. Safety and Health Requirements Manual. Volume EM 385-1-1. September.

U.S. Coast Guard. 1994. Federal Requirements and Safety Tips for Recreational Boats.

1.5 RESPONSIBILITIES

The Project Health and Safety Officer is responsible for review and approval of small boat operations as described in the Health and Safety Plan. The Project Health and Safety Officer provides any necessary safety requirements to the project team. The Project Health and Safety Officer shall review the job hazard analysis prepared by project personnel.

Onsite Health and Safety Officer—The Health and Safety Officer is responsible for ensuring proper use of small boats at field locations. The Health and Safety Officer ensures that only trained personnel operate small boats, subcontractors implement safety programs, and that all equipment is properly maintained. The Onsite Safety Officer is responsible for filing or maintaining a float plan.

Small Boat Operators—EA personnel working on small boats will follow this procedure and any applicable health and safety procedures identified in the Health and Safety Plan and the vessel rules. Small boat operators will identify any conflicts in procedures or any problems or equipment failures to the Health and Safety Officer. Small boat operators shall demonstrate training, experience, and compliance with state requirements for operator education and licensing prior to operating any vessel. For larger bodies of water, or rapidly moving water, knowledge of local conditions shall be obtained prior to embarkation.

2. SMALL BOAT REQUREMENTS

All small boats used by EA personnel must meet the minimum requirements in the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1 and the applicable Occupational Safety and Health Administration or state plan requirements, as well as meeting applicable U.S. Coast Guard Regulations. These requirements include the following:

- Small boats will meet the minimum floatation requirements of the U.S. Coast Guard, and must have a certification tag affixed to the hull.

- The maximum number of passengers and weight that may be safely transported must be posted on all small boats.

- The number of personnel on the small boat cannot exceed the number of Type I PFDs onboard.

- Each small boat will have sufficient room freeboard, and stability to safely carry the allowable number of personnel and cargo.

- Each motored boat measuring less than 26 ft in length will carry one 1A-10 BC fire extinguisher; motored boats measuring greater than 26 ft will carry two 1A-10 BC fire extinguishers.

Operators and occupants of small craft shall review Federal Requirements and Safety Tips for Recreational Boats (U.S. Coast Guard 1994) before engaging in work from rafts, dinghies, canoes, rowboats, or Jon boats.

2.1 WORK OVER OR NEAR WATER

Work over or near water, where the potential exists for personnel to fall in and possibly drown, will be conducted in accordance with the requirements of applicable Occupational Safety and Health Administration standards and the U.S. Army Corps of Engineers EM 385-1-1 standards. This includes work from shore, bridges, work platforms, and vessels. Work within 15 ft of unobstructed access to water is within the requirements of this section. Personnel will follow the guidelines listed below except where personnel are protected by continuous guardrails, safety belts, or nets, or are conducting work along beaches or similar shorelines:

- Personnel will use the buddy system at all times.

- Swimming is prohibited, with the following exceptions: (1) certified divers performing their duties, and (2) personnel entering water to prevent injury or loss of life.

- All personnel will wear a U.S. Coast Guard-approved PFD of the type able to support an unconscious person (Type 1 with 32-lb floatation).

- At least one Type IV throwable device (ring buoy, horseshoe buoy) will be available on the small boat. Throwable devices should be U.S. Coast Guard-approved and equipped with 150 ft of 600-lb capacity rope.

- If specified in the Health and Safety Plan, at least one person will provide a dedicated safety watch/look-out.

2.2 PERSONAL FLOATATION DEVICES

All EA personnel will wear a U.S. Coast Guard-approved, Type 1 PFD when working over or near bodies of water. PFDs should meet the following requirements:

- Before and after each use, the PFD will be inspected for defects that would alter its strength or buoyancy.

- All PFDs will be equipped with retro reflective tape.

PFDs need not be donned when working on larger craft (>26 ft) except when working over water or outside railing. PFDs should be worn at all times when working on smaller craft.

2.3 SAFETY EMERGENCY DRILL

The vessel operator shall provide a list of crew duties for normal operations and emergencies. Emergencies which shall be covered include man-overboard, vessel fire, and vessel emergency.

The vessel operator shall provide an orientation and emergency drill. An emergency drill shall be conducted at the start of each task, and monthly thereafter, or as provided for in U.S. Coast Guard regulations.

2.4 FLOAT PLAN

A float plan provides essential information to enable the U.S. Coast Guard or other emergency search and rescue teams to initiate a search in the event of personnel not reporting in on schedule. The vessel operator will file a daily float plan with the site representative and with the project health and safety representative listed in the Health and Safety Plan. Upon daily completion of on-water work, the vessel operator will check in with the designated on shore individual. The float plan is provided in Appendix A.

2.5 EMERGENCY PLAN

The emergency plan should list a main dock and an alternate dock, and provide emergency medical support contact for each location.

2.6 COMMUNICATIONS

A marine VHF radio shall be maintained onboard and in operable condition. At least one of the boat personnel shall have a mobile telephone onboard during operations.

2.7 OCEAN REQUIREMENTS

Contact the Corporate Health and Safety Officer and Project Health and Safety Officer prior to planning any work which requires work in open ocean.

2.8 SEVERE WEATHER PRECAUTIONS

During field operations involving small boats, EA personnel will make provisions for severe weather. Severe weather includes sudden and locally severe storms, high winds, hurricanes, and floods. Before beginning work over water, the Health and Safety Officer will evaluate weather reports and conditions to ascertain local weather and prevent personnel exposure to severe weather. In the event that severe weather is encountered, personnel will cease field operations and immediately return to shore.

2.9 COLD WATER AND DROWNING HAZARDS

EA personnel conducting field operations with a small boat may be exposed to cold water and drowning hazards. When water temperature is below 45°F, hypothermia is a serious hazard. A person can lose feeling in extremities within 5 minutes. Under no circumstances will EA personnel enter the water from a small boat unless conducting diving operations or performing a rescue.

Symptoms of hypothermia are discussed during standard first aid training and in the EA Health and Safety Program Plan. If a person who has fallen into the water displays symptoms of hypothermia, he or she should be treated immediately and the field operations canceled. Under no circumstances should the victim be given hot liquids, since they can accelerate shock. Drinks no warmer than body temperature are acceptable. If symptoms are severe and rapid evacuation is not possible, remove the victim's wet clothing and cover the victim with a blanket. Continue to treat the victim for shock.

When a high risk of cold water and drowning hazards exists, all field staff members should be familiar with cold water survival techniques. If a team member falls into the water, he or she should not remove any clothing in the water because all clothing will provide insulation. Although clothing creates added drag while swimming, the added insulation of the clothing outweighs the disadvantage of the additional drag.

If a team member falls into the water, another team member should try to reach the person in the water with an oar, paddle, pole, or similar object. The victim should try to grab the extended item. If the victim is unconscious, the rescuer should try to hook the victim's PFD, clothing, or hair and pull him or her toward the boat. Once the victim is retrieved, the other team members should begin any necessary emergency medical procedures. If no emergency medical procedures are necessary, the victim should change into dry clothing.

2.10 JOB HAZARD ANALYSIS

The requirements for preparing a job hazard analysis apply specifically to all on-water operations. Appendix B provides a sample job hazard analysis; however, an actual job hazard analysis shall consider the specific task including the body of water, vessel type, unique job requirements, training and experience of crew, and other circumstances such as tides, weather, water temperature, access of rescue craft, and other factors as may be appropriate. Job hazard analysis must be prepared specifically for each task and crew in accordance with the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1.

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Appendix A

Float Plan

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APPENDIX A

FLOAT PLAN

1 Name and phone number of person filing plan.

2 Description of boat (type, color, trim, registration number, length, name, make, other).

3 Engine type (horsepower, fuel capacity, number of engines, and fuel [diesel or gasoline]).

4. Survival—Equipment onboard (check):

- Anchor
- Flares
- Flashlight
- Food
- Life ring with 150 ft of line.
- Paddles
- PFDs
- Smoke signals
- Water.

5. Marine Radio onboard (type, frequencies):

6. Automobile (tag number, type, color, make, trailer tag number, where parked)

7. Persons aboard (name, affiliation, and telephone number)

8. Do any of the persons aboard have a medical problem (identify type)

9. Trip plan (depart from @ time, arrive to @ time; via waypoints; expect to return no later than time)

10. Operational area (attach map)

11. If not returned by (a.m./p.m. time), call the U.S. Coast Guard or onshore contact.

12. Onshore contact:

Alternate Other Numbers

Contact	Number

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Appendix B

Job Hazard Analysis Form

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APPENDIX B

JOB HAZARD ANALYSIS FORM

Activity Hazard Analysis		
Task	**Potential Hazards**	**Hazard Control Measures**
MOBILIZATION/ DEMOBILIZATION	Physical Hazards (slips, trips, falls, cuts, etc.)	• Clear walkways/work areas of equipment, tools, and debris. • Watch for accumulation of water work surfaces. • Mark, identify, or barricade obstructions. • Wear cut-resistant work gloves when the possibility of lacerations or other injury caused by sharp or protruding objects occurs.
	Physical Hazards (material handling moving, lifting)	• Observe proper lifting techniques. • Obey sensible lifting limits (60-lb maximum per person manual lifting). • Use mechanical lifting equipment (hand carts, trucks, etc.) to move large awkward loads. • Use two or more persons for heaving bulk lifting.
	Physical Hazards (vehicle and pedestrian traffic)	• Use orange traffic cones where necessary. • Use reflective warning vests if exposed to vehicular traffic. • Locate staging areas in locations with minimal traffic.
	Physical Hazards (cold/heat stress)	• Monitor cold/heat stress as recommended in Section 6 of the Generic Health and Safety Plan.
	Munitions and Explosives of Concern (MEC) Hazard	• Practice site reconnaissance with a trained, experienced MEC specialist capable of recognizing MEC hazards. • If MEC is discovered, use existing access roads to retract from the MEC.
	Biological Hazards (insects, poisonous plants, ticks)	• Wear protective outer clothing and insect repellant to avoid insect bites and ticks. • Wear long sleeve shirts when working in areas with poison ivy or oak. • Workers with allergies should carry antidote kits, if necessary.
SAMPLING ACTIVITIES	Physical Hazards (slips, trips, falls, cuts, etc.)	• Clear walkways/work areas of equipment, tools, and debris. • Watch for accumulation of water work surfaces. • Mark, identify, or barricade obstructions. • Wear cut-resistant work gloves when the possibility of lacerations or other injury caused by sharp or protruding objects occurs.
	Physical Hazards (electrical)	• Identify electrical utility hazards prior to sampling. • Inspect work areas for spark sources, maintain safe distances, properly illuminate work areas, and provide barriers to prevent inadvertent contact. • Maintain minimum clearance distances for overhead energized electrical lines as specified in the Generic Health and Safety Plan.
	Physical Hazards (weather)	• Monitor radio for up-to-date severe weather forecasts. • Discontinue work during thunderstorms and severe weather events.
	Physical Hazards (vehicle and pedestrian traffic)	• Establish an exclusion zone around the drilling location. • Use orange traffic cones (if necessary). • Use reflective warning vests if exposed to vehicular traffic. • Locate staging areas in locations with minimal traffic.

Activity Hazard Analysis		
Task	**Potential Hazards**	**Hazard Control Measures**
SAMPLING ACTIVITIES (continued)	Physical Hazards (cold/heat stress)	• Monitor cold/heat stress as recommended in Section 6 of the Generic Health and Safety Plan.
	MEC Hazards	• Follow established MEC avoidance protocols when performing intrusive sampling activities. • If MEC is discovered or suspected, use existing access roads to retract from the MEC.
	Chemical Hazards (including MEC)	• Perform environmental monitoring as required in the Site-Specific Health and Safety Plan. • Where appropriate, personal protective equipment as indicated in the Site-Specific Health and Safety Plan.
	Biological Hazards (bloodborne pathogens)	• Wear proper personal protective equipment, including nitrile gloves and a face shield or goggles when sampling sludge. • Wash with soap and water as soon as personal protective equipment is removed or when contact or exposure has occurred.
	Biological Hazards (insects, poisonous plants, and ticks)	• Wear protective outer clothing and insect repellant to avoid insect bites and ticks. • Wear long sleeve shirts when working in areas with poison ivy or oak. • Worker with allergies should carry antidote kits, if necessary.
BOATING ACTIVITIES	Physical Hazards (weather)	• Monitor radio for up-to-date severe weather forecasts. • Boat operators will be trained by the site supervisor and/or the senior boat operator. • Discontinue work during thunderstorms and severe weather events.
	Physical Hazard (slips, trips, and falls, including falls overboard)	• Boat operator will inspect the boat prior to operation. The operator will ensure the number of personal floatation devices is equal to or greater than the number of passengers onboard. • No personnel will embark or disembark the vessel without the direction of the vessel operator. Vessel operator will ensure passengers are wearing personal floatation devices while on deck. At the request of the operator, personnel will be seated. • Passengers will stay seated until boat is docked. Ensure three-point contact whenever possible or practical. • A Type IV throwable device will be readily available onboard.

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 112.4 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: 765°C (1409°F)

Melting Point: 320.9°C (609.6°F)

Critical Temperature: Not available.

Specific Gravity: 8.64 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Reacts violently with potassium.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m3 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans: May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:

Identification:

Special Provisions for Transport:

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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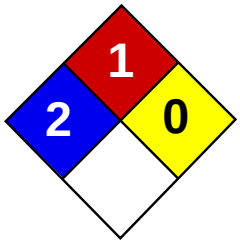

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 11/01/2010 12:00 PM

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Attachment C

Site-Specific Quality Assurance Project Plan Addendum

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Site-Specific Quality Assurance Project Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York

Prepared for

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by

EA Engineering, P.C. and its affiliate
EA Science and Technology
269 W. Jefferson Street
Syracuse, New York
(315) 431-4610

April 2019
Version: FINAL
EA Project 14907.33

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Site-Specific Quality Assurance Project Plan Addendum
Dzus Fastener Company, Inc. (152033)
West Islip, New York

Prepared for

New York State Department of Environmental Conservation
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Syracuse, New York 13202
(315) 431-4610

10 April 2019

Donald Conan, P.E., P.G., Vice-President — Date
EA Engineering, P.C.

10 April 2019

Adam Etringer, Project Manager — Date
EA Science and Technology

April 2019
Version: FINAL
EA Project No.14907.33

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
HNO3	Nitric acid
ASTM	American Society for Testing and Materials
DER	Division of Environmental Remediation
EA	EA Engineering, P.C. and Its Affiliate EA Science and Technology
EDD	Electronic data deliverable
EDS	Environmental Data Services, Ltd.
EPA	U.S. Environmental Protection Agency
HCl	Hydrochloric acid
in.	Inch(es)
NaOH	Sodium hydroxide
No.	Number
NYSDEC	New York State Department of Environmental Conservation
mL	Milliliter(s)
OU	Operable unit
PCB	Polychlorinated biphenyl
POC	Point-of-contact
QA	Quality assurance
QC	Quality control
QAPP	Quality Assurance Project Plan
RI	Remedial investigation
SOP	Standard operating procedures

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1. PURPOSE AND OBJECTIVES

1.1 PURPOSE

A Generic Quality Assurance Project Plan (QAPP) (EA Engineering, P.C. and its affiliate EA Science and Technology [EA] 2011)[1] was developed for field activities performed under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract Number (No.) D007624-33. This QAPP Addendum is for the remedial investigation (RI)/feasibility study Work Assignment for the Dzus Fastener Company, Inc. site in the Town of West Islip, Suffolk County, New York (NYSDEC Site No. 152033). This QAPP Addendum supplements the Generic QAPP with site-specific procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible.

1.2 QUALITY ASSURANCE PROJECT PLAN ADDENDUM OBJECTIVES

This QAPP Addendum provides site-specific information and standard operating procedures (SOPs) applicable to all work performed for the Operable Unit 5 (OU5) RI that is not included in the Generic QAPP. The information includes definitions and goals for data quality and required types and quantities of quality assurance (QA)/quality control (QC) samples. The procedures address sample handling, sample custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting specific to the analyses performed by the analytical laboratories. The Letter Work Plan (EA 2019)[2] details the procedures for sampling and decontamination protocols, as well as field documentation and specific project data quality objectives.

[1] EA. 2011. *Generic Quality Assurance Project Plan for Work Assignments under NYSDEC Contract No. D007624.* April.
[2] EA. 2019. *Operable Unit 5 Remedial Investigation/Feasibility Study Work Plan. Dzus Fastener Company, Inc. (152033).* April.

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2. PROJECT ORGANIZATION AND RESPONSIBILITIES

While all personnel involved in the investigation and generation of data are implicitly a part of the overall project management and QA/QC program, certain members of the Project Team have specifically designated responsibilities. Project personnel responsibilities are summarized below.

2.1 EA ENGINEERING, P.C. AND ITS AFFILIATE EA SCIENCE AND TECHNOLOGY

EA will provide oversight, coordination, health and safety, field support, and evaluation of analytical data. EA will also be responsible for evaluation of analytical test results, which will be submitted to NYSDEC. The EA staff involved in this project are as follows:

- ***Robert Casey, Project QA/QC Officer***—The QA/QC Officer will provide guidance on technical matters and review technical documents relating to the project. He will assess the effectiveness of the QA/QC program and recommend modifications, when applicable. Additionally, the QA/QC Officer may delegate technical guidance to specially trained individuals under his direction.

- ***Adam Etringer, EA Project Manager***—The Project Manager provides overall coordination and preparation of the project within EA. This includes coordination with NYSDEC and New York State Department of Health, budget control, subcontractor performance, implementation of the QAPP Addendum, and allocation of resources and staffing to implement both the QA/QC program and the site Health and Safety Plan.

- ***Hilary Williams, EA Project QA/QC Coordinator***—The Project QA/QC Coordinator is responsible for project-specific supervision and monitoring of the QA/QC program. She will ensure that field personnel are familiar with and adhere to proper sampling procedures, field measurement techniques, sample identification, and chain-of-custody procedures. She will coordinate with the analytical laboratory for the receipt of samples and reporting of analytical results and will recommend actions to correct deficiencies in the analytical protocol or sampling. Additionally, she will prepare QA/QC reports for management review.

- ***Justin Marra, EA Site Manager***—The Site Manager will serve as the onsite contact person for field investigations and tests. He will be responsible for coordinating the field activities including inspecting and replacing equipment, preparing daily and interim reports, scheduling sampling, and coordinating shipment and receipt of samples and containers.

The Program Health and Safety Officer is also an integral part of the project implementation team.

- ***Peter Garger, Certified Industrial Hygienist, Certified Safety Professional, EA Program Health and Safety Officer***—The Program Health and Safety Officer will be responsible for the development, final technical review, and approval of the Health and Safety Plan. In

addition, he will provide authorization, if warranted, to modify personal protective equipment requirements based on field conditions. He will also provide final review of all safety and health monitoring records and personal protective equipment changes to ensure compliance with the provisions of the Health and Safety Plan.

2.2 LABORATORY

Laboratory analyses for potential contaminants on this project will be performed by Con-Test Analytical Laboratory in East Longmeadow, Massachusetts, under subcontract with EA. Con-Test is NELAP certified in New York State. Geotechnical analyses will be performed by Chemtech of Mountainside, New Jersey, under subcontract with EA.

Adam Etringer (EA Project Manager) and Hilary Williams (EA Project QA/QC Coordinator) will have review responsibilities for sample results on this project. The laboratory will have their own provisions for conducting an internal QA/QC review of the data before they are released to EA. The laboratories' contract supervisors will contact EA's Project Manager with any sample discrepancies or data concerns.

Hard copy and electronic data deliverable formatted QA/QC reports will be filed by the analytical laboratories when data are submitted to EA. Corrective actions will be reported to the EA Project Manager along with the QA/QC report (Section 9 of the Generic QAPP). The laboratories may be contacted directly by EA or NYSDEC personnel to discuss QA concerns. EA will act as laboratory coordinator on this project, and all correspondence from the laboratories will be coordinated with EA's Project Manager.

3. SAMPLING RATIONALE, DESIGNATION, AND CONTAINERS

3.1 SAMPLING RATIONALE

The sampling rationale is presented for each planned field activity and is detailed in the Letter Work Plan (EA 2019)[2]. The rationale and frequency of the QC samples collected is discussed in the Generic QAPP (EA 2011)[1]. The RI laboratory program includes the number of samples for each sample location, as well as QA/QC samples (**Table 1**). The frequency of QA/QC samples is expressed as a percentage of the total number of samples collected for that matrix. The Generic QAPP also includes analytical methods and reporting limits.

3.2 SAMPLE DESIGNATION

Field samples collected from the site will be assigned a unique sample tracking number. Naming scheme varies by matrix type, as discussed below.

Sediment Samples

Sample ID numbers for sediment samples will be assigned using the following naming convention:

- 152033-OU5-SD-WT01-0006 = (NYSDEC SITE ID-OU5-Media/Type-Sample Area-Sample Depth Interval)

Media/Type	Sample Area	Depth Interval
SD – Sediment	WT – Willetts Tidal WTG – Willetts Tidal geotechnical	0006: 0–6 inches (in.)
		0612: 6–12 in.
		1218: 12–18 in.
		1224: 12–24 in.
		2436: 24–36 in.
		3648: 36–48 in.
		4860: 48–60 in.
		6072: 60–72 in.

- If one or more components of the sample naming convention are not necessary, they will not appear in the Sample ID number (e.g., 152033-OU5-SD-WT01-0006).

- Duplicate samples will be labeled 152033-OU5-SD-FD-MMDDYY. If multiple duplicate samples are taken on same day from same sample area, "-01," "-02," etc. will be appended to the end of the sample name.

- Samples to be used for matrix spike/matrix spike duplicates will be indicated in the "notes" column of the chain-of-custody form.

- Rinse blanks will be labeled 152033-OU5-SD-RB-MMDDYY and will only be collected when non-dedicated equipment is used.

Surface Water Samples

Sample ID numbers for surface water samples will be assigned using the following naming convention:

- 152033-OU5-SW-WT01 = (NYSDEC SITE ID-OU4-Media/Type-Sample Location).
- Duplicate samples will be labeled 152033-OU5-SW-FD-MMDDYY. If multiple duplicate samples are taken on same day from same area, "-01," "-02," etc. will be appended to the end of the sample name.
- Samples to be used for matrix spike/matrix spike duplicates will be indicated in the "notes" column of the chain-of-custody form.
- Rinse blanks will be labeled 152033-OU5-SW-RB-MMDDYY and only collected when non-dedicated equipment is used.

Residential Soil Samples

Sample ID numbers for the residential soil samples will be assigned using the following naming convention:

- 152033-OU5-SO-RDD-0002 = (NYSDEC SITE ID-OU5-Media/Type-Tax Parcel and Sample Location-Sample Depth Interval)

Media/Type	Sample Area	Depth Interval
SO – Soil	RDD – Tax Parcel specific MapID	0002: 0–2 inches (in.)
		0206: 2–6 in.
		0612: 6–12 in.
		1224: 12–24 in.

- Duplicate samples will be labeled 152033-OU5-SO-FD-MMDDYY. If multiple duplicate samples are taken on same day from same site, "-01," "-02," etc. will be appended to the end of the sample name.
- Samples to be used for matrix spike/matrix spike duplicates will be indicated in the "notes" column of the chain-of-custody form.
- Rinse blanks will be labeled 152033-OU5-SO-RB-MMDDYY and only collected when non-dedicated equipment is used.

3.3 SAMPLE CONTAINERS

Table 2 outlines the types of sample containers, sample volume, preservatives, and holding times required for sample collection. Con-Test and Chemtech will provide all required sample containers.

Table 1 Remedial Investigation Analytical Program

Samples	Sample Matrix	Number of Samples for Cadmium and Chromium[a]	Number of Geotechnical Samples[b]
SEDIMENT SAMPLING			
Number of Parent Samples	Sediment from 0–6 in., 6–12 in., 12–24 in., 24–36 in., 36–48 in., 48–60 in., and 60–72 in. depth intervals; geotechnical samples from 0–6 in. and 12–18 in. intervals only.	630	20
Field Duplicate [d]		32	0
Rinse Blank [e]		32	0
Matrix Spike/Matrix Spike Duplicate		32/32	0
Total Number of Analyses		**758**	**20**
SURFACE WATER SAMPLING			
Number of Parent Samples	Willetts Creek tidal area surface water	10	0
Field Duplicate		1	0
Rinse Blank		0	0
Matrix Spike/Matrix Spike Duplicate		1/1	0
Total Number of Analyses		**13**	**0**
FLOODPLAIN SOIL SAMPLING			
Number of Parent Samples	Floodplain soil from 0-2 in., 2-6 in., 6-12 in., and 12-24 in. depth intervals.	540	0
Field Duplicate		27	0
Rinse Blank		27	0
Matrix Spike/Matrix Spike Duplicate		27/27	0
Total Number of Analyses		**648**	**0**

(a) Chromium speciation will be analyzed in floodplain soil samples.
(b) Geotechnical samples include grain size, percent moisture, and bulk density
(c) Laboratory quality control samples will be collected at a rate of 1 per 20 samples, per matrix (excluding geotechnical samples).
(d) Rinse blanks are collected at a rate of 1 per 20 samples, per analysis (excluding geotechnical samples), and only when non-dedicated equipment is used.
NOTE: in. = inches

Table 2 Sample Containers, Preservation, and Holding Times

Parameter	Matrix	Container Type/Size	Sample Volume	Preservation	Maximum Holding Time from Verifiable Time of Sample Receipt
Sediment and Soil					
Cadmium and total chromium by EPA Method 6020; hexavalent chromium (for soil samples only, (EPA 7196A)	Sediment/Soil	(2) 4-ounce wide mouth glass jars	8 ounces	Cool 4°C	6 months from collection
Grain Size by ASTM D422	Sediment (for geotechnical)	(1) 1-gallon plastic Ziploc bag, double-bagged, filled halfway	500 grams	Ambient	none
Moisture Content by ASTM D2216-98	Sediment (for geotechnical)	(1) 1-gallon plastic Ziploc bag, double-bagged, filled halfway	500 grams	Ambient	none
Bulk Density by ASTM D7263	Sediment (for geotechnical)	(3) plastic molds provided by the laboratory	Fill each mold	Ambient	none
Surface Water and Rinse Blanks					
Cadmium and total chromium by EPA Method 6020	aqueous (surface water samples and rinse blanks)	(1) 250-mLplastic bottle	250 mL	HNO_3 Cool 4°C	6 months from collection
Hexavalent chromium by EPA 7196A	Aqueous (rinse blanks)	(1) 250-mLplastic bottle	250 mL	Cool 4°C	24 hours

NOTES: °C = Degrees Celsius
ASTM = American Society for Testing and Materials
EPA = U.S. Environmental Protection Agency
HNO_3 = Nitric acid
mL = Milliliter(s)

4. ANALYTICAL LABORATORIES

The data collected during this investigation will be used to determine the presence and concentration of certain analytes in soil, sediment, and surface water. Samples collected during execution of the Generic QAPP (EA 2011)[1] and this QAPP Addendum will be submitted to Con-Test Analytical Laboratory in East Longmeadow, Massachusetts, and Chemtech in Mountainside, New Jersey. Both Con-Test and Chemtech are New York State Department of Health Environmental Laboratory Analytical Program-certified laboratories, meeting specifications for documentation, data reduction, and reporting. Preliminary analytical results will be provided within 10 days of sample receipt, and full NYSDEC Analytical Services Protocol Category B deliverables and associated electronic data deliverables will be provided to EA within 30 days of sample receipt.

4.1 ANALYTICAL TEST PARAMETERS

This QAPP Addendum covers the analysis of non-aqueous (soil and sediment) and aqueous (surface water and rinse blanks) samples to be collected during the OU5 RI. The specific methods are listed above in **Table 2**. Compound lists for each analytical method are included in the Generic QAPP (EA 2011)[1]. A summary of the reporting limits for the analytical methods is provided as **Appendix A**.

4.2 SAMPLE SHIPPING PROCEDURES

Samples will be shipped to each laboratory by United Parcel Service, or laboratory courier if available. All samples will be checked into the laboratory's Laboratory Information Management System via chain-of-custody. Addresses for shipping and additional points-of-contact (POC) for each laboratory are included below:

- **Con-Test Analytical Laboratory**
  39 Spruce Street
  East Longmeadow, Massachusetts 01028
  POC: Aaron Benoit, Project Manager
  Direct: 413-525-2332 x47
  Email: aaron.benoit@contestlabs.com

- **Chemtech**
  284 Sheffield Street
  Mountainside, New Jersey 07092
  POC: Steven Kim, Project Manager
  Direct: 908-728-3157
  Email: steven@chemtech.net.

4.3 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

The QA/QC samples to be collected in the field throughout the duration of this project include field duplicates, matrix spikes, matrix spike duplicates, rinse blanks, and temperature blanks. Temperature blanks will be provided by the individual laboratories and will be placed in coolers with samples prior to sample shipment.

In addition to these field samples, the laboratories will run internal QA/QC samples including laboratory control samples and surrogate analyses. QA/QC samples are discussed in greater depth in Section 7 of the Generic QAPP (EA 2011).[1]

4.4 INSTRUMENT CALIBRATION AND MAINTENANCE

Each laboratory will provide EA with their QA Manuals prior to project initiation. The QA Manuals provide the instrument calibration and maintenance information for the equipment that the laboratories will use to analyze samples for metals, as well as total organic carbon and grain size, where appropriate.

4.5 DATA DELIVERY AND SAMPLE STORAGE

Full NYSDEC Analytical Services Protocol Category B deliverables with analytical results and associated NYSDEC EQuIS v3 electronic data deliverables (EDDs) will be provided to EA within 21 business days of sample receipt. Final Category B Data Deliverable PDFs (Adobe Acrobat file) will be fully bookmarked and searchable. Per the Generic QAPP (EA 2011)[1], the laboratories will store analyzed samples for 60 days after the submittal of the final data report to EA. After the 60-day period, the laboratories will dispose of the samples.

5. ANALYTICAL DATA VALIDATION

The laboratory will review data prior to release to EA. Objectives for review are in accordance with the QA/QC objectives stated in the Generic QAPP (EA 2011)[1] and NYSDEC Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (2010).[3] The laboratories are required to evaluate their ability to meet these objectives. Outlying data will be flagged in accordance with laboratory SOPs and corrective action will be taken to rectify the problem.

To ensure the validity of analytical data generated by a project, the data will be validated by an independent data validator, Environmental Data Services, Ltd. (EDS). The Generic QAPP (EA 2011)[1] addresses implementation of independent validation, in accordance with NYSDEC DER-10. Data will be submitted to EDS for 100 percent Category B data validation. EDS will prepare data validation reports and update the EQuIS EDDs with any new or revised results and qualifiers for each sample delivery group. Validation for data usability will be accomplished by comparing the contents of the analytical data packages and QA/QC results to the requirements contained in the QAPP Addendum, the respective methods, and the laboratory SOPs.

Contact information for EDS is as follows:

- Diane Waldschmidt
  Principal Consulting Chemist
  5 Brilliant Avenue
  Pittsburgh, Pennsylvania 15215
  Direct: 412-408-3288
  E-mail: dwaldschmidt@eds-pa.com.

[3] NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation*. May.

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Appendix A

A Summary of the Reporting Limits for the Non-Aqueous and Aqueous Analytical Methods

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Table A-1 Analytical Reporting Limits
U.S. Environmental Protection Agency Method 6020
(Aqueous and Non-Aqueous)

Constituent	Reporting Limit	
	Surface Water (µg/L)	Soil/Sediment (mg/kg)
Cadmium	0.50	0.095
Chromium	1.0	1.2

Notes: µg/L = microgram(s) per liter
mg/kg = milligram(s) per kilogram

Attachment D

Field Forms

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DAILY FIELD REPORT **Day:_____ Date:_____**

Temperature: (F)

Wind Direction:

Project Name: Dzus Fastener Company, Inc.

Weather: (am)

(pm)

NYSDEC Site # 152033

Contract # D007624-33 **Arrive at site:** (am)

Location: West Islip, New York **Leave site:** (pm)

HEALTH & SAFETY:

Are there any changes to the Health & Safety Plan? Yes ( ) No ( )
(If yes, list the deviation under items for concern)

Are monitoring results at acceptable levels?	Soil	Yes ( )	n/a ( )	* No ( )
	Waters	Yes ( )	n/a ( )	* No ( )
	Air	Yes ( )	n/a ( )	* No ( )

- *If No, provide comments*

OTHER ITEMS:

Site Sketch Attached: Yes ( ) No ( )
Photos Taken: Yes ( ) No ( )

DESCRIPTION OF DAILY WORK PERFORMED:

SAMPLING (Soil/Water/Air)

Sample ID:	Description:

DAILY FIELD REPORT **Day:_____ Date:_____**

CONTRACTOR/SUBCONTRACTOR EQUIPMENT AND PERSONNEL ON SITE:

EA personnel:

(Name of Subcontractor) personnel:

(Name of contractor) equipment:

(*Indicates active equipment)

Other Subcontractors:

VISITORS TO SITE:

1.

PROJECT SCHEDULE ISSUES:

PROJECT BUDGET ISSUES:

None.

ITEMS OF CONCERN:

COMMENTS:

ATTACHMENT(S) TO THIS REPORT:

SITE REPRESENTATIVE:

Name: (*signature*)
cc:

DAILY PHOTOLOG

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LITHOLOGIC LOG *Sediment Collection Log* *EA Engineering, Science, & Technology, Inc*	Client Name and Project Name NYSDEC - Dzus Fastener	Location/Boring Name	Sheet of
1 Geologist Name/Signature	5 Project Number 1490733	8 Start - Stop (Date/Tme)	
2 Subcontractor/Equipment Operator	6 Latitude/Northing/Grid	9 Sed Surface Elevation *ft* 10 Coordinate System H V 11 Depth of Water (start) *ft*	
3 Operator Name *(Licence # If Required)*	7 Longitude/Easting/Grid	12 Depth of Water (end) *ft* 13 Sunny/Cloudy/Rain 14 Temperature (start/high) *F*	

4 Sampling Equipment and Methodology (Check One)	
Rotosonic: ___ -ft barrel ___ -in diameter ___ -ft spoon/sample	15 Wind Direction 16 Total Boring Depth *ft*
Core: ___ -ft barrel ___ -in diameter ___ -VPM Manual/Vibracore/Other	17 Recovery Depth ft *%*
Grab Sample: -ft x -ft x -ft Box/Ponar/Van Veen/Other	18 Location Notes
Other:	
Sample Collection Method:	

Interval *(Depth)*	**Recovery** *(ft & %)*	**Description of Materials** Munsell Color; Moisture; Density; Consistency (Other Remarks)	**Sample ID** **Sample Interval**	**USCS** *Code*

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