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Edwin Reyes, Administrator
Guam Coastal Management Program
Bureau of Statistics and Plans
P.O. Box 2950
Hågatña, Guam 96932

July 07, 2016

Subject: Coastal Zone Management Act (CZMA) Consistency Determination for the Design and Implementation of Watershed Restoration Projects in the Manell and Geus Watersheds on Guam

Dear Mr. Reyes:

This letter is to inform you of the transmittal of the completed Guam Coastal Management Program Assessment Format Form and the CZMA Consistency Determination for the Design and Implementation of Watershed Restoration Projects in the Manell Watershed on Guam. This project is funded by the Coral Reef Conservation Program and is being implemented by the National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS) Pacific Islands Regional Office (PIRO).

The overall objective of implementing watershed restoration projects in the Manell Watershed is to stabilize steep slopes and stream banks and create riparian buffers with the intent of reducing sediment loads entering downstream coastal waters. This project will utilize watershed assessment and design plans developed through previous watershed restoration projects and implement two types of erosion control projects to reduce sediment loads in the Manell Watershed, as follows:

- 1.) streambank stabilization using vegetative methods, natural fibers, or other appropriate methods as approved;
- 2.) riparian buffer strips using vegetative methods and/or natural fibers or other appropriate methods.

The goals of this project are to:



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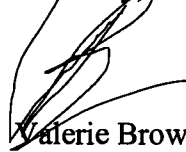
- 1.) reduce sediments entering the streams and,
- 2.) test lower cost, low maintenance erosion control options that can be used in other locations as funding becomes available.

This project includes implementation of watershed restoration at six (6) sites in the Manell Watershed. Ideally, the projects will include installation and maintenance tasks that could be completed by community volunteers and coordinated by government or non-government organizations.

The Guam Coastal Management Program Assessment Format Form and the CZMA Consistency Determination are being provided to assist in the review for consistency of the proposed project with Guam's Coastal Management Program.

We appreciate your support in working with NOAA/NMFS, PIRO to obtain the approved Coastal Zone Act Consistency Determination. If you have any questions or comments regarding the completed Guam Coastal Management Program Assessment Format Form or the CZMA Consistency Determination for the proposed project, please do not hesitate to contact Ms. Valerie Brown by phone at 671.646.1904 or by email at valerie.brown@noaa.gov.

Sincerely,



Valerie Brown
Fishery Biologist

Correspondence Address:
NOAA, Pacific Islands Regional Office
Habitat Conservation Division
Guam Field Office
P.O. Box 315488
Tamuning, GU 96931

Attachments:

- Guam Coastal Management Program Assessment Format Form for the Design and Implementation of Watershed Restoration Projects in the Manell Watershed on Guam
- CZMA Consistency Determination for the Design and Implementation of Watershed Restoration Projects in the Manell Watershed on Guam

Coastal Zone Management Act (CZMA) Consistency Determination

This document provides the Guam Coastal Management Program with the National Oceanic and Atmospheric Administration (NOAA) Consistency Determination under CZMA § 307(c) (1) and 15 CFR part 930, subpart C, for the NOAA Design and Implementation of Watershed Restoration Projects in the Manell and Geus Watersheds on Guam. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39. This activity includes:

- 1.) Slope and bank stabilization by hand-installing vegetation and natural fibers;
- 2.) Riparian buffer strip installation using vegetation and/or natural fibers or other appropriate methods. The goal is to test lower cost, low maintenance options that can be used in other locations as funding becomes available. Ideally, project designs will be scalable and include installation and maintenance tasks that could be completed by community volunteers.

NOAA has determined that the Design and Implementation of Watershed Restoration Projects in the Manell and Geus Watersheds on Guam affects the land or water uses or natural resources of Guam in the following manner:

The primary objective of this project is to implement projects to stabilize eroding areas and create riparian buffers in the Manell Watershed in Southern Guam. The project's intent is to demonstrate practices which improve slope and stream stability and reduce the amount of sediment entering downstream coastal waters, reducing impacts to coastal benthic habitats and coral reef health. This project will assess steep slopes, streams and riparian zones for feasibility of erosion control projects and design two types of erosion control projects mentioned above to reduce sediment loads in the Manell Watershed.

The Guam Coastal Management Program contains the following applicable enforceable policies:

- Guam Environmental Protection Agency (GEPA) Section 401 Water Quality Certification [401(b)- discharge to or withdrawal from inland surface waters and 401(c) discharge of dredged material or fill in wetlands and other inland surface waters.
- Wetlands Permit - Chapters 61 & 62 of the Government Code of Guam and Executive Order No. 91-27
- Pollution Discharge Permit - "Water Pollution Control Act," Title 10, Chapter 47, Guam Code Annotated; and 22 GAR Chapter 10
- Erosion Control Permit - "Water Pollution Control Act," Title 10, Chapter 47, Guam Code Annotated; and "Soil Erosion and Sedimentation Control" Regulations, 1985. 22 GAR Chapter 10
- Section 106 - National Historic Preservation Act, "Historical Objects and Sites," Title 21, Chapter 76, Guam Code Annotated, PL 12-126
- Floodplain Management Ordinance – Government of Guam, Department of Public Works, Subsection (a), Subsection 66116, Article 1, Chapter 66, Building Law, 21 Guam Code Annotated

Based upon the following information, data and analysis NOAA finds that the Design and Implementation of Watershed Restoration Projects in the Manell and Geus Watersheds in Southern Guam is consistent to the maximum extent practicable with the enforceable policies of the Guam Coastal Management Program. This project will not adversely affect the ability:

- to determine the extent to which Guam's natural resources limit urban and rural development;
- to plan for the preservation of the natural charm and character of Guam within the framework of a growing population and modern technology;
- to plan for a high quality environment essentially free from pollution with adequate well-kept open space throughout Guam's varying activity centers; and,
- to recommend creative legislation regulating the use of land for protection of future generations.

Pursuant to 15 CFR § 930.41, the Guam Coastal Management Program has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR §930.41(b). The Territory's concurrence will be presumed if the Territory's response is not received by NOAA on the 60th day from receipt of this determination.

The Guam Coastal Management Program response should be sent to:

NOAA, Pacific Islands Regional Office
Habitat Conservation Division
Guam Field Office
770 E. Sunset Blvd. Ste. 170
Tiyan, GU 96913
Email: Valerie.brown@noaa.gov
Phone: 671-646-1904

**GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT**

DATE OF APPLICATION: July 2016

NAME OF APPLICANT: National Oceanic and Atmospheric Administration (NOAA)

ADDRESS: 770 East Sunset Blvd, Suite 170, Tiyan, GU 96913

TELEPHONE NO. 671-646-1904 Fax No. 671-646-1906 E-Mail Address: Valarie.brown@noaa.gov

TITLE OF PROPOSED PROJECT: Design and Implementation of Watershed Restoration Projects in the
Manell and Geus Watersheds in Southern Guam

COMPLETE FOLLOWING PAGES

FOR BUREAU OF STATISTICS AND PLANS ONLY:

DATE APPLICATION RECEIVED: _____

OCRM NOTIFIED: _____ LC. AGENCY NOTIFIED: _____

APPLICANT NOTIFIED: _____ PUBLIC NOTICE GIVEN: _____

OTHER AGENCY REVIEW REQUESTED: _____

**DETERMINATION: () CONSISTENT () NON-CONSISTENT () FURTHER INFORMATION
REQUESTED**

OCRM NOTIFIED: _____ LIC. AGENCY NOTIFIED: _____

APPLICANT NOTIFIED: _____

ACTION LOG: 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____

DATE REVIEW COMPLETED: _____

GUAM COASTAL MANAGEMENT PROGRAM ASSESSMENT FORMAT

DEVELOPMENT POLICIES (DP):

DP1. Shore Area Development

Intent: To ensure environmental and aesthetic compatibility of shore area land uses.

Policy: Only those uses shall be located within the Seashore Reserve which:

- enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or
- can demonstrate dependence on such a location and the lack of feasible alternative sites.

Discussion: *The project area is not located within or in proximity to the Seashore Reserve, but it is upstream of and connected to the shore area by drainages in the watersheds. Policy DP 1 does not directly apply to this project, but the project will result in an enhancement in the quality of waters entering the Seashore Reserve area by reducing sediment loads associated with runoff from actively eroding areas in the Manell Watershed.*

DP2. Urban Development

Intent: To cluster high impact uses such that coherent community design, function, infrastructure support and environmental compatibility are assured.

Policy: Commercial, multi-family, industrial and resort-hotel zone uses and uses requiring high levels of support facilities shall be concentrated within appropriate zone as outlined on the Guam Zoning Code.

Discussion: *This project is not located near urban development areas and urban development areas will not be affected by the project. Policy DP 2 does not apply to this project.*

DP3. Rural Development

Intent: To provide a development pattern compatible with environmental and infrastructure support suitability and which can permit traditional lifestyle patterns to continue to the extent practicable.

Policy: Rural districts shall be designated in which only low density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure including functional sewerage is provided.

Discussion: *The Proposed Action is located in the Manell Watershed on Government of Guam property that is bordered on the east by privately owned land. The watershed is characterized primarily by savannah habitat with limited forested habitat occurring in association with ravines and drainages. The watershed is sparsely developed mostly in flat lying areas adjacent to the coast. The project is compatible with the existing traditional rural lifestyle patterns and will not affect the existing infrastructure.*

This project is consistent with the intent of Policy DP3.

DP4. Major Facility Siting

- Intent: To include the national interest in analyzing the siting proposals for major utilities, fuel and transport facilities.
- Policy: In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, Guam shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.

Discussion: *This project is not associated with major utilities, fuel or transport facilities. Policy DP 4 does not apply to this project.*

DP 5. Hazardous Areas

- Intent: Development in hazardous areas will be governed by the degree of hazard and the land use regulations.
- Policy: Identified hazardous lands, including flood plains, erosion-prone areas, air installations' crash and sound zones and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety or welfare of the people of Guam, and complies with the land use regulations.

Discussion: *The project goals are to stabilize currently unstable hazardous areas (erosion-prone areas). Therefore, this project is consistent with the intent of Policy DP5.*

DP 6. Housing

- Intent: To promote efficient community design placed where the resources can support it.
- Policy: The government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and manmade hazards, and recognize the limitations of the island's resources to support historical patterns of residential development.

Discussion: *This project does not include development of residential areas or structures and residential areas will not be affected by the project. Policy DP 6 does not apply to this project.*

DP 7. Transportation

- Intent: To provide transportation systems while protecting potentially impacted resources.
- Policy: Guam shall develop an efficient and safe transportation system, while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, coral reefs and other coastal resources.

Discussion: *This project does not involve the development of transportation systems and will not result in the creation of vehicle traffic at the site. The site is accessed by foot. This project is consistent with the intent of Policy DP7.*

DP 8. Erosion and Siltation

Intent: To control development where erosion and siltation damage is likely to occur.

Policy: Development shall be limited in areas of 15% or greater slope by requiring strict compliance with erosion, sedimentation, and land use regulations, as well as other related land use guidelines for such areas.

Discussion: *The intent of the project is to stabilize areas that are currently undergoing erosion in the headwater areas of the Manell Watershed and to reduce the off-site transport of sediment that is resulting in siltation in downstream aquatic habitats. Temporary and permanent erosion and sediment control best management practices will be constructed and/or installed to divert storm water from exposed areas and prevent sediment from moving offsite, if necessary. The project site will be minimally impacted by use of hand tools and a plant auger to implement erosion stabilization practices. Increased storm water runoff resulting from project implementation is not expected. Best management practices that could be implemented to stabilize soils that might be temporarily exposed to erosion during project implementation could include:*

- *Installation of vegetation (sedimentation) barriers where needed depending on site drainage*
- *Use of mulching on areas that will be exposed for extended periods (i.e., longer than 10 days)*

This project is consistent with the intent of Policy DP8.

RESOURCES POLICIES (RP):

RP1. Air Quality

Intent: To control activities to insure good air quality.

Policy: All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.

Discussion: *Dust emission control measures will be implemented if determined necessary during field activities. The field activities will take place during the rainy season and no generation of dust is anticipated. Exposed soil will be sprayed with water to minimize the generation of dust if it is determined to be necessary. This project is consistent with the intent of Policy RP1.*

RP2. Water Quality

Intent: To control activities that may degrade Guam's drinking, recreational, and ecologically sensitive waters.

Policy: Safe drinking water shall be assured and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuaries, reef and aquifer areas.

Discussion: *The project will improve the quality of the surface and receiving waters by stabilizing currently unstable steep slopes and stream reaches. This project is consistent with the intent of Policy RP2.*

RP3. Fragile Areas

- Intent: To protect significant cultural areas, and natural marine and terrestrial wildlife and plant habitats.
- Policy: Development in the following types of fragile areas including Guam's Marine Protected Areas (MPA) shall be regulated to protect their unique character.
- historical and archeological sites
 - wildlife habitats
 - pristine marine and terrestrial communities
 - limestone forests
 - ravine forests
 - mangrove stands and other wetlands
 - coral reefs

Discussion: *Implementation of the project would not be expected to result in direct or indirect impacts to terrestrial resources (vegetation communities or wildlife) or benthic and marine resources, including sensitive species occurring on or in the vicinity of the site. Surveys for listed plant species were conducted on the site on July 8, 2016. No listed plants were found. Listed fauna species are not expected to occur on or in proximity to the project sites due to a lack of suitable habitat.*

Archaeological surveys of the site were conducted on July 8, 2016 and the week of July 11, 2016. Pottery shards were found at some locations in proximity to the six individual proposed watershed restoration sites. No shards were found within the six project sites. Correspondence with the Guam Historic Preservation Office is being conducted to ensure that activities associated with the watershed restoration project will not result in adverse effects to cultural resources. Stabilization of actively eroding sites in the project area would be expected to result in long term beneficial effects to cultural resources that might occur downslope of the erosion sites, as a result of stabilizing the actively eroding areas.

The project would not be expected to result in impacts on cultural or historic resources on and in the vicinity of the sites during or as a result of project implementation. If an inadvertent discovery of a cultural resource occurs during implementation activities, the work where the discovery is made will immediately cease, and the Guam Historic Preservation Officer Point of Contact (POC) will be immediately notified. An archaeologist (or designee) and/or the Guam Historic Preservation Officer POC may stop work to allow investigators to inspect the area and to protect the artifacts. The perimeter of the find, as determined by the archaeologists, will be delineated and access to the area will be restricted. No intrusive work will proceed without consultation with the archaeologist (or designee).

This project is consistent with the intent of Policy RP3.

RP4. Living Marine Resources

- Intent: To protect marine resources in Guam's waters.
- Policy: All living resources within the waters of Guam, particularly fish, shall be protected from over harvesting and, in the case of corals, sea turtles and marine mammals, from any taking whatsoever.

Discussion: *No impacts to the marine resources and mangrove habitat would result from implementation of the proposed project.*

The intent of the project is to stabilize and restore areas of actively eroding soils in the headwater areas of the Manell Watershed. Implementation of the project would result in a reduction in the amount of sediments being transported from the actively eroding project sites. A reduction in the amount of sediments entering Guam's waters will result in an improvement in habitat conditions for all associated living resources. The project does not involve any harvesting of marine resources or activities within the waters that could otherwise adversely impact marine resources. This project is consistent with the intent of Policy RP4.

RP5. Visual Quality

Intent: To protect the quality of Guam's natural scenic beauty

Policy: Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws. Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails.

Discussion: *The project includes the installation of native vegetation in an area that has historically been subjected to frequent fires and subsequent recruitment of non-native grasses. Implementation of the project will improve the diversity of native vegetation at the project sites resulting in an improvement in the natural scenic beauty of the site.*

This project is consistent with the intent of Policy RP5.

RP6. Recreation Areas

Intent: To encourage environmentally compatible recreational development.

Policy: The Government of Guam shall encourage development of varied types of recreational facilities located and maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and urban areas and protect beaches and such passive recreational areas as wildlife, marine conservation and marine protected areas, scenic overlooks, parks, and historical sites. Developments, activities and uses shall comply with the Guam Recreational Water Use Management Plan (RWUMP).

Discussion: *The project site is not located on or near any recreational areas and will not have any effects on recreational areas. Policy RP 6 does not apply to the Proposed Action.*

RP7. Public Access

Intent: To ensure the right of public access.

Policy: The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Guam recreation areas, parks, scenic overlooks, designated conservation areas and their public lands. Agreements shall be encouraged with the owners of private and federal property for the provision of releasable access to and use of resources of public nature located on such land.

Discussion: *This project is not located on or near public access areas and it will not affect access to public areas. Policy RP 7 does not apply to the Proposed Action.*

RP8. Agricultural Lands

Intent: To stop urban types of development on agricultural land.

Policy: Critical agricultural land shall be preserved and maintained for agricultural use.

Discussion: *The project does not involve urban development on agricultural land and will not preclude surrounding properties from being used for agricultural purposes in the future. Policy RP 8 does not apply to the Proposed Action.*

WORK PLAN

Implementation of Watershed Restoration Projects in the Manell-Geus Watershed in Guam

**NOAA/ National Marine Fisheries Service
Pacific Islands Regional Office,
Habitat Conservation Division**

Prepared for:

National Oceanic and Atmospheric Administration,
National Marine Fisheries Service,
Pacific Islands Regional Office,
Habitat Conservation Division

Prepared by:

EA Engineering, Science, and Technology, Inc., PBC

February 2016

EA Engineering, Science, and Technology, Inc., PBC

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WORK PLAN

Implementation of Watershed Restoration Projects in the Manell-Geus Watershed in Guam NOAA / National Marine Fisheries Service Pacific Islands Regional Office, Habitat Conservation Division

February 2016

Prepared for:

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Contract Number: WC133F-11-CQ-0004

EA Project No. 62543.07

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Acronyms and Abbreviations

CLTC	Chamorro Land Trust Commission
CZMA	Coastal Zone Management Act
EA	EA Engineering, Science, and Technology, Inc., PBC
ESA	Endangered Species Act
GHPO	Guam Historic Preservation Office
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
PIRO	Pacific Islands Regional Office
PM	Project Manager
POC	Point of Contact
SHSO	Site Health and Safety Officer
WP	Work Plan

1.0 INTRODUCTION

This Work Plan (WP) presents the approach, rationale, and field procedures for the Implementation of Watershed Restoration Projects in the Manell-Geus Watershed in Southern Guam (Figure 1). The WP presents the technical and quality aspects of the project's field and reporting activities.

The overall objective of implementing watershed restoration projects in the Manell-Geus Watershed is to stabilize stream banks and create riparian buffers with the intent of reducing sediment loads entering downstream coastal waters. This project will utilize watershed assessment and design plans developed through previous watershed restoration projects and implement two types of erosion control projects to reduce sediment loads in the Manell-Geus Watershed, as follows:

- 1.) streambank stabilization using vegetative methods, natural fibers, or other appropriate methods as approved;
- 2.) riparian buffer strips using vegetative methods and/or natural fibers or other appropriate methods.

The goals of this project are to:

- 1.) reduce sediments entering the streams and,
- 2.) test lower cost, low maintenance erosion control options that can be used in other locations as funding becomes available.

Ideally, the projects will include installation and maintenance tasks that could be completed by community volunteers and coordinated by government or non-government organizations.

This project includes implementation of watershed restoration at six (6) sites in the Manell Watershed.

1.1 Project Key Elements

The intent of this project is to implement restoration actions to stabilize streambanks and create riparian buffers in the Manell watershed in Southern Guam. This project is funded by the Coral Reef Conservation Program and contracted under the National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS) Pacific Islands Regional Office (PIRO), and is comprised of the following key components.

- Notifications and Permits
- Mobilization and Setup
- Preparatory Activities

- Field Activities and Design Implementation
- Monitoring and Maintenance
- Demobilization

The details of these project components are discussed in Section 3.0 (Methods and Procedures) of this WP.

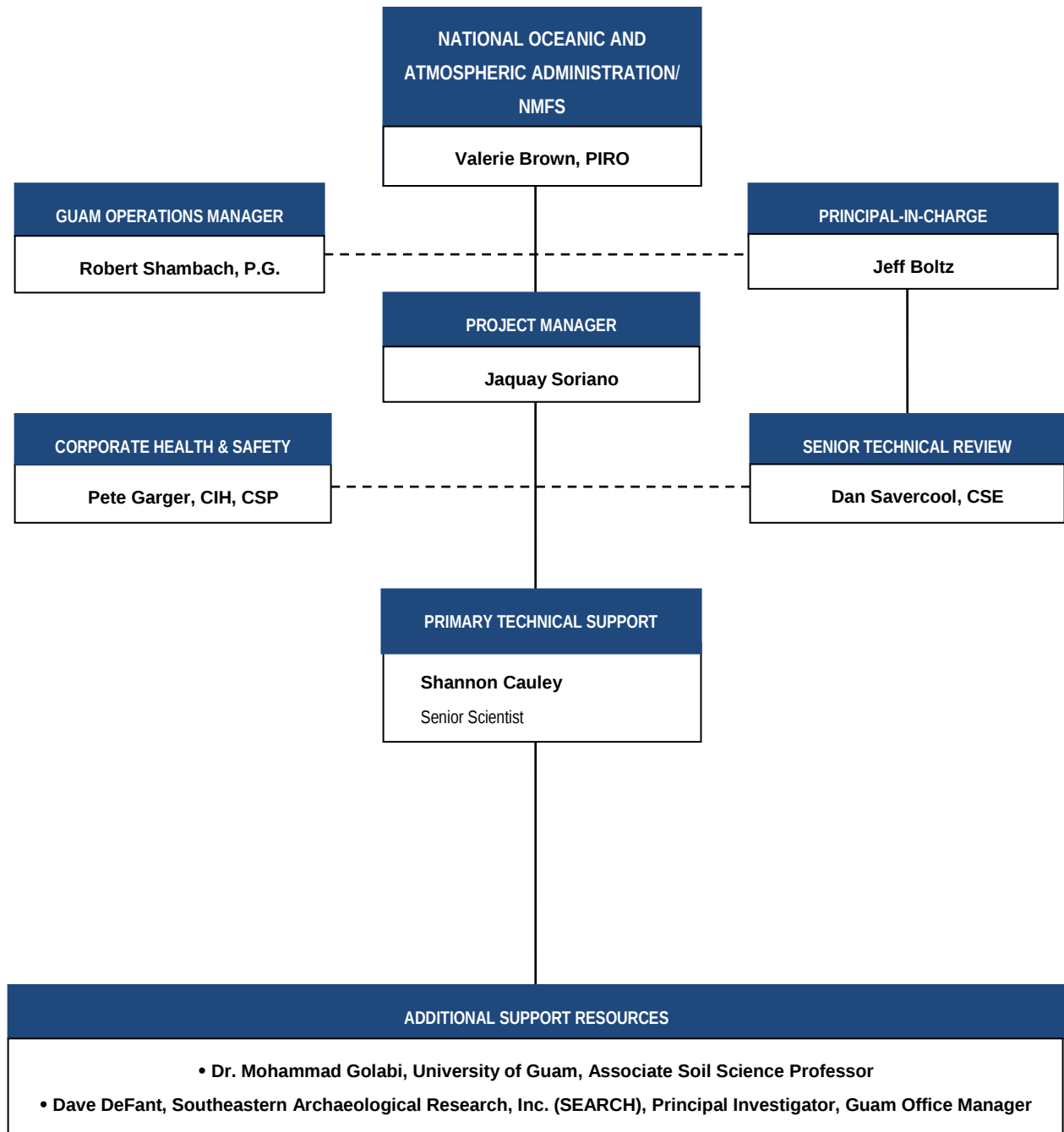
1.2 Project Organization

The project organizational chart (Table 1) presents the list of project personnel and their responsibilities related to the implementation of field activities described in this WP.

1.3 Schedule

The project schedule is included in Appendix A.

Table 1. Project Organizational Chart



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2.0 BACKGROUND INFORMATION

The following section presents background information including a description of the site and the physical setting.

2.1 Watershed Description

2.1.1 Manell Watershed Project Area

The Manell watershed is located in southern Guam in the Village of Merizo (Figure 1). The headwaters of the watershed are located on Government of Guam property while most of the areas transitioning into the coastal plain are privately owned. The Geus River flows to the south approximately 0.5 miles to the west of the project sites and the Manell River flows to the south and southwest approximately 0.5 miles to the east of the sites. An unnamed tributary to the Achang River flows northwest to southeast adjacent to the eastern boundary of the project sites and an unnamed ephemeral drainage directs flows to the southeast towards Achang Bay within the project area. The highest elevation in the watershed is in its northern area and is approximately 1,122 feet above mean sea level. The watershed is characterized primarily by savannah habitat with limited forested habitat occurring in association with ravines and drainages. The watershed is sparsely developed mostly in flat lying areas adjacent to the coast.

The dominant soil mapping unit in the watershed in proximity to the project area includes the Akina-Agfayan association. The Akina series is characterized by very deep, well drained and moderately slowly permeable soils that developed on volcanic uplands in residuum derived from tuff and tuff breccia (USDA 1988). The Agfayan series consists of very shallow to shallow, well drained and moderately slowly permeable soils that developed on volcanic uplands in residuum derived from marine deposited tuff, tuff breccia and tuffaceous sandstone. The soil overlies strongly weathered tuff (USDA 1988).

2.2 Project Area Description

The watershed restoration project area consists of six (6) individual project sites located in the western section of the Manell watershed (Figure 1). The combined area encompassing the project sites includes approximately 3,600 square feet of undeveloped and unoccupied land characterized primarily by grasses associated with savanna habitat that has been modified by recent planting of acacia (*Acacia auriculiformis*) by the Guam Department of Agriculture, Forestry division. There are no existing structures or above ground utilities in close proximity to the Manell project sites. The project sites are accessed through a private land owner's property that borders the main access road. Access onto the Manell sites to perform the survey and implement the watershed restoration demonstration projects was granted by the private landowner. The historical and existing land use at the Manell watershed project sites is unimproved land.

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3.0 FIELD METHODS AND PROCEDURES

The following section describes the methods and procedures to be used during the field implementation activities.

3.1 Notifications and Permits

Prior to field activities, EA will coordinate with applicable review agencies and secure needed clearance and permits for the project.

EA will provide data to the PIRO Point of Contact (POC) at NOAA as necessary to meet commitments stipulated under the National Environmental Policy Act (NEPA), Magnuson-Stevens Act, and Endangered Species Act (ESA) reviews, including cultural resources investigation of project area and sediment sources. EA will indicate in the preliminary Restoration and Planting Plan drawings any areas of culture resources that will be avoided.

EA will identify all governing codes, regulations, and required permits applicable to the project and shall ensure the preliminary Restoration and Planting Plans conform to all applicable federal, Territory of Guam, and local codes, and shall identify and resolve, where necessary, conflicts among federal, territorial, and local codes and ordinances.

The following notifications and permitting may be required for project execution:

- Formal consultation under Section 7 of the Endangered Species Act of 1973;
- Formal consultation under Section 106 of the National Historic Preservation Act;
- Coastal Zone Management Act (CZMA) consistency.

These items will be coordinated with the PIRO POC as necessary. Additional permits, or notification requirements, if any, will be coordinated with the PIRO POC prior to commencing fieldwork.

3.2 Mobilization and Setup

Upon acceptance of the final WP, permitting/notifications, and receipt of notice to proceed for field work from the POC, personnel and equipment will be mobilized for site work. The work will be conducted in accordance with applicable federal, state, and local laws and regulations, utilizing personnel as identified in the organizational chart.

Equipment

No heavy equipment will be required for this project. The mobilization of the following equipment to the project site is anticipated:

- Hand tools, such as shovels, picks, spades, machetes, etc.
- Portable plant auger

3.3 Preparatory Activities and Restoration and Planting Plan Development

3.3.1 Vegetation Clearing

All six of the proposed watershed restoration sites are currently accessible without the need for vegetation clearing. An existing two track and foot trails provide access to the sites. Minor vegetation clearing might be necessary to provide access to the sites over the extent of the project, but the need for any clearing would be expected to be minimal. Natural vegetation growth occurs rapidly on Guam; therefore no vegetation restoration will be performed within the foot trail areas. Disturbed areas within the foot trails will be left to revegetate naturally. Removal of unwanted invasive plant species might be required prior to planting activities. Unwanted plants may be mechanically and/or chemically (herbicide) removed or treated.

3.3.2 Survey

Six sites have been identified for restoration and planting. A site survey of the six restoration sites will be completed using a handheld global positioning system instrument. Coordinates will be recorded for the site locations, and field data will be collected for each of the six sites. These data will include measurements of study site slopes, dimensions of study sites, proximity to drainages and streams, visual evaluation of canopy cover and root density or ground cover, and presence of topsoil. Notable geologic features, the composition of existing vegetation, and the presence of invasive species will also recorded for the sites.

3.3.3 Restoration and Planting Plan Development

A Preliminary Restoration and Planting Plan Report for the six identified sites will be prepared and submitted to the PIRO POC for review and comment. The report will contain the following, at a minimum:

1. Recommended project features (i.e. dimensions and placement of plantings, specific methods to be used, etc.);
2. Detailed map indicating the limits of the project implementation areas;
3. Preliminary restoration and planting plan drawings;
4. Results of data analysis review;
5. Planting schedule; and,
6. Results of supplemental investigations/analyses.

EA will arrange and lead a meeting with representatives of NOAA and other project participants as determined by the PIRO POC to discuss the preliminary Restoration and Planting Plans. EA will take notes and produce minutes of the meeting.

EA will incorporate government comments into the Preliminary Restoration and Planting Plan Report, Preliminary Drawings and Specifications and Cultural Resources Report and resubmit the report for review.

EA will incorporate all additional government comments into the report and will prepare the Final Restoration and Planting Plan Report, Drawings and Specifications, and Cultural Resources Report.

3.4 Field Activities and Design Implementation

3.4.1 Project Sites

Restoration and planting activities at the six identified sites will include vetiver (*Chrysopogon zizanioides*) filter strip installation and a combination of riparian and understory enhancements as detailed in the Restoration and Planting Plan.

3.4.2 Species to Implement

A variety of native and one non-native plant species have been selected for planting in the restoration sites due to their ability to stabilize soils as a result of quickly growing, extensive root systems.

Table 2 provides a summary of species and planting locations in the six Manell project sites:

Table 2. Proposed Plant Species List and Planting Locations

Scientific Name	Common or Chamorro Name	Planting Site Locations
Woody shrubs		
<i>Glochidion marianum</i>	Abas duendes	1 & 3
<i>Hibiscus tiliaceus</i>	Pago	3, 4, 5, & 6
<i>Morinda citrifolia</i>	Lada or Noni	3, 4, 5, & 6
Ferns		
<i>Nephrolepis hirsutula</i>	Scaly Sword Fern	3, 4, 5, & 6-
<i>Polypodium scolopendrium</i>	Monarch Fern	4, 5, & 6
Grass		
<i>Chrysopogon zizanioides</i>	Vetiver grass	1, 3, 4, 5, & 6
Trees		
<i>Artocarpus altilis</i>	Lemai	4, 5, & 6
<i>Artocarpus mariannensis</i>	Dukduk	4 & 6
<i>Cocos nucifera</i>	Coconut (3 year), Niyok	3, 4, 5, & 6
<i>Pandanus dubius</i>	Pahong	3, 4, 5, & 6
<i>Pandanus tectorius</i>	Kafu	3, 4, 5, & 6
Optional Plant Species		
<i>Melanolepis multiglandulosa</i>	Alom	1, 3, & 6
<i>Cerbera dilatata</i>	Chi'ute	3, 4, 5, & 6
<i>Mammea odorata</i>	Chopak	4 & 6
<i>Rhynchospora rubra</i>	Red sedge	2 (Seeds)
<i>Scleria polycarpa</i>	Nutrush	2 (Seeds)

3.4.3 Planting Methods

The plant species mix represents a combination of woody, herbaceous, and canopy tree species. They are intended to be implemented as container-grown stock of at least 1-gallon size and as live stakes, as shown in the Restoration and Planting Plan. The following sections provide general descriptions of the planting methods. Detailed spacing, installation notes, and planting schedules will be included in the Restoration and Planting Plan.

3.4.3.1 Container-Grown Stock

Container-grown stock should be well-tended, non-root-bound stock, installed in prepared holes with the root ball opened and expanded through careful work by hand. For each plant, a hole will be dug at least 50% wider than the container. If root-bound plants are encountered, the root system will be slitted and flared out over the planting hole, and roots will be pruned before planting. If more than 20% of the root system is cut off, the same amount of leaf area will be removed (proportionately). Root balls will be planted level to, or just below the natural ground level. Each hole will be backfilled with soil and packed well to remove air pockets (NRCS, 2010).

3.4.3.2 Dibble Tube Slips

Vetiver grass may be installed using dibble tube slips. This will involve use of a nursery spade or other tool to dig a shallow trench. Each vetiver slip will be placed in the trench at the same depth as grown in the container. Each trench will be backfilled with soil and packed well to remove air pockets (NRCS, 2010). Slips will be placed at 4-inch spacing and then heeled-in carefully by field personnel.

3.4.3.3 Live Stakes

Live stakes are freshly cut branches typically between one quarter and three quarters of an inch in diameter. They are installed with the bud end up, and bottom cut at an angle to facilitate being driven into the ground. They are best installed in a dormant phase into moist soils. Live staking is only successful in some species without the aid of rooting hormones, or through the use of other means which preclude them from being used easily in the field. Pago (*Hibiscus tiliaceous*) is a species which is easily live staked and has been selected for these projects. If needed for plant establishment, soil amendments (e.g., lime, fertilizer, compost) will be applied, if applicable.

3.4.4 Protection of Installed Vegetation

Plantings will be protected from weeds and animals or other organisms as necessary to ensure suitable plant establishment. Applying organic mulch around trees or shrubs may help to conserve moisture and control weeds. Individual tree protection or fencing of the entire test plot may be utilized as determined necessary in the field to best protect the plantings. This may vary based on individual site conditions and the size of test plots.

3.5 Monitoring and Maintenance

Following successful installation of plantings and installation of fencing and tree protection (if applicable), and within the first month after installation, the plantings will be inspected for proper establishment. Any damage, distress, insect infestations, or disease will be recorded.

The ultimate survivability of test plots will be measured approximately one year following installation by NOAA and/or volunteers. A count of living stock will be performed and compared to as-built recorded installation counts.

Periodic maintenance of new plantings will include the removal of unwanted vegetation and debris which could inhibit planted species growth. Watering will occur if unexpected dry weather is encountered; otherwise, the rainy season should be sufficient for watering of new plant stock. If reduced plant growth is observed, a periodic application of fertilizer may be warranted to expedite plant establishment.

3.6 Demobilization

After completing the planned field activities, the equipment and supplies used will be demobilized from the project site. The temporary fencing barriers will also be removed from the project site following the successful revegetation of the project sites, which may occur following the monitoring period.

4.0 ENVIRONMENTAL PROTECTION PLAN

The following sections describe the environmental protective measures that will be used to control and correct conditions that may develop at the project site during fieldwork associated with this project. Protective measures for this project will include erosion and sediment controls and work practices that minimize damage to site features and adjacent vegetation. It is expected that archaeological and cultural resources will not be encountered.

4.1 Archaeological and Cultural Resources Preservation

EA has teamed with Southeastern Archaeological Research, Inc., (SEARCH) to perform the archaeological survey/investigations in compliance with the requirements of Guam Title 21 GCA Chapter 76; Guam Executive Orders 89-9 and 89-24; and Section 106 of the U.S. National Historic Preservation Act of 1966.

Prior to initiating field activities, SEARCH will consult with the Guam Historic Preservation Office (GHPO) regarding survey scope and methods and will prepare a detailed Draft Archaeological Research Design for review by the GHPO. A Final Archaeological Research Design will be prepared based on GHPO comments. Field activities will include execution of systematic pedestrian transects throughout each of the six project sites and along access trails leading to plots. Shovel test excavations will be completed at identified prehistoric sites and at select non-site areas within each of the six project sites. Identified archaeological sites and features will be recorded. Any identified artifacts will be properly recovered. Identified site types and associations will be assessed and evaluated for significance. An end of Fieldwork Letter Report and Draft and Final Reports including background research, survey results, site significance evaluations, and recommendations for additional work (if needed) will be prepared.

Project personnel will be briefed on recognition and reporting of archaeological features. If any archaeological resources are encountered, measures will be taken to carefully preserve and immediately report these findings to the NOAA POC. If archaeological resources such as artifacts (e.g., stone tools), features (e.g., stone walls), deposits (e.g., sea shells and charcoal-stained soil), human bones, and other cultural remains are encountered, that portion of the work will immediately cease, and the NOAA POC will be immediately notified. An archaeologist (or designee) and/or the NOAA POC may stop work to allow investigators to inspect the area and to protect the artifacts. The perimeter of the find, as determined by the archaeologists, will immediately be delineated with caution tape to restrict access to the area of the find. No intrusive work will proceed without consultation with the archaeologist (or designee).

4.2 Erosion and Sediment Control

Temporary and permanent erosion and sediment control best management practices will be constructed and/or installed to divert stormwater from exposed areas and prevent migration of sediment offsite, if necessary. The project site will be minimally impacted by use of hand tools and a plant auger. The potential for increased offsite stormwater drainage from the project sites is anticipated to be minimal.

Erosion and sediment controls may include:

- Installation of vegetation (sedimentation) barriers where needed, depending on site drainage;
- Use of mulching on areas that will be exposed for extended periods (i.e., longer than 10 days), and;
- Installation of sediment socks (mulch or coir fiber-filled photodegradable textile socks).

During maintenance activities, disturbed areas and sediment controls will be inspected to ensure the controls are in place and adequately functioning. If sediment inspections indicate that a control is not functioning properly, the control will be replaced or modified promptly.

4.3 Dust Emission Control

Dust emission control measures will be implemented when deemed necessary during field activities. The field activities will take place during the rainy season, and no dust emissions are anticipated during the duration of the project implementation activities. If dust controls are deemed necessary, the soil will be sprayed with water.

5.0 FIELD DOCUMENTATION

5.1 Field Notes

This section discusses recordkeeping in the field, which will include the use of field logbooks and photographs.

5.1.1 Field Logbooks

Field logbooks will document dates, plant species planted, field planting procedures, and names of field personnel responsible for conducting the implementation activities. Logbook entries will also include descriptions of the field activities. Logbooks will be bound with consecutively numbered pages. Each page will be dated and the time of entry will be noted in military time. All entries will be legible, written in ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions.

5.1.2 Photographs

Photographs will be taken to document field activities.

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6.0 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to planting as presented in this plan. When appropriate, the NOAA POC will be notified and a verbal approval will be obtained before implementing the changes.

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7.0 FIELD HEALTH AND SAFETY PROCEDURES

A Corporate Safety and Health Program Manual and a Site-Specific Addendum for the Manell-Geus Watershed have been prepared to minimize the threat of serious injury to workers engaged in field activities while performing site work. The Corporate Safety and Health Program Manual and the Site Specific Addendum are presented in Appendix B.

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8.0 REFERENCES

United States Department of Agriculture (USDA), 1988. *Soil Survey of Territory of Guam*. United States Department of Agriculture, Natural Resources Conservation Service (formerly Soil Conservation Service) in cooperation with the Guam Department of Commerce and the University of Guam.

Natural Resources Conservation Services (NRCS), 2010. *Plant Establishment Procedures*, PI Vegetative Technical Note No. 7.

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Figures

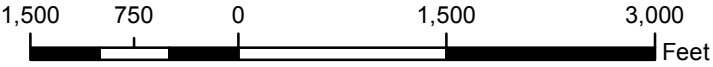
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COORDINATE/REFERENCE: WGS_1984_UTM_Zone_55N

Legend

-  Area of Investigation
-  Rivers in Watershed
-  Rivers in Sub-watershed
-  Watershed Boundary
-  Streets



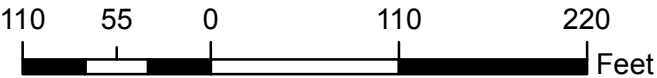
EA Engineering, Science, and Technology, Inc.,PBC 1001 Army Drive, Suite 103, Barrigada, 96913-1402 Telephone: (671) 646-5231 Facsimile: (671) 646-5230 		Implementation of Watershed Restoration Projects in the Manell-Geus Watershed In Guam NOAA/ NMFS- Contract No. WC133F-11-CQ-0004	
Drawing No. NOAA_Manell-Geus Watershed_Fig 1_Vicinity Map		Date: 02/15/16	Drawn By: JSoriano
		Figure 1 Vicinity Map	
		EA Project No.62543.07	

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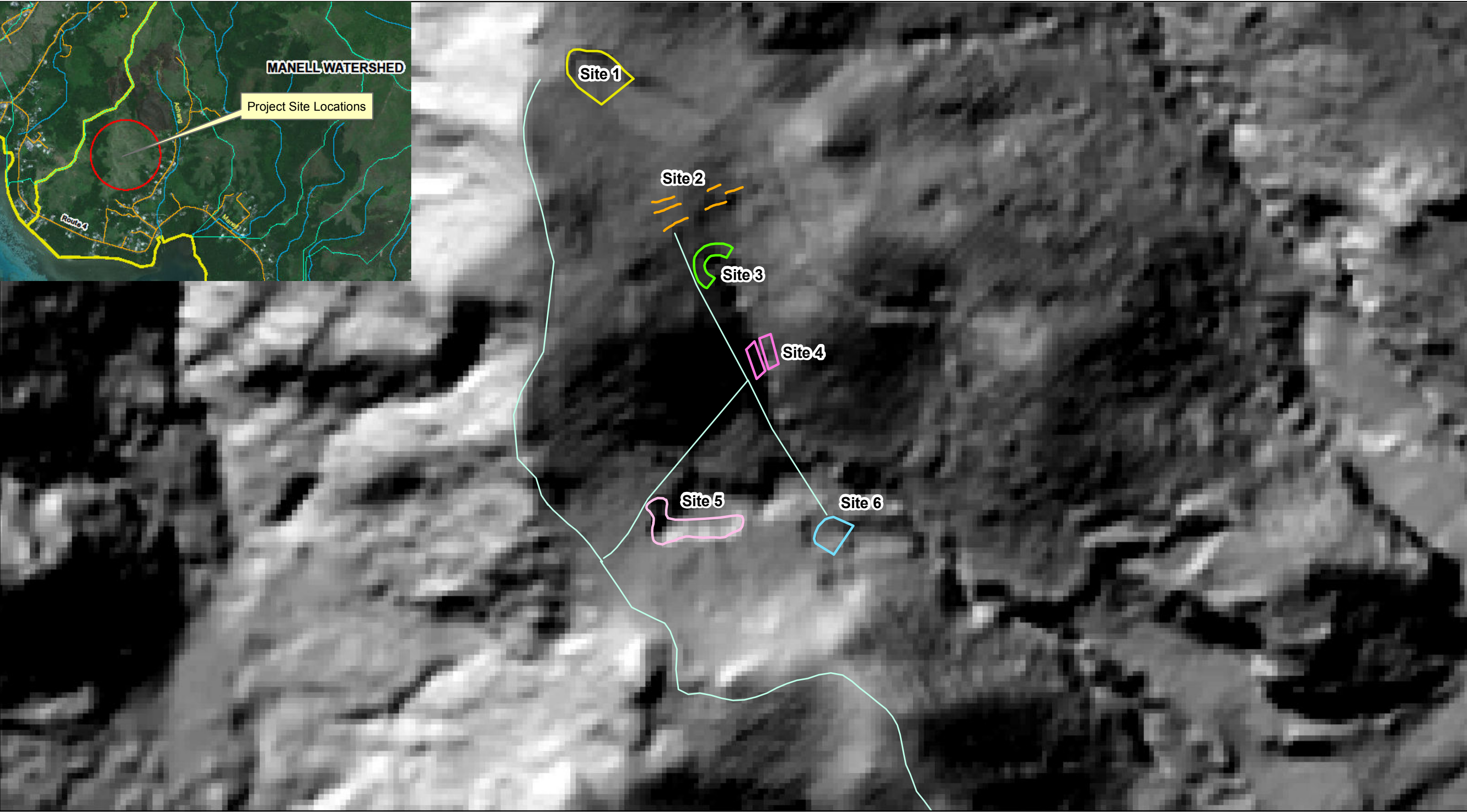
Legend

- Site 1 Location
- Site 2 Location
- Site 3 Location
- Site 4 Location
- Site 5 Location
- Site 6 Location
- Pathway_Route



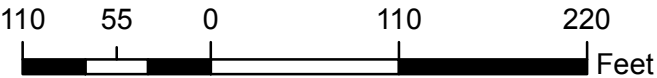
EA Engineering, Science, and Technology, Inc., PBC 1001 Army Drive, Suite 103, Barrigada, 96913-1402 Telephone: (671) 646-5231 Facsimile: (671) 646-5230 		Implementation of Watershed Restoration Projects in the Manell-Geus Watershed In Guam NOAA/ NMFS- Contract No. WC133F-11-CQ-0004 Figure 2 Manell Watershed Site Locations		
Drawing No. NOAA_Manell-Geus Watershed_ Fig 2 Manell WatershedSite Locations		Date: 02/15/16	Drawn By: JSoriano	EA Project No.62543.07

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Legend

- Site 1 Location
- Site 2 Location
- Site 3 Location
- Site 4 Location
- Site 5 Location
- Site 6 Location
- Pathway_Route



EA Engineering, Science, and Technology, Inc., PBC 1001 Army Drive, Suite 103, Barrigada, 96913-1402 Telephone: (671) 646-5231 Facsimile: (671) 646-5230 		Implementation of Watershed Restoration Projects in the Manell-Geus Watershed In Guam NOAA/ NMFS- Contract No. WC133F-11-CQ-0004		
		Figure 3 Manell Watershed Site Location – LIDAR Map		
Drawing No. NOAA_Manell-Geus Watershed_ Fig 3 Manell WatershedSite Location_LIDAR Map		Date: 02/15/16	Drawn By: JSoriano	EA Project No.62543.07

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Appendix A

Project Schedule

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Appendix B

Corporate Safety and Health Program Manual

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Site-Specific Addendum to Corporate Safety and Health Program Manual for the Manell-Geus Watersheds

Client: National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS), Pacific Islands Habitat Conservation Division

Project Name/Number: Implementation of Watershed Restoration Projects in the Manell-Geus Watersheds in Southern Guam – EA Project No.62543.07

Site Location:

The Manell watershed is located in southern Guam in the Village of Merizo. The headwaters of the watershed are located on Government of Guam property while most of the areas transitioning into the coastal plain are privately owned. The Geus River flows to the south approximately 0.5 miles to the west of the project sites and the Manell River flows to the south and southwest approximately 0.5 miles to the east of the sites. An unnamed tributary to the Achang River flows northwest to southeast adjacent to the eastern boundary of the project sites and an unnamed ephemeral drainage directs flows to the southeast towards Achang Bay within the project area. The highest elevation in the watershed is in its northern area and is approximately 1,122 feet above mean sea level.

Work Description:

The overall objective of implementing watershed restoration projects in the Manell-Geus Watershed is to stabilize stream banks and create riparian buffers with the intent of reducing sediment loads entering downstream coastal waters. This project will utilize watershed assessment and design plans developed through previous watershed restoration projects and implement two types of erosion control projects to reduce sediment loads in the Manell-Geus Watershed, as follows:

- 1.) streambank stabilization using vegetative methods, natural fibers, or other appropriate methods as approved;
- 2.) riparian buffer strips using vegetative methods and/or natural fibers or other appropriate methods.

The goals of this project are to:

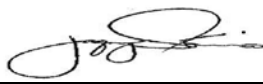
- 1.) reduce sediments entering the streams and,
- 2.) test lower cost, low maintenance erosion control options that can be used in other locations as funding becomes available.

Field activities will include hiking up the Manell watershed project area and implementing streambank stabilization practices and riparian buffers strips by using vegetative methods and with the use of other best management practices in conjunction with vegetation.

APPROVALS:

Program Safety and Health Officer:  February 14, 2016

Pete Garger Date

Project Manager:  February 14, 2016

Jaquay Soriano Date

EMERGENCY CONTACT INFORMATION:

Contacts	Name	Phone Number(s), Work / Cell
Project Manager	Jaquay Soriano	671-646-5231 / 671-483-2930
Program Safety and Health Officer	Peter Garger	410-527-2425 / 410-790-6338
Site Safety and Health Officer	Jaquay Soriano	671-646-5231 / 671-483-2930
Client Contact – NOAA/NMFS Pacific Islands Regional Office	Valerie Brown	671-646-1904
Coral Management Liaison and Coastal Specialist, NOAA Office of Ocean and Coastal Resource Management	Adrienne Loerzel	671-300-8586
EA Medical Services	Health Resources	800-350-4511
Guam Memorial Hospital	- - -	671-647-2555
POLICE/FIRE/AMBULANCE	911	911

NEAREST EMERGENCY ROOM:

Guam Memorial Hospital Authority
850 Gov. Carlos G. Camacho Rd.
Oka, Tamuning, Guam 96913-3128
Tel: 671-647-2555

See Figure 1: Hospital Map

MEDICAL EMERGENCIES

Personnel will be alert for signs and symptoms of illnesses related to chemical, physical, and disease factors onsite. Severe injuries resulting from accidents will be recognized as emergencies and treated as such. At least one person currently trained in first aid/CPR will be present onsite.

Personnel currently trained in first aid will evaluate the nature of the injury and initiate first aid assistance immediately. First aid will be administered to limit further injury and stabilize the victim. The local Emergency Medical Services will be notified immediately if needed. Personnel will not transport victims to emergency medical facilities unless the injury does not pose immediate threat to life and transport to the emergency medical facility can be accomplished without the risk of further injury. First aid equipment will be available onsite as well as in company vehicles.

The Field Team Leader will complete an Accident /Loss Report (Appendix B-4) and submit it to the Project Manager within 24 hours of the following types of incidents:

- Job-related injuries and illnesses
- Accidents resulting in loss or damage to property
- Accidents involving vehicles and/or vessels, whether or not they result in damage to property or personnel
- Accidents in which there may have been no injury or property damage but have a high probability of recurring with at least a moderate risk to personnel or property

An accident that results in a fatality or the hospitalization of three or more employees will be reported within 8 hours to the U.S. Department of Labor through the Project Manager.

Subcontractors are responsible for their required reporting to the U.S. Department of Labor.

HAZARDS OF CONCERN: Check as many as are applicable.

☒ Heat Stress	☐ Reactive	☐ Oxygen Deficient	☒ Insect Bite
☐ Cold Stress	☐ Noise	☐ Corrosive	☒ Snake Bite
☐ Explosion/Flammable	☐ Inorganic	☐ Toxic	☐ Excavations
☒ Biological	☐ Organic	☐ Inert	☐ Vegetation
☐ Radiological	☐ Utilities	☐ Excavations	☐ Electrical
☐ Volatile	☒ Lifting	☒ General Physical	
☐ Confined Space (see Section 9 of GHASP)			
☐ Other, specify:			

CONTROLS OR PROTECTIVE MEASURES: Check as many as are applicable.

☒ Pre-entry Briefing/Safety Meetings	☒ PPE	☒ Site control
☐ Operator Training		
☒ Permits _____		
☐ Engineering Controls _____		
☐ Work Practices _____		
☐ Other _____		

EXPOSURE PATHWAYS: ☐ Inhalation ☐ Ingestion ☐ Dermal ☐ Injection

POTENTIALLY IMPACTED MEDIA:

☐ Air ☐ Soil (dust) ☐ Surface Water ☐ Sediment ☐ Groundwater ☐ Other

FIRE/EXPLOSION POTENTIAL: ☐ High ☐ Medium ☒ Low

SURROUNDING POPULATION: ☐ Residential ☐ Industrial ☒ Rural ☐ Urban

OVERALL HAZARD EVALUATION: ☐ High ☐ Medium ☒ Low ☐ Unknown

JUSTIFICATION (brief narrative of how work activities may encounter hazards and their controls, include known or anticipated contaminant concentrations):

Refer to the Activity Hazard Analysis (AHA).

PROTECTIVE EQUIPMENT: Protective equipment should be specified by the type of task and site (e.g., soil boring and sampling at landfill). Indicate type and/or material, as necessary. Use additional pages as necessary.

Primary

TASKS: Vegetative planting and implementing BMPs

INITIAL PPE LEVEL: A - B - C - (D) - Modified (Circle applicable)

UPGRADE CRITERIA: _____

Respiratory: (X) Not needed

() SCBA, Airline: _____

() APR: _____

() Cartridge: _____

() Escape Mask: _____

() Other: _____

Head and Eye: () Not needed

(X) Safety Glasses: _____

() Face Shield: _____

() Goggles: _____

() Hard Hat: _____

() Overgloves: _____

() Hearing Protection: _____

Protective Clothing: () Not Needed

() Encapsulating Suit: _____

() Splash Suit: _____

() Apron: _____

() Tyvek Coverall

() Saranex Coverall

() Coverall: _____

(X) Other: Long sleeve-shirt and pants

Gloves: () Not needed

() Undergloves: _____

() Gloves: Nitrile

(X) Other: Specify below Work gloves

Boots: () Not Needed

Boots: hiking boots

Overboots: none needed

ACTIVITY HAZARD ANALYSIS

Principal Step	Potential Hazards	Recommended Controls	
Hiking along riverbanks, streams, and slopes	Slips, trips and falls	- Be cautious when walking on unstable, uneven and slippery terrain. - Walk slowly and obtain sure footing when necessary.	
	Heat	Protocol will include proper clothing, hydration, monitoring, and corrective action.	
	Biological	- Exercise caution in unknown areas. - As needed, apply insect spray containing DEET. - Wear clothing in such a way as to restrict access by insects (e.g., mosquitoes, bees and spiders)	
	Severe weather	Where there are warnings or indications of impending severe weather, conditions will be monitored and appropriate action taken.	
Equipment – Hand Tools and Battery Operated Drill	Hand and Foot Injuries	- Read Manufacturer's Manual. - Use caution before and during drill operations.	
Mobilization and Demobilization of equipment and supplies	Heavy lifting	- Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. - Get assistance with moving object that may be awkward or heavier than 75 pounds	
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
- PPE - Eye wash - First aid kit		- Long pants, long sleeve shirt and ankle high boots, safety glasses, and a hat to protect from sun exposure. - Eyewash – daily - First aid kit – daily	- Proper use of PPE and its limitations - Proper use of eyewash

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Appendix B-1

Site Health and Safety Plan Signature Form

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SITE HEALTH AND SAFETY PLAN SIGNATURE FORM

SITE NAME/NUMBER: Manell Watershed / Project No. 62543.07

LOCATION: Manell Watershed

I have read, understood, and agreed to comply with the provisions of the above-referenced Site-Specific Addendum to the Corporate Health and Safety Program Manual and the Corporate Health and Safety Program Manual (CHASP) for work activities on this site.

PRINTED

NAME

SIGNATURE

COMPANY

DATE _____

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

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Appendix B-2

Tailgate Safety Meeting Form

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TAILGATE SAFETY MEETING FORM

EA Engineering Project Number: 62543.07

Client: NOAA / NATIONAL Marine Fisheries Service (NMFS), Pacific Islands Regional Office
Work Title: Manell and Geus Watersheds

Work Site: Merizo, Guam.

Scope of Work: Hiking and implementing Best Management Practices (BMP) to stabilize stream bank and create riparian buffers in the Manell Watershed in Guam

Personal Protective Equipment: Safety glasses, long-sleeve shirt, pants, hiking boots.

Potential Chemical Hazard: Not anticipated.

Potential Physical Hazards: For complete listing, please see Activity Hazard Analysis

Emergency Contacts: **Fire, Police, and Ambulance: 911**
Guam Memorial Hospital Emergency Nos.: 671-647-2555

Site Safety and Health Officer: Jaquay Soriano (EA) at **671-646-5231**, cell **671-483-2930**

Program Safety and Health Officer: Peter Garger (EA) at **410-527-2425**, cell **410-790-6338**

Guam Operations Manager: Bob Shambach (EA) at **671-646-5231**, cell **671-727-6094**

Project Manager: Jaquay Soriano (EA) at **671-646-5231**, cell **671-483-2930**

Daily Record

Date: _____

Time: _____

Tailgate Meeting Conducted By: _____

List of Attendees

List of Signatures

1.	
2.	
3.	
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Appendix B-3

Heat Exposure

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HEAT STRESS SYMPTOMS AND APPROPRIATE ACTIONS

	Description	How to Recognize	What To Do
Heat Rash			
	A skin irritation caused by excessive sweating during hot, humid weather. It can occur at any age but is most common in young children.	Looks like a red cluster of pimples or small blisters. It is more likely to occur on the neck and upper chest, in the groin, under the breasts, and in elbow creases.	Provide a cooler, less humid environment and keep the affected area dry. Dusting powder may be used to increase comfort, but avoid using ointments or creams, as they keep the skin warm and moist and may make the condition worse.
Heat Cramps			
	Usually affect people who sweat a lot during strenuous activity. This sweating depletes the body's salt and moisture. The low salt level in the muscles causes painful cramps. Heat cramps may also be a symptom of exhaustion.	Muscle pains or spasms -- usually in the abdomen, arms, or legs -- that may occur in association with strenuous activity. If you have heart problems or are on a low-sodium diet, get medical attention for heat cramps.	If medical attention is not necessary, take the following steps: - Stop all activity and sit quietly in cool place - Drink clear juice or a sports drink - Do not return to strenuous activity for a few hours after the cramps subside -- further exertion may lead to exhaustion or stroke Seek medical attention if the cramps do not subside in 1 hour.
Heat Exhaustion			
	A milder form of heat stress that can develop after several days of exposure to high temperatures and inadequate or unbalanced replacement of fluids. Those most prone to heat exhaustion are elderly people, people with high blood pressure, and people working or exercising in a hot environment.	- Heavy sweating - Paleness - Muscle cramps - Tiredness - Weakness - Dizziness - Headache - Nausea or vomiting - Fainting	Cooling measures that may be of help: - Cool, non-alcoholic beverages - Rest - Cool shower, bath, or sponge bath - An air-conditioned environment

HEAT STRESS SYMPTOMS AND APPROPRIATE ACTIONS

	Description	How to Recognize	What To Do
Heat Stroke			
	Occurs when the body is unable to regulate its temperature. The body's temperature rises rapidly, the sweating mechanisms fail, and the body is unable to cool down. Body temperature may rise to 106 degrees F or higher within 10-15 minutes. Heat stroke can cause death or permanent disability if emergency treatment is not provided.	Warning signs of heat stroke: - Extremely high body temp. - Red, hot, and dry skin - Rapid, strong pulse - Throbbing headache - Dizziness - Nausea - Confusion - Unconsciousness	Have someone call for immediate medical assistance if you see these signs. While you are waiting for the assistance, begin cooling the victim by: - Get victim to shady place - Cool victim rapidly with whatever methods you can (e.g. cool cloth, cool shower or water splashes) - Monitor body temperature and continue cooling efforts Sometimes a victim's muscles will begin to twitch uncontrollably. If this happens, keep the victim from injuring himself/herself, but do not place any objects in the mouth and do not give fluids. If vomiting occurs, make sure airway is open by turning victim on his or her side.
Sunburn			
	Should be avoided due to skin damage. Although discomfort is usually minor and healing often occurs within a week, a more severe sunburn may require medical attention.	Symptoms are well known: skin becomes red, painful, and abnormally warm after sun exposure.	Consult a physician if these symptoms are present: - Fever - Fluid-filled blisters - Severe pain Also, remember these tips: - Avoid repeated sun exposure - Apply cold compress or water - Do not break blisters

Appendix B-4

Accident/Loss &

“Near Miss” Incident Report

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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/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:	M:		F:
Marital Status:		Hourly Rate:			
Employee Number:		Date of Hire:			
Number of Dependents:					
Employee's Job Title:					
Department Regularly Employed by:					
Was the Employee Injured on the Job:		Yes:		No:	
Primary Language of the Employee					

B. ACCIDENT/INCIDENT INFORMATION

Date of Accident:		Time of Accident:	
Report 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(s) of the body affected (e.g., laceration, right hand, third finger)			

Object or Substance that Directly Injured the Employee:			
Number of Days or 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 or No):		If yes, status (Open/Closed):	
Was the Employee Assigned to Restricted Duty (Yes or No)?			

C. ACCIDENT INVESTIGATION INFORMATION (Yes or No)

Was Safety Equipment Provided?		If yes, was it used	
Was an Unsafe Act Being Performed?		If yes, describe:	
Was a Machine Part Involved?		If yes, describe:	
Was the Machine Part Defective?		If yes, in what way?	
Was a Third Party Responsible for the Accident/Incident?		If yes, list name, address, and phone number:	
Was the Accident/Incident Witnessed?		If yes, list name, full address, and phone number:	

D. PROVIDER INFORMATION

Was First Aid Given Onsite (Yes or No)/		If yes, what type of medical treatment was given	
Physician Information (if medical attention was administered)?		Name, full address, and phone number	
Hospital Address		Name, full address, and phone number:	
Was the Employee Hospitalized (Yes or No)?		If yes, on what date?	
Was the Employee Treated as an Out-Patient. Receive Emergency Treatment, or Ambulance Service (Yes or No)?			

Please attach the physician's written Return to Work slip.

NOTE: 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 Number			
EA Employee Vehicle Year, Make, and Model			
V.I.N.		Plate/Tag No.:	

Owner's Name and Address:			
Driver's Name and Address:		Driver's License No.:	
Relation to Insured:			
Describe Damage to Your Property:			
Describe Damage to Other Vehicle or Property:			

Other Driver's Name and Address:	
Other Driver's Phone No.:	
Other Driver's Insurance Company and Phone Number:	
Location of Other Vehicle:	
Name, Address, and Phone No. of Other Injured Parties:	

Witness 1 Name:		Phone No.:	
Address:			
Statement:			
Signature of Witness 1:			

Witness 2 Name:		Phone No.:	
Address:			
Statement:			
Signature of Witness 2:			

F. ACKNOWLEDGEMENT

Name of Supervisor:			
Report Prepared by:		Date Prepared:	

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

Signature of Injured Employee

Date

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

Please forward all bills/invoices/correspondence to:

**EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
225 Schilling Circle
HUNT VALLEY, MARYLAND 21031**

**ATTENTION: Michele Bailey
HUMAN RESOURCES**

**(410) 584-7000
(410) 771-1780 (FAX)**



“NEAR MISS” INCIDENT REPORT

A “near miss” is a potential hazard or incident that has not resulted in any personal injury or property damage. Unsafe working conditions, unsafe employee work habits, improper use of equipment, or use of malfunctioning equipment have the potential to cause work-related injuries. It is everyone’s responsibility to report and correct these potential accidents/incidents immediately.

Please complete this form as a means to report these “near miss” situations.

Department/Location _____ Date: _____ Time: _____ a.m. / p.m.

Please check all appropriate conditions:

_____ Unsafe act _____ Unsafe equipment _____ Other
_____ Unsafe condition _____ Unsafe use of equipment

Description of incident or potential hazard _____

Employee Signature _____ Date _____

“NEAR MISS” INVESTIGATION

Description of the “Near Miss” Condition _____

Causes (primary and contributing) _____

Corrective Action Taken (i.e., remove the hazard; replace, repair, or retrain in the proper procedures for the task) _____

Signed _____ Date Completed _____

Form not completed within 4 hours of incident for the following reason(s) _____

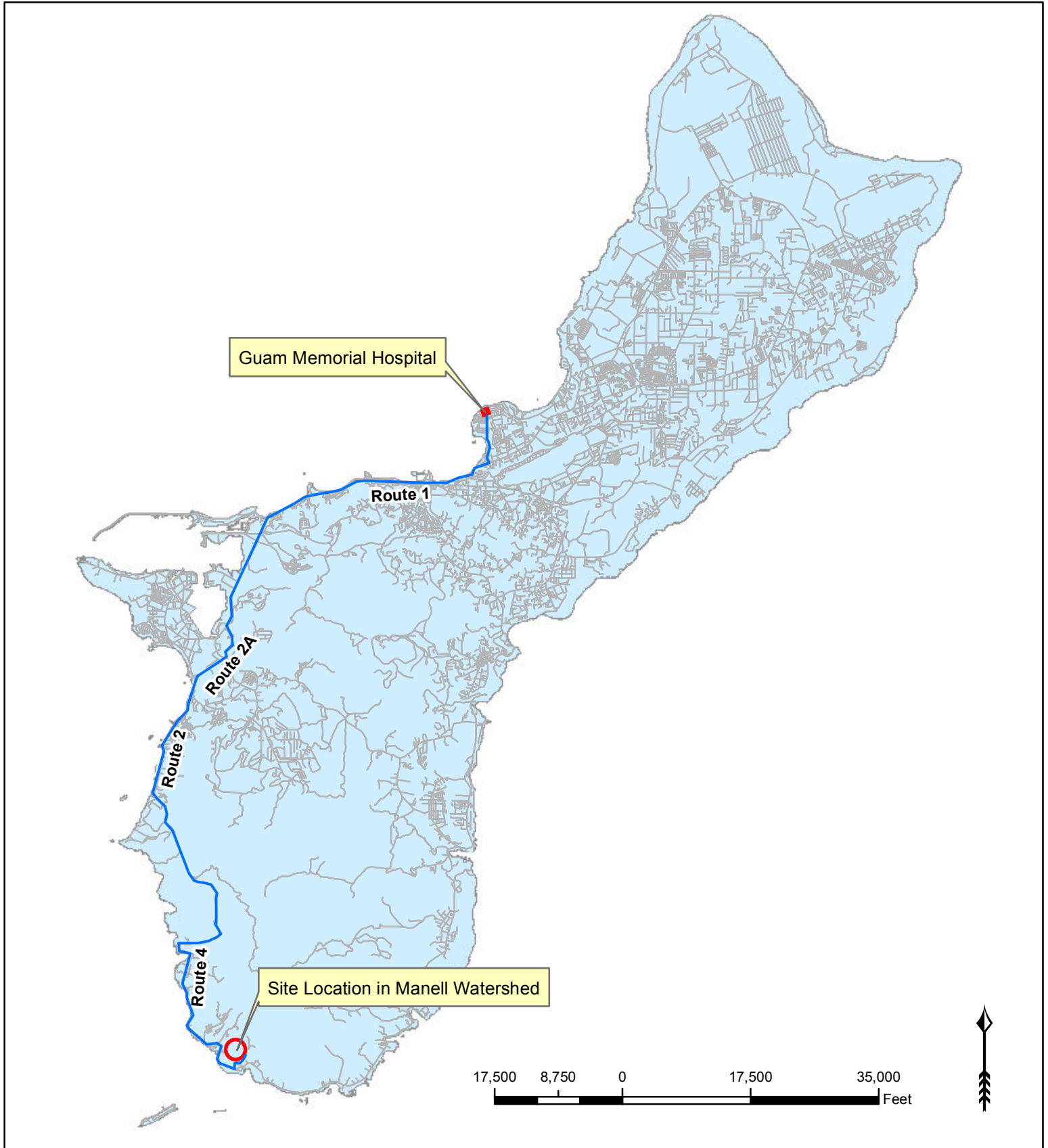
Corporate Director of Safety and Health _____ Date _____

*****Forward to Corporate Director of Safety and Health when completed.*****

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Figure

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COORDINATE/REFERENCE: WGS_1984_UTM_Zone_55N

Legend

-  Road
-  Guam_Shoreline
-  Route to the Hospital

EA Engineering, Science, and Technology, Inc., PBC
 1001 Army Drive, Suite 103,
 Barrigada, 96913-1402
 Telephone: (671) 646-5231
 Facsimile: (671) 646-5230



Implementation of Watershed Restoration
 Projects in the Manell-Geus Watershed
 In Guam
 NOAA/ NMFS- Contract No. WC133F-11-CQ-0004

Figure 1 Hospital Map

Drawing No. NOAA_Manell-Geus
 Watershed_Fig 1 Hospital Map

Date: 02/15/16

Drawn By: JSoriano

EA Project No. 62543.07

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EA Engineering, Science,
and Technology, Inc.

Corporate Safety and Health Program Manual



October 2013

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COMMITMENT TO A SAFE WORK ENVIRONMENT

EA's employees are our most important resource and protecting them is our greatest responsibility. We are committed to providing a safe and healthy work environment for our employees and contractors. Meeting this objective requires the sustained commitment of each employee to create and maintain an injury free, environmentally safe workplace. Strict adherence to EA's established safety and health policies and practices is essential to reach this objective.

When warranted by site conditions and/or the nature of the field activity, we will establish plans and procedures to ensure compliance not only with EA's Safety and Health Program Manual, but also with state and federal health and safety regulations. Each employee is responsible for performing work in accordance with these plans and procedures in an effort to eliminate unsafe acts and conditions in the workplace. As a condition of employment, personnel will be accountable for adhering to safety rules, practices, and procedures.

EA is committed to providing the resources and tools necessary to ensure that employees are capable of fulfilling their safety and health responsibilities. In addition, if an employee believes an unsafe condition exists, he/she is hereby empowered to suspend or stop work pending resolution of the condition by appropriate members of supervision and/or management.

EA employees, supervisors, and managers are responsible for adhering to this policy and applicable safety and health program elements. Supervisors and managers will ensure that the expectations for safe work performance are communicated to all employees, and will continually evaluate safety performance to identify areas for improvement.

A handwritten signature in cursive script that reads 'Ian D. MacFarlane'.

Ian D. MacFarlane
President and Chief Executive Officer

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17-1	Generic checklist of safety and health considerations for remote field sites.

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1. INTRODUCTION

1.1 ACCESS TO THIS DOCUMENT

A copy of this Manual and its companion documents (Corporate Construction Operations Program Manual, Corporate Vessel Operations Manual, and Corporate Ordnance and Explosive/Unexploded Ordnance Activities Manual) are available to all EA employees via EA's Intranet site ([inside.ea](#)).

1.2 PURPOSE

EA Engineering, Science, and Technology, Inc. considers the safety and health of its employees, clients, and visitors and the prevention of work-related accidents and illnesses and property loss to be of the highest priority. Proactively implemented, a comprehensive and systematic safety and health program will result in more efficient and profitable operations by improving employee health and morale, and by reducing Worker's Compensation costs, lost time, fire and liability insurance premiums, and property damage.

The objectives of EA's Safety and Health Program are to ensure:

1. Sound safety and health practices and conditions necessary for the protection of the health and welfare of employees, clients, and visitors.
2. Compliance with federal and state safety and health regulations and standards.
3. Effective safety and fire prevention practices necessary for protection of company-owned or operated property.

1.3 APPLICABILITY

This Safety and Health Program Manual applies to EA personnel at all locations. Three additional companion documents (Corporate Construction Operations Program Manual, Corporate Vessel Operations Manual, and Corporate Ordnance and Explosive/Unexploded Ordnance Activities Manual) apply to EA personnel at all locations where such activities are performed to clarify additional requirements and guidance for the associated programs.

Due to the varying nature of EA client and project types, the project manager will address the applicability of the content of the companion documents in the project site Safety and Health Plan. In certain cases, the client safety and health requirements may supercede EA's requirements.

1.4 RESPONSIBILITIES

The success of a Safety and Health Program depends, to a great extent, on the assignment of specific program responsibilities to individuals who have the knowledge and authority to affect their implementation. The organization is presented on Figure 1-1.

1.4.1 President and Senior Vice President – Operations

The President will be responsible for ensuring the appropriate resources are budgeted for in the annual business plan, and are in place to develop, implement, and monitor the Safety and Health Program. The

Senior Vice President – Operations will ensure effective implementation of the policies and procedures designed to meet the objectives of the Corporate Safety and Health Program.

1.4.2 Director of Safety and Health

The Director of Safety and Health will:

- Establish and administer a company-wide Safety and Health Program designed to ensure compliance with Occupational Safety and Health Administration (OSHA) regulations, federal and state regulations, client-specific requirements (i.e., the U.S. Army Corps of Engineers and ExxonMobil Corporation), and safe work practices.
- Review Safety and Health Program progress and periodically report significant problems and accomplishments to management.
- Conduct an annual evaluation of the effectiveness of the Safety and Health Program, submitting any recommended changes to the President for review and comment.
- Establish procedures to ensure that periodic safety and health inspections are conducted at EA locations and for company vehicles.
- Assist Project Managers, Safety and Health Coordinators, Business Unit Directors, and Profit Center Managers in training, safety promotion, employee motivation, and project audits.
- Review proposed facility, process, and procedure changes, and major equipment requests to determine any safety or health implications.
- Meet with Project Managers or designate regional Safety and Health Coordinators to discuss the safety and health requirements of their projects and to develop site safety and health plans.
- Ensure that procedures are established which provide for the availability of essential medical and first aid personnel and emergency medical equipment.
- Evaluate any reported hazardous conditions and direct the necessary corrective action as appropriate.
- Review and/or investigate work-related injuries and illnesses, ensuring that appropriate corrective action has been taken.
- Ensure Safety and Health Coordinators, Profit Center Managers, Business Unit Directors, and other Corporate Officers are kept up-to-date on safety and health issues by implementing training and disseminating information.

1.4.3 Business Unit Directors and Profit Center Managers

The Safety and Health Program will be managed within each Business Unit with overall responsibility at the Business Unit Director level. If the Business Unit is comprised of individual offices organized as Profit Centers, responsibility for program administration may extend to the designated Profit Center Manager. In all cases, the Business Unit Director will remain accountable for program compliance. Business Unit Directors and/or Profit Center Managers will:

- Implement the established Safety and Health Program.
- Provide a program supplement to this manual, if necessary, which will implement the Safety and Health Program locally and provide the procedures necessary to resolve unique safety hazards and conditions. At a minimum, site-specific safety, health, and emergency response plans (SHERPs) and standard operating procedures (SOPs) will be established for field operations and, if applicable, warehouses, shops, or laboratories.
- Designate Safety and Health Coordinators to provide local safety and health expertise to Project Managers, Program Managers, and Site Safety and Health Officers.
- Ensure Profit Center compliance with the requirements of OSHA; state and local safety, health, and fire regulations; and company, client, and facility safety and health program procedures and policies, including posting, recordkeeping, training, and accident notification requirements.
- Conduct periodic review and inspection of established safety and health procedures, taking corrective action where necessary.
- Implement appropriate measures to ensure that employees:
 - Maintain safe working conditions and practices within their work area
 - Receive training in the appropriate safe work practices
 - Wear the required protective equipment and clothing.

1.4.4 Program and Project Managers

Program and Project Managers will:

- Ensure that safety and health measures and site-specific SHERPs have been prepared and properly reviewed prior to the beginning of a new project or program.
- Ensure the implementation of any job or site-specific safety or health requirements specified by clients.
- Ensure that personnel assigned to field operations have received the required safety and health training and medical examinations, and are fit for duty.
- Periodically monitor field operations to ensure that safety and health requirements are appropriate for the work and are being effectively implemented.

1.4.5 Regional Safety and Health Coordinators

Regional Safety and Health Coordinators will:

- Coordinate the region's safety and health program with the Director of Safety and Health.
- Ensure that inspections are conducted of EA facilities and of EA vehicles at least annually.
- Arrange for the required safety and health training for all workers within their region of responsibility.

- Provide safety and health training to employees in their Region, as necessary.
- Ensure that assigned safety and monitoring equipment is properly used, calibrated, and maintained.
- Assist supervisors with investigation of accidents and near misses, and provide copies to the Director of Safety and Health, and Profit Center Manager.
- Ensure that employees identified as requiring medical surveillance per OSHA regulations (hazardous waste operations, lead, asbestos, benzene, etc.) are examined annually or biannually as per EA's designated Medical Director.
- Ensure that air sampling or air monitoring is properly conducted for all appropriate field operations.
- Write or review site-specific safety, health, and emergency response plans.

1.4.6 Site Safety and Health Officers

- Ensure that assigned safety and monitoring equipment is properly used, calibrated, and maintained.
- Assist supervisors with investigation of accidents and near misses, and provide copies to the Regional Health and Safety Coordinators, Director of Safety and Health, and Profit Center Manager.
- Ensure that employees identified as requiring medical surveillance per OSHA regulations (hazardous waste operations, lead, asbestos, benzene, etc.) are examined annually or biannually as per EA's designated Medical Director.
- Ensure that air sampling or air monitoring is properly conducted for all appropriate field operations.
- Write or review site-specific safety, health, and emergency response plans.
- Investigate and report accidents, injuries, and occupational illnesses as required.
- Investigate employee reports of hazardous conditions, taking actions as appropriate.

1.4.7 Supervisors

Supervisors will:

- Instruct and train employees in the hazards of job operations and the appropriate safe work practices.
- Periodically monitor employee activities to ensure conformance with safe work practices and the Safety and Health Program Manual.

- Investigate and report accidents, injuries, and occupational illnesses as required.
- Investigate employee reports of hazardous conditions, taking actions as appropriate.

1.4.8 Employees

Employees will:

- Follow safety and health rules, regulations, and procedures and use necessary controls and safety devices, including personal protective equipment.
- Notify his or her supervisor of suspected safety or health hazards.
- Report any accidents, injuries, occupational illnesses, and near misses to his or her supervisor.

1.5 EMERGENCY PREPAREDNESS

In the event of an emergency situation such as an outbreak of pandemic flu, EA's decentralized structure will provide for continuation of operations. We have 20 offices located throughout the United States (including Hawaii and Guam). EA has a robust corporate Virtual Private Network system that allows employees to work on projects from remote locations; therefore, if an office were to be affected by a regional pandemic situation, the employees from that office could work from home or we could bring other resources in from non-affected office locations to support our project work.

EA performs full weekly backups of all critical data on company servers and performs nightly differential backups of any data that have changed since the last full backup. The backup data in the Sparks and Hunt Valley, Maryland locations are replicated to ensure an offsite disaster recovery scenario. Data backed up at the other remote EA offices are stored on tape media with the end-of-month tape shipped to our Corporate Information Technology Department for offsite disaster recovery. This system was tested just recently in our Baltimore City office when two servers failed simultaneously and we were able to backup all data with no loss of information.

EA has an ongoing safety and health training program for its employees and also communicates important safety and health information via our intranet website. This includes a quarterly safety newsletter as well as periodic safety and health-related issues specific to EA project work.

Additionally, EA maintains an updated list of key employees' home and cell phone numbers so that, in the event of an emergency, communications would not have to depend on reaching these employees in their offices. In the event of an emergency, managers would be able to communicate from remote locations and allocate resources to allow for continuity of operations.

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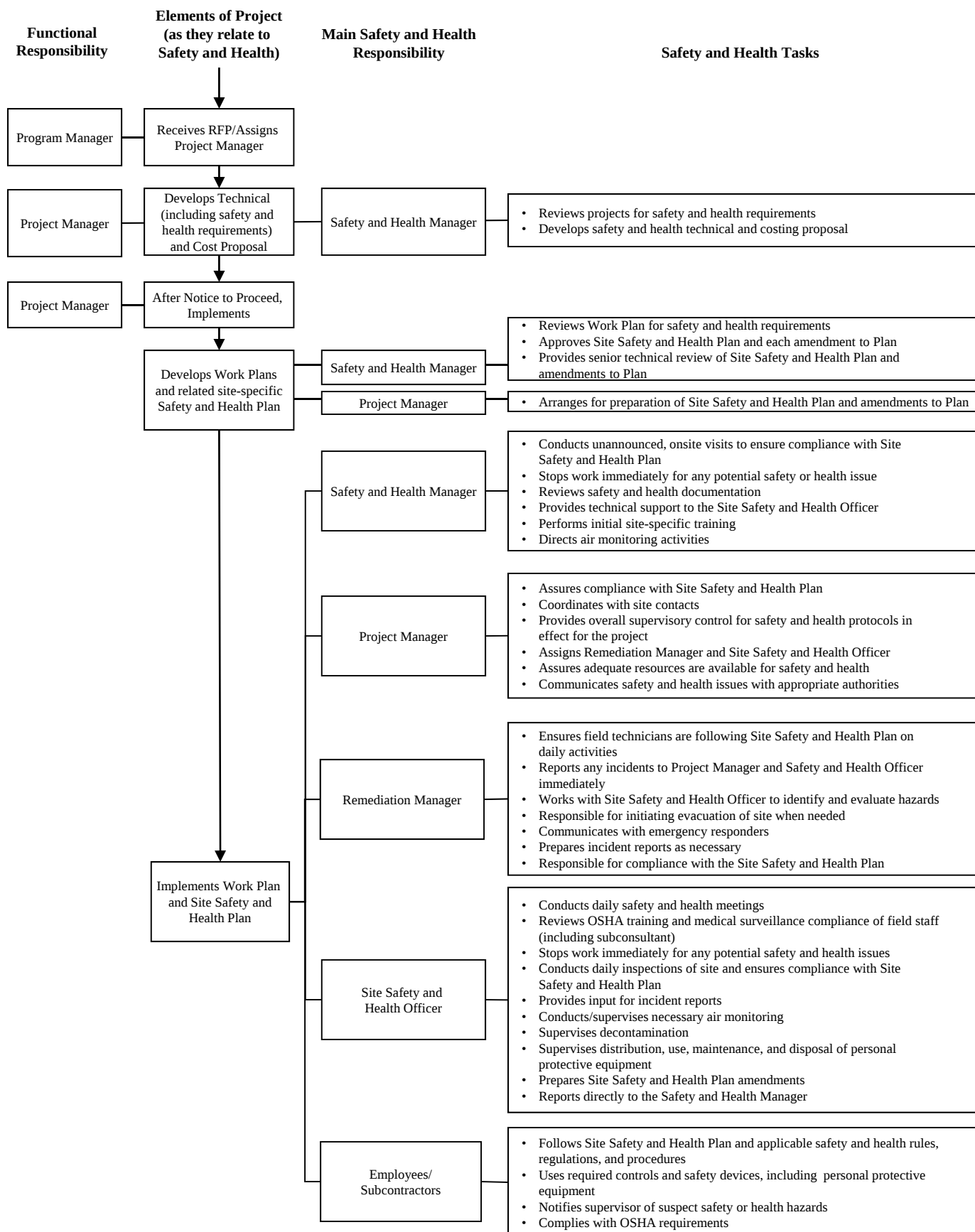


Figure 1-1. Organization chart.

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2. ACCIDENT INVESTIGATION AND REPORTING

A systematic approach to accident investigation, identification of causal factors, and implementation of corrective actions is essential to an effective safety and health program and management system.

Good accident investigation procedures:

- Identify, without placing blame, the basic causal factors that contribute directly or indirectly to accidents.
- Suggest corrective action alternatives for a given accident.
- Identify deficiencies in this Safety and Health Program or the site-specific safety, health, and emergency response plans.
- Provide information needed to identify trends and problem areas.
- Satisfy Workers' Compensation and OSHA requirements for recordkeeping and reporting.

2.1 REPORTABLE ACCIDENTS

An accident investigation will be conducted for the following:

- Job-related injuries and illnesses.
- Accidents resulting in loss or damage to property above \$100.
- Accidents involving vehicles and/or vessels, whether or not they result in damage to property or personnel. Complete the Accident/Loss Report (Figure 2-1) as soon as possible, no later than 24 hours after the accident occurred, and fax it immediately to the Director of Human Resources.
- Accidents in which there may have been no injury or property damage, but which have a high probability of recurring with at least a moderate risk to personnel or property ("Near Miss").

NOTE: *Accidents that result in a fatality must be reported within 8 hours to the Department of Labor. Accidents that result in the hospitalization of one or more employees, the loss of an eye, or an amputation must be reported to the Department of Labor within 24 hours.*

2.2 REPORTING AND INVESTIGATION PROCEDURE

Employees will immediately report accidents to their supervisor.

The Supervisor will:

- Render assistance and attempt to limit further injury and damage.
- Arrange for appropriate medical treatment.
- Report the accident to his or her supervisor.

- Complete the Accident/Loss Report (Figure 2-1) as soon as possible, no later than 24 hours after the accident occurred.
- Forward the report through his or her supervisor to the Director of Human Resources who will coordinate with the Director of Safety and Health to determine if drug/alcohol screening is necessary.

The Director of Safety and Health will:

- Review the Accident/Loss Report for accuracy and thoroughness.
- If necessary, return the report to the Supervisor for further investigation or corrective action.
- After appropriate review and comment, forward Accident/Loss Reports to Human Resources.
- Follow up to see that corrective action has been implemented.
- Prepare an annual summary of accidents to be distributed company-wide. The purpose of this summary is to identify accident trends and to evaluate the effectiveness of the Safety and Health Program.
- Maintain the Company OSHA 300 log.

2.3 WORKERS' COMPENSATION

Employees will complete EA's Accident/Loss Report and submit to the Director of Safety and Health and Human Resources within 24 hours of the accident (Figure 2-1).

EA Human Resources will submit claims to the insurance carrier as necessary. The insurance carrier will file the Employer's First Report of Injury or Illness with the appropriate state workers' compensation agency.

2.4 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FORM 300

The Director of Safety and Health will ensure that the Bureau of Labor Statistics' Log and Summary of Occupational Injuries and Illnesses, OSHA Form 300 (Figure 2-2), is maintained as required.



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/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:	M:		F:
Marital Status:		Hourly Rate:			
Employee Number:		Date of Hire:			
Number of Dependents:					
Employee's Job Title:					
Department Regularly Employed by:					
Was the Employee Injured on the Job:		Yes:		No:	
Primary Language of the Employee					

B. ACCIDENT/INCIDENT INFORMATION

Date of Accident:		Time of Accident:	
Report 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(s) of the body affected (e.g., laceration, right hand, third finger)			

Object or Substance that Directly Injured the Employee:			
Number of Days or 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 or No):		If yes, status (Open/Closed):	
Was the Employee Assigned to Restricted Duty (Yes or No)?			

C. ACCIDENT INVESTIGATION INFORMATION (Yes or No)

Was Safety Equipment Provided?		If yes, was it used	
Was an Unsafe Act Being Performed?		If yes, describe:	
Was a Machine Part Involved?		If yes, describe:	
Was the Machine Part Defective?		If yes, in what way?	
Was a Third Party Responsible for the Accident/Incident?		If yes, list name, address, and phone number:	
Was the Accident/Incident Witnessed?		If yes, list name, full address, and phone number:	

D. PROVIDER INFORMATION

Was First Aid Given Onsite (Yes or No)?		If yes, what type of medical treatment was given	
Physician Information (if medical attention was administered)		Name, full address, and phone number	
Hospital Address		Name, full address, and phone number:	
Was the Employee Hospitalized (Yes or No)?		If yes, on what date?	
Was the Employee Treated as an Out-Patient. Receive Emergency Treatment, or Ambulance Service (Yes or No)?			

Please attach the physician's written Return to Work slip.

NOTE: 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 Number			
EA Employee Vehicle Year, Make, and Model			
V.I.N.		Plate/Tag No.:	

Owner's Name and Address:			
Driver's Name and Address:		Driver's License No.:	
Relation to Insured:			
Describe Damage to Your Property:			
Describe Damage to Other Vehicle or Property:			

Other Driver's Name and Address:	
Other Driver's Phone No.:	
Other Driver's Insurance Company and Phone Number:	
Location of Other Vehicle:	
Name, Address, and Phone No. of Other Injured Parties:	

Witness 1 Name:		Phone No.:	
Address:			
Statement:			
Signature of Witness 1:			

Witness 2 Name:		Phone No.:	
Address:			
Statement:			
Signature of Witness 2:			

F. ACKNOWLEDGEMENT

Name of Supervisor:			
Report Prepared by:		Date Prepared:	

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

Signature of Injured Employee

Date

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

Please forward all bills/invoices/correspondence to:

**EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
225 SCHILLING CIRCLE, SUITE 400
HUNT VALLEY, MARYLAND 21031**

**ATTENTION: Michele Bailey
HUMAN RESOURCES**

**(410) 584-7000
(410) 771-1780 (FAX)**

OSHA's Form 300
Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name
City
State

Table with 13 columns: (A) Case No., (B) Employee's Name, (C) Job Title (e.g., Welder), (D) Date of injury or onset of illness (mo./day), (E) Where the event occurred (e.g. Loading dock north end), (F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch), (G) Death, (H) Days away from work, (I) Job transfer or restriction, (J) Other recordable cases, (K) On job transfer or restriction (days), (L) Away from work (days), (M) Injury, (N) Skin Disorder, (O) Respiratory Condition, (P) Poisoning, (Q) All other illnesses.

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.
Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.
Page 1 of 1

Figure 2-2. OSHA's Form 300 - Log of Work-Related Injuries and Illnesses.

OSHA's Form 300A

Summary of Work-Related Injuries and Illnesses

Year _____



U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days of job transfer or restriction	Total number of days away from work
0	0
(K)	(L)

Injury and Illness Types

Total number of...
(M)

(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) All other illnesses	0
(3) Respiratory Condition	0		

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (e.g., Manufacture of motor truck trailers)

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

Employment information

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive Title

Phone Date

OSHA's Form 301

Injuries and Illnesses Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.



U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

Information about the employee

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____
Title _____
Phone _____ Date _____

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering the data, reviewing the collected data, completing and reviewing the collection of information, and sending the collection of information to the Office of Management and Budget, Paperwork Project Director (0451-0046). Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Paperwork Project Director (0451-0046), U.S. Government Printing Office, Washington, DC 20540.

- 1) Full Name _____
- 2) Street _____
City _____ State _____ Zip _____
- 3) Date of birth _____
- 4) Date hired _____
- 5) ☐ Male
☐ Female

Information about the physician or other health care professional

- 6) Name of physician or other health care professional _____
- 7) If treatment was given away from the worksite, where was it given?
Facility _____
Street _____
City _____ State _____ Zip _____
- 8) Was employee treated in an emergency room?
☐ Yes
☐ No
- 9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

Information about the case

- 10) Case number from the Log _____ (Transfer the case number from the Log after you record the case.)
- 11) Date of injury or illness _____
- 12) Time employee began work _____ AM/PM
- 13) Time of event _____ AM/PM ☐ Check if time cannot be determined
- 14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."
- 15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."
- 16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."
- 17) **What object or substance directly harmed the employee?** Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.
- 18) **If the employee died, when did death occur?** Date of death _____

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3. REPORTING OF “NEAR MISS” INCIDENTS

3.1 BACKGROUND

An important aspect of risk reduction is the matter of accident investigation. The intent of such an activity is not to “point fingers” by identifying a convenient scapegoat, but rather to analyze what went wrong during the activity or process that resulted in an accidental injury or damage. By identifying the root causes—regardless of who might or might not have been “to blame”—corrective steps can be taken to ensure that such an event will not happen again. Whether or not they actually follow-up in such a manner after an accident, most people will at least acknowledge the wisdom underlying the above procedure. After all, if injuries can be prevented, equipment and supplies protected, and production maintained, we are all the beneficiaries. However, what many people overlook is the incident that can be termed a “near miss”—the situation that did not **QUITE** result in an accident or injury. Breathing a sigh of relief, the worker returns to work, thankful that no serious harm resulted from the incident. Does the lack of harm indicate the lack of future risk? Not at all! It may only be due to fortuitous circumstances that the worker was just out of harm’s way when the incident happened. Another time, that worker (or another worker) may not be so lucky. If the conditions that gave rise to the “near miss” are not addressed, the risk may continue unabated and, sooner or later, a full-blown accident may occur, with all of its attendant consequences.

For this reason, a “near miss” **should** be investigated with the same diligence as an accident. Just as much can be learned about weaknesses in the job situation from events that almost happened as from things that actually occurred. For example, suppose that a worker on a construction site is nearly struck on the head by a falling tool. Whether the worker was or was not actually hit by the tool is really secondary to the questions of **why** the tool fell in the first place, **why** the worker was in the vicinity of overhead work, and **whether or not** the worker was wearing adequate head protection. Even if no one was injured *this time*, the answers to these questions will give an indication of how likely it will be that someone might be injured *another time* if the root issues are not addressed. One of the reasons that “near misses” are so often ignored may have to do with our terminology. When an event is referred to as an “accident,” we know that something actually happened. However, if the event is regarded as a “miss,” the impression left is that there is really nothing to investigate. Therefore, both accidents and “near misses” should be collectively referred to as “incidents.” By removing the terminological distinctions, we would be treating both events with the same degree of investigation, acknowledging that there are lessons to be learned from either situation.

3.2 REPORTING PROCEDURE

Figure 3-1 is to be used to record each “near miss” incident. “Near miss” reporting should be completed within a few hours of observations to ensure accurate documentation.

The individual(s) witnessing the “near miss” should complete the first portion of the “Near Miss” Incident Report. Provide as much detail as possible when describing the “near miss.” Photographs should be added when available to assist in describing the surrounding conditions.

The “near miss” investigation should be completed by the Project Manager, Site Safety and Health Officer, and the employee(s) witnessing the event.

Descriptions should be as complete and accurate as possible. Causes are not for placing blame or responsibility but for identifying the reasons for the “near miss.” Corrective actions should include steps such as removal of hazard, repairing components, or training. The corrective actions should be agreed upon and signed by the Project Manager and/or Site Safety and Health Officer.

If the form cannot be completed at that time, the reason or reasons should be documented on the lower portion of the form. Once the form has been completed, the document should be forwarded to the Corporate Safety and Health Director for review and distribution of lessons learned company-wide to ensure that we gain knowledge to prevent accidents and injuries.

3.3 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION POSTER

The Project Manager and the Site Safety and Health Officer will ensure that the OSHA poster, or a state-equivalent poster, is displayed in a conspicuous place in EA facilities.



“NEAR MISS” INCIDENT REPORT

A “near miss” is a potential hazard or incident that has not resulted in any personal injury or property damage. Unsafe working conditions, unsafe employee work habits, improper use of equipment, or use of malfunctioning equipment have the potential to cause work-related injuries. It is everyone’s responsibility to report and correct these potential accidents/incidents immediately.

Please complete this form as a means to report these “near miss” situations.

Department/Location _____ Date: _____ Time: _____ a.m./p.m.

Please check all appropriate conditions:

_____ Unsafe act _____ Unsafe equipment _____ Other
_____ Unsafe condition _____ Unsafe use of equipment

Description of incident or potential hazard _____

Employee Signature _____ Date _____

“NEAR MISS” INVESTIGATION

Description of the “Near Miss” Condition _____

Causes (primary and contributing) _____

Corrective Action Taken (i.e., remove the hazard; replace, repair, or retrain in the proper procedures for the task) _____

Signed _____ Date Completed _____

Form not completed within 4 hours of incident for the following reason(s) _____

Corporate Director of Safety and Health _____ Date _____

*****Forward to Corporate Director of Safety and Health when completed.*****

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4. SAFETY AND HEALTH INSPECTIONS

The purpose of systematically conducting safety and health inspections is to:

- Identify potentially hazardous conditions.
- Provide management with a summary of these conditions.
- Aid management in the establishment of abatement priorities based on potential risk.

4.1 FORMAL INSPECTIONS

Safety and health audits of EA facilities, vehicles, boats, toxicology laboratory, and warehousing facilities will be conducted annually. These audits will be the responsibility of the Profit Center Managers and will be reviewed by the Regional Safety and Health Coordinators. Advance notification will be provided only to the extent that it ensures that the responsible personnel will be available to participate in the inspection. During the inspection, the auditor will talk with a representative number of employees in an effort to ascertain safety or health concerns, suggestions, or complaints.

A report of findings will be produced and forwarded by the Profit Center Manager to the Business Unit Director and the Regional Safety and Health Coordinator. The Regional Safety and Health Coordinator will forward a copy to the Director of Safety and Health with a list of corrective actions employed to minimize safety or health concerns.

More frequent inspections or inspections of other work areas will be scheduled as deemed necessary by the Director of Safety and Health and/or Business Unit Director.

4.2 LABORATORY INSPECTIONS

In addition to the annual inspections, the toxicology laboratory will also be audited annually by the Director of Safety and Health. This inspection will determine compliance with the Chemical Hygiene Plan.

4.3 INFORMAL AUDITS AND MONITORING

Unscheduled, periodic monitoring of work areas will be conducted by the Regional Safety and Health Coordinators. Findings will be immediately reported to the responsible personnel for action.

Business Unit Directors or Profit Center Managers and Supervisors will also conduct unscheduled, informal work area audits to assess the status of workplace safety and health controls and to ensure that employees under their supervision understand and are conforming with EA safety and health practices and procedures. Action will be taken to correct deficiencies or unsafe conditions observed during the inspections.

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5. SAFETY AND HEALTH TRAINING

An effective safety and health program is dependent on proper job performance. It, therefore, follows that if employees are taught and understand what is required of them to perform their jobs safely, they will be motivated to act with maximum concern for the personal safety of themselves and others.

5.1 NEW EMPLOYEE ORIENTATION

New employees will receive a safety and health briefing which includes, at a minimum:

- General EA Policy and pertinent provisions of EA's Safety and Health Program manual.
- Introduction to applicable standard operating procedures developed by departments, sections, and facilities, where needed, to ensure safe working procedures for anticipated hazards and safe operation of EA equipment.
- Employee's role in the Safety and Health Program, including:
 - Responsibility for following the applicable standard operating procedures
 - Reporting of on-the-job injuries/illnesses to his or her supervisor
 - Procedures for reporting potentially hazardous conditions
 - Responsibility for wearing any required PPE
 - Arrangements for medical/first aid treatment
 - Fire prevention and emergency procedures.

5.2 ON-THE-JOB TRAINING

Employees who are required to handle or use flammable liquids, gases, or toxic materials will receive instruction regarding the safe handling, potential hazards, personal hygiene, protective equipment, storage, disposal, and other protective measures involved or required. Other on-the-job training, including the safe operation of equipment, boats, and vehicles, will be provided as needed. While this training will generally be presented by the employee's supervisor, assistance will be provided by the Regional Safety and Health Coordinators or the Director of Safety and Health upon request.

5.3 SPECIALIZED TRAINING

Specific OSHA standards require that employees receive safety and health training.

5.3.1 Hazardous Waste Operations

Employees will receive the 40-hour initial hazardous waste operations course and, as appropriate, the annual refresher and supervisors course prior to undertaking hazardous waste operations. Additional training will be provided as needed in specific operations required by site work, e.g., airborne

contaminant monitoring, wearing self-contained breathing apparatus (SCBA) respirators (see Section 12.3 for additional information). Daily tailgate meetings will be conducted onsite to cover the day's events and the hazards and standard safe operating procedures relative to those operations.

5.3.2 Handling of Fire Extinguisher

Fire extinguisher training will be given annually to employees expected or likely to use them.

5.3.3 Fork Lift Operations

Employees who operate a fork lift will receive appropriate training. The training will conform with the requirements in OSHA standard 29 CFR 1910.178 (1).

5.3.4 Respirator Training

No employee will be issued a respirator unless he or she has been properly fit-tested and has received training in the selection, fit, use, maintenance, and limitations of respirators.

5.3.5 Confined Space Entry

Employees required to enter confined or enclosed spaces or atmospheres potentially immediately dangerous to life and health (IDLH) will complete a confined space entry safety training course prior to entry. The Director of Safety and Health or Regional Safety and Health Coordinator will be contacted prior to entry to review safety, health, and emergency response procedures.

5.3.6 Hazard Communication

Employees will be provided training as required in OSHA 29 CFR 1910.1200.

5.3.7 Other Training

Other training will be provided based on identified need. The Director of Safety and Health will be available to assist in the arrangements for, or provision of, safety and health training.

5.4 TRAINING RECORDS

A record of formal safety and health training will be maintained by the Corporate Safety and Health Department. Copies of all training must be forwarded to Corporate Safety and Health to be included in employees' Corporate Safety and Health file.

6. MOTOR VEHICLE SAFETY

The risk of injury to personnel and property damage is probably greater during operation of vehicles than at any other time while under the employment of EA. The purpose of this section is to provide a means to implement an effective maintenance program and appropriate training to minimize this risk. By far, the most important factor in reducing the risk of injury, damage, and loss is through employee adherence to safe driving practices.

6.1 AUTHORIZATION AND TRAINING

No employee will be authorized to operate an EA vehicle unless he or she has a valid state driver's license.

A state driving record check will be made prior to authorizing an employee to operate a company-owned vehicle.

No employee will be authorized to operate a vehicle with a trailer or a vehicle requiring the use of mirrors due to restricted vision until he or she has been instructed in their safe operation and use.

No employee will be authorized to operate a fork lift until he or she has received training in its safe operation.

6.2 OPERATION

Operators of company-owned, leased, and privately owned vehicles while on company business will:

- Drive vehicles in a safe and courteous manner
- Obey traffic regulations; traffic citations will be the responsibility of the operator
- Use safety belts (including passengers)
- Abstain from drinking alcoholic beverages or using drugs prior to or while driving (including passengers).

6.3 MAINTENANCE

Business Unit Directors will establish a maintenance schedule for EA vehicles which is consistent with the manufacturer's servicing recommendations.

Employees using EA vehicles will make their own inspection prior to each use, including:

- Coolant level
- Oil level
- Fuel level
- Windshield wipers and washer fluid
- Headlights

- Turn signals/flashers
- Tail lights/brake lights
- Tire inflation and condition (tread).

Malfunctions and deficiencies will be reported to the Office Administrator for corrective action.

6.4 VEHICLE SAFETY EQUIPMENT

The following is a suggested list of equipment to be maintained in EA vehicles:

- First aid kit
- Fire extinguisher
- Safety flares or reflective triangles
- Spare tire and jack.

7. FIRE PROTECTION

Each year, fires are responsible for major catastrophes, taking a great toll in human life and causing severe damage to property. It is important that personnel take every precaution to prevent such catastrophes at EA's facilities and during field investigations. Preventing the death, injury, and property damage that a fire can cause is each person's individual responsibility. This procedure establishes the basic requirements for fire prevention and protection equipment, and provides for the development of an emergency action plan.

7.1 FIRE PREVENTION

The following guidelines should be practiced to prevent fires:

1. Practice good housekeeping, including minimization of combustible materials.
2. Designate, post, and enforce the prohibition of smoking, where required. Smoking is prohibited in all EA offices.
3. Minimize the volume of flammables on hand, and store them properly.
4. Inspect heat-producing equipment frequently.
5. Safeguard cutting and welding operations.
6. Keep exits clear.
7. Maintain fire alarm and firefighting equipment in good working condition.
8. Report potential fire hazards.
9. Building maintenance, construction, and major repairs (other than routine cleaning and maintenance services) should be reported to the Site Safety and Health Officer or Regional Safety and Health Coordinator prior to start of work. This includes painting, cleaning with solvents, and welding or cutting with a torch.

Evaluation of the adequacy of existing fire prevention and protection equipment and the identification of potential fire hazards will be included in the safety and health inspections.

7.2 FIRE PROTECTION EQUIPMENT

7.2.1 Fire Extinguishers

Portable fire extinguishers will be provided for employee use, where needed. They will be selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard that would require their use.

Fire extinguishers will be kept in all boats. In addition, a fire extinguisher will be in all vehicles transporting flammable materials. This equipment will not be removed except for inspection and/or use in an emergency.

Where fire extinguishers are provided for use by employees, the employee will be trained in the general principles of fire extinguisher use and the hazards involved with incipient-stage firefighting. This training will be repeated annually.

Every fire extinguisher will be visually inspected monthly. In addition, extinguishers will undergo an annual maintenance check. These inspections and maintenance checks will be recorded on tags affixed to the extinguishers.

7.2.2 Fire Alarm Systems

The adequacy and reliability of each employee alarm system will be tested at least annually.

7.2.3 Lighting and Exit Signs

Emergency lighting and exit signs will be checked monthly.

7.3 EMERGENCY ACTION

7.3.1 Emergency Action Plan

Business Unit Directors will develop and keep current an Emergency Action Plan that includes the following:

1. The preferred means for employees to report emergencies, including the posting of emergency telephone numbers
2. Procedures for sounding emergency alarms in the facility
3. Procedures for evacuating the building, including the posting of emergency exit notices or instructions.

7.3.2 Emergency Evacuation Drill

An emergency evacuation drill will be conducted annually at each facility. A written report will be sent by the Regional Safety and Health Coordinator to the Director of Safety and Health.

8. HAZARD COMMUNICATION PROGRAM

The purpose of this Hazard Communication Program is to ensure that important information regarding hazardous chemicals used, handled, or stored during the conduct of the business of EA and affiliated business groups is transmitted to employees and other affected persons as appropriate.

EA believes that it is each individual's "Right-to-Know and Understand" the chemical identities and chemical hazards with which they are working. When employees have information about the chemicals being used, they can take steps to reduce exposures, substitute less hazardous materials, and establish proper work practices. Through these efforts and the implementation of this plan, it is the intent of EA that the prevalence of chemically-related occupational illnesses and injuries will be minimized. Access to chemical hazard information as outlined in this program is fundamental to protecting the safety, health, and welfare of our employees and other affected persons.

A hazardous chemical as defined by OSHA means any chemical that is either a physical hazard or health hazard and includes hazardous chemicals generated during work operations (e.g., welding fumes). EA will make chemical hazard information available to employees and other affected persons, as appropriate, through the implementation of this comprehensive program, which includes container labeling and other forms of warning, the collection and compilation of safety data sheets (SDS), and training. The components of this program are further detailed within this written Hazard Communication Program.

This program, which has been developed in accordance with the requirements of the OSHA Standards for General Industry (29 CFR 1910.1200) and the Construction Industry (29 CFR 1926.59), will be reviewed and revised at least annually to ensure that this program is effective. Periodic inspections will be conducted by the Regional Safety and Health Coordinators to evaluate the program effectiveness and changes will be made as needed. This chapter has been updated to comply with the new OSHA requirements associated with the OSHA revised Hazard Communication Standard that aligns the OSHA standard with the United Nations Globally Harmonized System of Classification and Labeling of Chemicals. The major changes to the standard include: revised guidance on product labeling, use of signal words to indicate the relative severity of a chemical, use of pictograms on labels to identify the hazard category of a chemical, use of hazard statements on labels that describe the nature and degree of the hazards of a chemical, and use of precautionary statements to describe recommended measures to minimize or prevent adverse effects from exposure to a hazardous chemical.

The Director of Safety and Health is the Hazard Communication Program Administrator and is responsible for overall program development and implementation. The Profit Center Manager for each EA office location is responsible for the implementation of this program in his/her respective office. The designated Field Supervisor is responsible for implementation of this program during field operations.

As EA does not produce, distribute, or import chemicals; conduct chemical hazard determinations; or prepare SDS, the OSHA required elements governing these activities are not addressed within this program.

EA will make this written Hazard Communication Program available, upon request, to employees, their designated representatives, OSHA, National Institute of Occupational Safety and Health (NIOSH), and other appropriate parties in accordance with the requirements of 29 CFR 1910.20(e).

Requests should be made in writing to the Profit Center Manager or Regional Safety and Health Coordinator (office locations), the Field Supervisor (field operations), or the Director of Safety and Health. A copy is also available on *Inside EA* (<http://inside.ea/hands/SitePages/Home.aspx>).

As required by 29 CFR 1910.20 (d)(1)(ii)(B), a copy of this program, including the lists of hazardous chemicals used by EA, will be maintained by EA for at least 30 years. Copies of SDS are not required to be maintained for this period.

If further information or clarification regarding OSHA Hazard Communication Program requirements is necessary, please review OSHA Standards 29 CFR 1910.1200/29 CFR 1926.59 (<https://www.osha.gov/law-regs.html>). Additionally, the designated Site Safety and Health Officer, Regional Safety and Health Coordinator (office locations), the Field Supervisor (field operations), or the Director of Safety and Health will be consulted as necessary. EA employees should feel free to ask questions about the chemical hazards in their work area.

8.1 SCOPE AND APPLICATION

This program covers all EA employees.

8.1.1 Description of EA Operations

In order to provide unity and consistency throughout EA operations, the scope of this written Hazard Communication Program applies to all EA Regions and Profit Centers. The individual business groups are listed below followed by a brief summary of the nature of their operation.

Science and Technology Services—This business area consolidates EA’s core skills in the environmental sciences, while enabling the Company to expand its focus on technology applications as needed for improved, cost-effective environmental management. We expect our expanded focus to reacquire existing and attract new clients with our Company’s unique combination of scientific talent and years of applications experience in making science understandable and useful for the management of environmental problems. We also plan to aggressively pursue new technologies for assessing environmental quality. Primary services include risk assessment management, resource management, air and water quality management, and strategic environmental management.

Engineering and Remediation Services—This business area provides site investigations and engineering design and construction of remediation systems as needed for restoration and cleanup of environmental contamination. Our industry continues to move rapidly toward aggressive programs to remediate environmental contamination and “close” regulatory cases. Such efforts require integration of multiple processes, information/ data gathering, site assessment, and conceptual/final design followed by installation of effective air, soil, water treatment, and cleanup systems; and, where appropriate, application of innovative treatment technologies for environmental remediation and restoration. The best engineering solutions must also effectively integrate constructability into the design process.

EA’s combined engineering skills and remediation experience is structured to solve complex environmental remediation and restoration assignments. As remedial designs move into active construction sites in the field, construction supervision and oversight are needed for cost management, schedule adherence, and overall response to the challenges associated with field conditions encountered at construction sites.

Laboratory Services—EA maintains toxicological and biology laboratories at the Hunt Valley location. Our toxicology laboratory capabilities are unique in our industry in detecting low-level toxicity and determining long-term impacts on aquatic organisms from exposure to both treated and untreated aquatic wastes.

8.1.2 Covered Chemicals and Operations

EA operations are covered where a hazardous chemical that is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

It is the responsibility of the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) to ensure that covered chemical materials meet the provisions of this Hazard Communication Program. If there are any questions regarding the applicability of these program requirements to a particular material or situation, the Director of Safety and Health will be consulted.

8.1.3 Exempt Materials

1. Hazardous waste as defined by the Resource Conservation and Recovery Act when subject to regulations issued under the U.S. Environmental Protection Agency (EPA).
2. Hazardous substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when subject to regulations issued under CERCLA by EPA.
3. Tobacco or tobacco products.
4. Wood or wood products which will not be processed. Wood treated with a hazardous chemical and wood which may be sawed or cut, generating dust, ARE covered.
5. Articles which are a manufactured item other than a fluid or particle; which is formed to a specific shape or design during manufacture; which has end use functions dependent in whole or in part upon its shape or design during end use; and which, under normal conditions or use, do not release more than minute or trace amounts of a hazardous chemical and does not pose a physical hazard or health risk to employees.
6. Any drug when it is in solid, final form for direct administration such as over-the-counter drugs and first aid supplies.
7. Cosmetics.
8. Any consumer product or hazardous substance, where EA can demonstrate that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.
9. Nuisance particulate where the chemical manufacturer or importer can establish that they do not pose any physical or health hazard.
10. Ionizing and non-ionizing radiation.
11. Biological hazards.

8.2 DEFINITIONS

Definitions are a key component in interpreting and implementing this Hazard Communication Program. It is the responsibility of the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) to know and understand these definitions which will be consulted as necessary. Rather than include all the definitions found in the OSHA Hazard Communication Standard, a copy of the standard can be found on <https://www.osha.gov/law-regs.html> (definitions are located in Part [c]).

8.3 HAZARD DETERMINATION

Chemical hazard determinations involve the review of scientific and technical information for each chemical; an evaluation of carcinogenicity, human data, animal data, etc.; and the generation of legally defensible, sound technical information. OSHA has many requirements for chemical manufacturers and importers who conduct chemical hazard determinations of the chemicals they manufacture or import. EA does not conduct any chemical manufacturing operations or chemical importing operations. EA relies solely upon the chemical hazard determination conducted by the manufacturer or importer. Therefore, this program does not address hazard determination procedures.

If, in the future, EA operations necessitate the conduct of chemical hazard determinations, such activities will only be undertaken after this Hazard Communication Program has been amended to include all applicable requirements specified by OSHA 29 CFR 1910.1200/29 CFR 1926.59 with specific emphasis on Section (d) Hazard Determination.

8.4 LISTS OF HAZARDOUS CHEMICALS

OSHA requires that lists of hazardous chemicals known to be present be compiled for the workplace as a whole or for individual work areas. The Regional Safety and Health Coordinator (office locations) will conduct an inventory as needed but no less than annually in order to develop and maintain an accurate list of all covered hazardous chemicals.

The Project Manager (field operations) will develop and maintain the hazardous chemical list for each project. The list may be included as part of the Safety and Health Plan for Hazardous Waste Operations and Emergency Response projects which will be available and accessible at a location made known to all affected parties during the conduct of field operations. Alternatively, or for non-hazardous waste operations and emergency response field operations, the list may be maintained with the project files but will be available and accessible at a location made known to all affected parties during the conduct of field operations.

The lists of hazardous chemicals will be kept current and updated by the Regional Safety and Health Coordinator or designee (office locations) or the Field Supervisor (field operations) as necessary. The lists of hazardous chemicals will contain the location, the name of each chemical as referenced on the SDS, the type of compound (i.e., flammable, corrosive, poison, etc.), the date of the inventory, and the name of the person generating the list. For office locations, an updated list will be submitted to the Director of Safety and Health by 1 January of each year for inclusion in the Hazard Communication Program. Any new materials will be marked with an asterisk. For field operations, the lists will be maintained in the project files.

8.5 LABELS AND OTHER FORMS OF WARNING

The Regional Safety and Health Coordinator or designee (office locations) will post a sign or signs in offices near hazardous materials in plain view of all possible exposed workers. The sign will indicate the location of the written Hazard Communication Program, the location of the SDS for that location, any PPE or safety measures required for that location, and any appropriate emergency information.

EA does not use a specific labeling system such as NFPA, HMIS, American National Standards Institute (ANSI), etc. EA will rely upon the original product labels to the extent practical. When EA must apply labels, they will be printed in English and contain the information specified below.

The Regional Safety and Health Coordinator or designee (office locations) and the Field Supervisor (field operations) will ensure that each container (except as exempted below) of hazardous chemicals in the workplace is labeled, tagged, or marked with the following information:

1. Identity of the hazardous chemical(s)
2. Appropriate hazard warnings i.e., any words, pictures, symbols, or combination thereof, which provides employees with specific information regarding the physical or health hazard(s) including primary target organ effect(s)
3. The name of the chemical manufacturer, importer, or other responsible party if appropriate.

EA employees will not remove or deface existing labels on incoming containers of hazardous chemicals unless the container is immediately marked with the required information.

Labels and other forms of warning will be legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift.

As EA employees speak English, labels and other forms of warning are not required to be marked in a second language. If site requirements include a second language, then it will be included.

If existing labels already contain the required information, new labels are not required.

If EA becomes newly aware of any significant information regarding the hazards of a chemical, the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) will revise the labels for the corresponding chemical(s) as soon as feasible not to exceed 3 months of becoming aware of the new information.

8.5.1 Alternatives to Labeling, Tagging, or Marking Requirements

Alternatives to the above-referenced labeling, tagging, or marking requirements are described below:

1. Signs, placards, process sheets, batch tickets, operating procedures, or other such written materials may be used in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the marking information required above. The written materials will be readily accessible to employees in their work area throughout each work shift.

If this alternative system is utilized, it will be done only with approval of the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations).

2. Portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer are not required to be labeled. If the container is to be used by multiple people and for more than immediate use, the secondary container must be labeled with the chemical's common name, trade name, hazards, and the date the container was filled.

8.5.2 Materials Exempted from Labeling Requirements

1. **Pesticides**—Hazard communication labeling is not required if the pesticide is labeled in accordance with EPA Federal Insecticide, Fungicide and Rodenticide Act requirements.
2. **Chemical Substances or Mixtures**—Hazard communication labeling is not required if the material is labeled in accordance with EPA Toxic Substances Control Act requirements.
3. **Food, Food Additives, Color Additives, Drugs, Cosmetics, or Medical or Veterinary Devices or Products**—Hazard communication labeling is not required if the material is labeled in accordance with Food and Drug Administration or Department of Agriculture requirements.
4. **Beverage Alcohols**—Hazard communication labeling is not required if the material is intended for non-industrial use and labeled in accordance with Bureau of Alcohol, Tobacco, and Firearms requirements.
5. **Consumer Products**—Hazard communication labeling is not required when subject to a consumer product safety standard or labeling requirements in accordance with the Consumer Product Safety Commission.
6. **Agricultural or Vegetable Seed Treated with Pesticides**—Hazard communication labeling is not required if the materials are labeled in accordance with Department of Agriculture requirements.

8.5.3 Shipping Hazardous Chemicals

OSHA requires that chemical manufacturers, importers, and distributors ensure that each container of hazardous chemicals leaving their workplace is labeled, tagged, or marked with specific information. EA is not a chemical manufacturer, chemical importer, or distributor so the requirements for these entities are not addressed within this program.

For covered EA operations where hazardous chemicals may be shipped to another location, the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) will ensure that each container of hazardous chemicals is labeled, tagged, or marked with the following information:

1. Identity of the hazardous chemical(s) (i.e., chemical name or common name as listed on the SDS).

2. Appropriate hazard warnings i.e., any words, pictures, symbols, or combination thereof which provides employees with specific information regarding the specific physical or health hazard(s), including primary target organ effect(s).
3. The name and address of the chemical manufacturer, importer, or other responsible party, if appropriate.

In addition to the above, the Regional Safety and Health Coordinator (fixed locations) or the Field Supervisor (field operations) will ensure that containers of hazardous chemicals being shipped are marked in a manner which does not conflict with the requirements of the U.S. Department of Transportation.

For the shipment of samples, labeling and SDS requirements outlined herein are not required under this Hazard Communication Program. EA employees should follow proper packaging and shipping requirements as established by the U.S. Department of Transportation and/or IATA/ICAO.

If the hazardous chemical being shipped is regulated by OSHA in a substance-specific health standard, the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) will ensure that the labels or other forms of warning used are in accordance with the requirements of that standard.

8.6 SAFETY DATA SHEETS

Chemical manufacturers and importers are required to obtain or develop a SDS for each hazardous chemical they produce or import. EA does not conduct chemical hazard determinations or develop SDS. EA will rely on the SDS generated by the chemical manufacturer or importer.

SDS will be obtained and maintained in the work area by the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) for each hazardous chemical used, stored, or handled during the conduct of EA operations.

Each SDS will be in English and contain the information specified in 29 CFR 1910.1200/1926.59 (g). If an SDS is obviously inadequate, the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) will request a corrected SDS from the chemical manufacturer or importer. If the SDS is not forwarded, the Director of Safety and Health will be informed and may inform OSHA.

Chemical manufacturers, importers, and distributors are responsible to ensure that EA is provided with an appropriate SDS with the initial shipment and with the first shipment after an SDS is updated. SDS can be shipped with the containers of hazardous chemicals or sent to EA prior to or at the time of shipment. If EA does not receive an SDS as required, the Regional Safety and Health Coordinator or Field Supervisor will contact the chemical manufacturer or importer and obtain one as soon as possible. Chemical manufacturers, importers, and distributors are required to provide copies of SDS upon request. New hazardous chemicals will not be used until an SDS has been received.

The Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) will maintain a copy of the SDS for each hazardous chemical, and will ensure that they are readily accessible during each work shift to employees when they are in their work area(s). This location will be made known to all affected persons.

EA currently does not utilize a database, microfiche, or other non-paper alternatives to maintaining paper copies.

Where employees, such as during multiple site field operations, travel between workplaces during a work shift (i.e., their work is carried out at more than one geographical location), the written Hazard Communication Program may be kept at the primary workplace facility as long as employees can immediately obtain the required emergency information.

During the conduct of singular site field operations, the list of hazardous chemicals and the SDS MUST be readily available onsite. Their location will be accessible and made known, by the Field Supervisor, to all affected persons on a per project basis. Generally, this is a component of the safety, health, and emergency response plan. SDS can be kept in any form as long as they contain the required information.

SDS will also be made readily available, upon request, to designated representatives, OSHA, NIOSH, and other appropriate parties in accordance with the requirements of 29 CFR 1910.20 (e).

8.7 EMPLOYEE INFORMATION AND TRAINING

Training and education is an ongoing essential part of this Hazard Communication Program. It is important that employees not only have access to the technical information regarding the chemical hazards in their workplace but they must understand what it says. Training, information, and education are intended to give our employees the skills they need to do their jobs in a way that protects their safety, health, and welfare.

At a minimum, training will be conducted at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained in is introduced into their work area. Training is NOT required for each chemical, but may be designed to cover categories of hazards such as flammables, carcinogens, etc. The training will be conducted by the Regional Safety and Health Coordinator (office locations), Field Supervisor (field operations), or Director of Safety and Health. Other persons may conduct the training as specified by the Director of Safety and Health.

At a minimum, training material will include information regarding:

1. OSHA Hazard Communication requirements
2. Any operations in their work area where hazardous chemicals are present
3. The location and availability of the written Hazard Communication Program, including the lists of hazardous chemicals, and SDS
4. Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area
5. The physical and health hazards of the chemicals in the work area
6. Protection measures such as work practices, emergency procedures, and PPE
7. Details of EA's Hazard Communication Program, including an explanation of the labeling system and SDS, and how employees can obtain and use the appropriate hazard information.

Training sessions will be documented and documentation sent to the Director of Safety and Health. Training records will also be maintained by the Regional Safety and Health Coordinators (office locations) and by the Field Supervisor (field operations).

Training materials will be supplied by the Director of Safety and Health and the Regional Safety and Health Coordinators. Training materials will be maintained by the Director of Safety and Health, the Regional Safety and Health Coordinator (office locations), and/or the Field Supervisor (field operations).

8.7.1 Hazards of Non-Routine Tasks

In order to prevent personnel from being accidentally exposed, OSHA requires that EA specify the methods that will be utilized to inform employees of the hazards of non-routine tasks (e.g., the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas. Although this requirement is primarily for industrial type facilities, it may apply during certain hazardous waste site remediation, construction, or other specialized situations at EA. For activities where OSHA requirements for hazardous waste operations and emergency response (29 CFR 1910.120) apply, the hazards and safety procedures will be specified in the Site-Specific Safety and Health Plan. For other situations not covered by hazardous waste operations and emergency response, the Supervisor will conduct an appropriate training session describing the hazards and safe work procedures for hazardous non-routine tasks. The Field Supervisor will document the training as specified by the Director of Safety and Health.

8.8 CONTRACTORS, SUBCONTRACTORS, VISITORS, AND MULTI-EMPLOYER WORK SITES

Where persons (other than EA employees) including, but not limited to, contractors, subcontractors, visitors, etc. may be exposed to hazardous chemicals that are used or stored during EA operations, EA will ensure that these persons, as appropriate, have access to adequate chemical hazard information to ensure their “Right-to-Know and Understand.” EA will ensure that these persons have access to SDS for each hazardous chemical to which they may be exposed while working, that they are informed of precautionary measures used to protect personnel during the workplace’s normal operating conditions and in foreseeable emergencies, and that they are informed of the labeling system used during EA operations.

To achieve these goals, the Site Safety and Health Officers or supervisor will notify exposed workers of the location of the written Hazard Communication Program, the location of the SDS for that site, any PPE or safety measures required for that site, and any appropriate emergency information. This will be accomplished by having all subcontractors for a job site included in pre-job safety orientation and pre-job meetings. In addition, all subcontractors will be required to attend tailgate safety meetings where topics such as job safety analyses, hazard assessments, and safety inspection procedures will be discussed. EA will also conduct post-job safety performance reviews of subcontractors on an as-needed basis.

For field operations, the Field Supervisor will coordinate the Hazard Communication Programs of affected parties, as appropriate. This can be accomplished in several ways depending on the situation. For example, the Field Supervisor may require that subcontractors submit a copy of their written Hazard Communication Program to him/her prior to the initiation of field work. This will enable the Field Supervisor to disseminate the necessary information to other parties as appropriate. The Field Supervisor may incorporate the appropriate Hazard Communication Program information into the Site-Specific Safety and Health Plan for hazardous waste operations and emergency response projects and disseminate this information as appropriate to all individuals prior to being exposed to the chemical hazards.

During the conduct of field operations the hazardous chemical list and the SDS must be available at the job site at an accessible location made known to all affected parties. EA will make the written Hazard Communication Program available, upon request, to employees, their designated representatives, OSHA, NIOSH, or other appropriate parties, in accordance with the requirements of 29 CFR 1910.20 (e). Requests for Program copies should be made in writing to the Regional Safety and Health Coordinator (office locations), the designated Field Supervisor (field operations), or the Director of Safety and Health.

8.9 TRADE SECRETS

A trade secret is any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know of or use it.

Sometimes, trade secret information (secret ingredients) is permitted to be left off an SDS. If trade secret information is left off an SDS, it must be so indicated. Under no circumstances can the properties of the chemical or the effects be withheld.

In certain situations such as exposure, the specific chemical identity is required to be made available to health professionals, employees, and designated representatives. For emergency situations, the chemical manufacturer or importer must immediately disclose the specific chemical identity, regardless of the existence of any written statements or confidentiality agreements.

If trade secret information is necessary during an emergency, any EA employee in conjunction with an appropriate health professional is authorized to contact the manufacturer or importer and make a request for the trade secret information.

In non-emergency situations, the chemical manufacturer or importer may be required to release the information but specific legal requirements must be met. In this case, only the Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations), under specific authority of the Director of Safety and Health, will initiate and conduct the request for trade secret release.

8.10 ADDITIONAL STATE-SPECIFIC REQUIREMENTS

Federal OSHA mandates minimum requirements for Hazard Communication Programs and administers the federal programs in many states. Some states, however, implement their own OSHA programs (State-Plan States) which must at least meet the federal requirements. Some State-Plan States require procedures more stringent than the federal requirements. In addition, some states may have passed Hazard Communication Program legislation that also exceeds federal OSHA requirements. The Regional Safety and Health Coordinator (office locations) or the Field Supervisor (field operations) is responsible to ensure compliance, as appropriate, with any additional state or local requirements.

OSHA State-Plan States currently include Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming.

For additional information, contact the Regional Safety and Health Coordinator, Field Supervisor, or the Director of Safety and Health.

9. OCCUPATIONAL HEALTH PROGRAM

During EA operations, personnel may be exposed to environmental factors and stresses that could affect their well being. Recognition and evaluation of the importance of these environmental factors (e.g., exposure to airborne contaminants, heat stress, and noise) will determine the need for measures to minimize and/or control exposures. In addition, medical surveillance and periodic exposure monitoring will be provided to ensure that the stresses are not affecting the health of employees.

9.1 RESPONSIBILITIES

9.1.1 Director of Safety and Health

The Director of Safety and Health will:

1. Maintain a Medical Director (physician) to provide guidance and oversee the medical surveillance program and make all medical determinations
2. Administer the Occupational Health Program, including coordination of EA's medical and first aid program.
3. Periodically conduct an industrial hygiene survey of EA operations involving potential employee exposure to chemicals, noise, and/or radiation. During the survey, areas requiring additional evaluation, e.g., air sampling, will be identified and scheduled for a follow-up investigation.
4. Develop an occupational health management information system. This system will be used to provide medical personnel with data regarding employees' exposures to potentially hazardous materials.
5. Make recommendations to management regarding the minimization or control of exposures to potentially hazardous materials.
6. Review projects or programs before their application to evaluate the potential impact on the health of employees.

9.1.2 Corporate Physician

The Corporate Physician will:

1. Consult with EA on the appropriate examination and tests for employees potentially exposed to hazardous materials.
2. Where and when warranted, conduct personnel medical evaluations.
3. Determine employees' ability to wear respirators.

9.2 MEDICAL SURVEILLANCE

Employees whose jobs require them to work with chemicals at levels that may be potentially hazardous to their health will be provided physical examinations. The Director of Safety and Health and EA's

Corporate Physician will identify employees to be included in the medical surveillance program. The purpose of the examination is to establish the baseline status of the employee's health and to determine the suitability of the employee for the job. Periodic surveillance may be necessary for individuals potentially exposed to hazardous materials regularly to ensure their work exposure is not impairing their well being.

EA's Corporate physician will notify the employee, in writing, of the results of their physical examination and medical tests.

Participants in EA's Medical Surveillance Program will receive Employee Medical Surveillance Report for Hazardous Waste Operations (Figure 9-1) annually for completion. The completed questionnaire will become part of each employee's permanent Safety and Health file as well as being used for the determination of their status in the Medical Surveillance Program.

9.3 FREQUENCY OF MEDICAL EXAMINATIONS

Personnel must pass a comprehensive medical examination prior to assignment to field sampling and exploration activities. The purpose of the examination is to establish the individual's baseline physiological data and to determine his/her ability to wear PPE, especially respirators.

The examination will be repeated annually for employees who are potentially exposed to hazardous materials for 30 days or more per year, employees who wear respirators for 30 days or more per year, and for employees who are members of hazardous materials teams. Whenever an employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or the employee has been exposed above the established exposure levels in an emergency situation, a medical examination will be performed. A medical examination will also be performed whenever an employee is terminated or reassigned to work that does not require his/her participation in the medical program. Employees who are potentially exposed to hazardous materials less than 30 days per year will receive biennial examinations.

9.3.1 Content of Medical Examinations

The protocol for medical examinations will be determined by the examining physician. However, the minimum requirements for initial and interim examination of EA employees is delineated in Table 9-1.

9.4 CERTIFICATION FORM TO EMPLOYER

The certification form provides a written opinion regarding each examined employee which includes the following:

1. The physician's written opinion as to whether the employee has detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or from the use of respirators.
2. The physician's recommended limitations upon the employee's work assignment.
3. A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

The written opinion must not reveal specific findings or diagnoses unrelated to the occupational exposure.

9.4.1 Recordkeeping Requirements

EA's medical provider will maintain a secure medical and exposure records storage location. The following information must be retained for duration of employment plus 30 years for each employee:

1. The name and social security number of the employee.
2. Physician's written opinions as described above.
3. Employee medical complaints related to exposure to hazardous substances.
4. Medical results.

9.5 FIRST AID TREATMENT

First aid training will be provided as needed. Designation of the appropriate individuals to be trained will be made by the Site Safety and Health Officer or Regional Safety and Health Coordinator or the Business Unit Directors. Crews working in locations that require more than a 15-minute response time for medical assistance but are unlikely to encounter serious medical harm will be required to have first aid and CPR training. If operations are such that serious medical emergencies may be encountered, then first aid and CPR training will be provided whenever response times are 4 minutes or more.

Only trained individuals will be permitted to treat EA employees. First aid supplies will be maintained in their custody, and it will be their responsibility to ensure that an adequate supply of materials is on hand at all times. First aid kits will also be maintained in boats and vehicles.

First aid kits will consist of appropriate items and will be stored in weatherproof containers with individual sealed packages of each type of item. The contents of the first aid kits will be checked before being sent to job sites, and will be checked weekly on job sites to ensure that expended items are replaced.

On all job sites where there is a potential for either eye or full body exposure to corrosive materials, procedures will be developed and facilities provided for quick drenching or flushing of the eyes.

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**EMPLOYEE MEDICAL SURVEILLANCE REPORT
FOR HAZARDOUS WASTE OPERATIONS**

Name: _____ Date of Evaluation: _____

The following is a summary of your recent evaluation. This examination is not intended to be a complete physical examination nor to substitute for regular visits to your private physician.

Abnormal Findings: _____

_____ There were no medical conditions related to occupational exposure which would place you at an increased risk of material impairment of your health.

_____ The following medical conditions related to occupational exposure would place you at an increased risk of material impairment of your health.

If you are a cigarette smoker, we strongly recommend that you stop smoking. We also suggest that you consult your private physician to discuss your:

_____ Blood pressure _____ Chest x-ray _____ Other
_____ Pulmonary function test _____ Blood studies

It is recommended that your activities or use of personal protective equipment, including respirators, be limited as follows:

_____ No limitations _____ See limitations below

We recommend a re-evaluation in _____ year(s).

Signature of Examiner

Date of Report

Telephone Number

Figure 9-1. Employee Medical Surveillance Report for Hazardous Waste Operations.

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Table 9-1—Medical Surveillance Protocol for Field Workers (Non-Asbestos)

Corporate Safety and Health Program Manual

October 2013

**TABLE 9-1 MEDICAL SURVEILLANCE PROTOCOL FOR FIELD WORKERS
(NON-ASBESTOS)**

Exam/Test/Procedure		Pre-Placement	Periodic (Annual/Biennial)	Termination
1.	Baseline occupational and medical history	X	X	
2.	Interim occupational and medical history		X	X
3.	Complete physical examination	X	X	X
4.	Screening (vision tester)	X	X	X
5.	Audiogram	X	X	(a)
6.	Electrocardiogram	X	(a)	(a)
7.	Pulmonary function test	X	X	X
8.	Chest x-ray	X	(a)	(a)
9.	Complete blood count with differential and platelets	X	X	X
10.	Biochemical blood profile	X	X	X
11.	Urinalysis with microscopic examination	X	X	X
12.	Other specific tests	(b)	(b)	(b)
13.	Report and copies to employee	X	X	X
14.	Certification form to employer	X	X	X
15.	Report and copies to EA corporate consulting physician	X	X	X
(a) Examination to be ordered by examining physician only if there are significant clinical indications from medical or work history or physical examination.				
(b) Tests to evaluate specific toxic exposures may be ordered by the examining physician in urgent situations or in routine examinations as previously arranged in specific protocol or as approved by EA.				

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10. PERSONAL PROTECTIVE EQUIPMENT

While the elimination of potential on-the-job hazards through engineering controls must be the goal of any safety and health program, it is neither practical nor feasible to do so in all operations. PPE must, therefore, sometimes be worn to prevent injury and illness of personnel from chemical, physical, and biological hazards. If the equipment is to be effective, i.e., protect the individual from harm, it must be properly selected, fitted, used, and maintained.

Workplace hazard assessments are to be conducted to determine if the use of head, eye, face, hand, or foot protection are required. Hazard assessments are to be conducted by the Regional Safety and Health Coordinators or designated Site Safety and Health Officers with support from the local managers and supervisors. These assessments must be documented (usually in the safety, health, and emergency response plan).

Training must be provided to each employee by the Site Safety and Health Officer and/or his/her designee on the use, limitations, proper fitting, and care and maintenance of PPE necessary to perform their job. This training must be documented and will contain the name of each employee trained, the date of training, the trainer's name, and the PPE training that was conducted. Employee re-training will be conducted when any workplace changes (making the earlier training obsolete; the type of PPE changes; or when the employee demonstrates lack of use, improper use, or insufficient skill or understanding). Employee-owned safety equipment is not allowed on any job site, and any EA-provided PPE that is deemed to be defective or damaged shall be replaced immediately.

10.1 RESPIRATORY PROTECTION

EA's Respiratory Protection Program is provided in Appendix A.

10.2 EYE AND FACE PROTECTION

Eye protection (industrial safety glasses or goggles) will be worn in any area designated and posted as an eye hazard area, e.g., laboratory, shop, etc. Visitors entering an eye hazard area will, at a minimum, wear visitors' safety glasses.

Specific operations/jobs may be identified by the Site Safety and Health Officer, Regional Safety and Health Coordinator, Director of Safety and Health, Profit Center Manager, or supervisor as requiring specific eye and face protection.

For EA employees who wear prescription glasses, safety glasses are available. The Regional Safety and Health Coordinator or Office Administrator can provide details.

10.3 HEARING PROTECTION

EA's Hearing Conservation Program is found in Chapter 15.

10.4 FOOT PROTECTION

Safety-toe boots will be worn by EA employees when field operations present a crushing hazard to workers feet, or objects piercing the sole, and where employees' feet are exposed to electrical hazards.

All safety-toe boots will meet the requirements specified in ANSI Standard Z41.1-1967 as required by 29 CFR 1926.96 and 29 CFR 1910.136.

10.5 HEAD PROTECTION

Head protection (hard hats) will be worn by EA employees whenever possible danger of head injury exists from impact, or from falling or flying objects, or from electrical shock and burns. The hard hat will meet the requirements in ANSI Standard Z89.1-1969 or Z89.2-1972 as required by 29 CFR 1926.100 and 29CFR1910.135. Hard hats may be labeled with EA logo stickers or adhesive name stickers but otherwise will not be painted, altered, or worn backwards unless the manufacturer had approved such use.

10.6 HAND PROTECTION

Appropriate hand protection, as determined in the hazard assessment, will be used by EA employees when employees' hands are exposed to hazards such as those from skin absorption and harmful substances; severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes.

10.7 TORSO PROTECTION

Appropriate protective clothing, as determined in the hazard assessment, will be worn by EA employees to protect against heat, splashes of hot metals and liquids, impacts, cuts, hazardous chemicals, and radiation.

11. DIVING SAFETY PROGRAM

11.1 OVERVIEW

EA's diving safety program has been developed out of the periodic need for employees to engage in underwater diving operations. These operations are in support of data collection activities for EA projects.

EA conducts or supervises diving operations through a variety of regulations covering all phases of diving. Rules and regulations established by the U.S. Coast Guard, Association of Diving Contractors, and OSHA contained in 29 CFR Part 1910, Subpart T, as well as those established by State governments have been used as guidelines in the preparation of this program. In addition, EA has utilized information contained in the U.S. Army Corps of Engineers EM 385-1-1, Section 30 (Diving Operations). Whenever conflicts between regulations occur, the more conservative shall apply. When diving operations are conducted in areas not covered by our diving safety program, local regulations must be ascertained. If a conflict between regulations or subcontractors exists, EA management will act as arbiter.

Changes and additions to the rules and regulations governing commercial diving operations occur periodically. As these changes to existing rules occur, or as proposed rules are finalized, areas which are in conflict with this chapter will be brought to the attention of the users and, as required, changes will be issued.

Detailed diving procedures as compiled by EA are provided in the Corporate Diving Procedures and Safe Practices Manual (Appendix B). This manual provides written operational procedures for diving performed or conducted on EA project sites. EA's Corporate Health and Safety Director shall periodically review this appendix to determine if it contains up-to-date safety procedures and checklists for diving operations, assignments and responsibilities of the dive team members, equipment procedures and checklists, and emergency procedures (at a minimum: fire, equipment malfunction or failure, adverse environmental conditions, and medical illness and injury). This guidance and procedures detailed within Appendix B must be supplemented with additional information specific to each diving operation.

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12. HAZARDOUS WASTE OPERATIONS PROGRAM

12.1 INTRODUCTION

Personnel involved in field sampling and exploration at sites where hazardous wastes may be present are potentially exposed to a variety of hazards including:

1. Inhalation of toxic airborne contaminants
2. Skin contact with contaminated soil and water
3. Presence of flammable/combustible vapors
4. Oxygen-deficient atmospheres
5. Heat stress due to protective clothing and environmental conditions
6. Physical hazards inherent to field operations (e.g., working near heavy equipment or at remote locations).

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

12.1.1 Purpose

The purpose of this program is to communicate EA's basic policies and procedures regarding safety and health during the performance of work involving hazardous wastes. This section introduces the reader to EA's Hazardous Waste Operations Program and critical references and definitions of terms used in this program. The general organizational structure for site operations is described in Section 12.2. EA's training requirements are specified in Section 12.3. In Section 12.4, EA's medical surveillance program is described in detail. EA's Personal Protection Program is delineated in Section 12.5. A comprehensive Work Plan for specific phases of EA's Hazardous Waste Operations Program is detailed in Section 12.6. In Section 12.7, EA's standard format for Site Safety and Health Plans is described.

12.1.2 Applicability

The procedures and requirements in this section apply to EA and subcontractor personnel involved in the field aspects of hazardous waste operations. Visitors who enter the work zones at the site will also be required to follow these requirements.

While performing various environmental projects, it may be necessary to perform ordnance and explosive and unexploded ordnance activities. For any activities associated with these, personnel will utilize EA's companion document, Corporate Ordnance and Explosive/Unexploded Ordnance Activities Plan, which establishes the minimal requirements for performing ordnance and explosive activities. There is no "safe" procedure for dealing with ordnance and explosive/unexploded ordnance, merely procedures that are considered less dangerous. Maximum safety in any ordnance and explosive operation, however, can be achieved through adherence to applicable safety precautions and a thoroughly planned approach. All personnel engaged in ordnance and explosive operations will be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures.

12.1.3 References

The following standards and technical references comprise the regulatory framework for development of this program:

1. U.S. Department of Labor, OSHA, *Hazardous Waste Operations and Emergency Response* Standard, 29 CFR 1926.65
2. U.S. Department of Labor, OSHA, *Personal Protective Equipment*, 29 CFR 1910, Subpart I
3. State of California, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)
4. NIOSH/OSHA/U.S. Coast Guard/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985, NIOSH Publication 85-115.

12.1.4 Definitions

Hazardous Substances—Any substance designated or listed under:

- Section 101(14) of CERCLA.
- Any biological agent and other disease-causing agents as defined in 104(33) of CERCLA.
- Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendixes.
- Hazardous waste exposure to which results or may result in adverse effects on the safety and health of employees.

Hazardous Waste—A waste or combination of wastes, as defined in 40 CFR 261.3, or those substances defined in 49 CFR 171.8.

Hazardous Waste Operation—Any field operation conducted involving employee exposure to hazardous wastes, hazardous substances, or any combination of hazardous wastes and hazardous substances.

Site Safety and Health Plan—A written site-specific plan establishing the policies and procedures that will be followed to reduce the risk of injury or illness to site workers and the public. This is also identified in this program as a site-specific safety, health, and emergency response plan.

Safety and Health Officer—The individual located on a hazardous waste site who has been assigned responsibility for site safety and health. This individual reports directly to the Project Manager and has the authority and knowledge necessary to implement the Site Safety and Health Plan.

12.1.5 Policy

The following basic policies apply to field operations involving hazardous wastes:

1. Personnel assigned to field operations involving hazardous wastes will participate in EA's medical surveillance program for hazardous waste operations.

2. Only personnel who have been certified as being trained as specified in Section 12.3 will be assigned to both supervise and do work involving hazardous waste or hazardous substances.
3. A Site Safety and Health Plan will be prepared for field work involving hazardous waste. This plan will be approved by the Project Manager prior to commencement of the work.
4. Compliance with the Site Safety and Health Plan will be documented by the Site Safety and Health Officer in the master copy of the Site Safety and Health Plan.

12.1.6 Preliminary Evaluation

A preliminary evaluation of site characteristics will be made to aid in the selection of appropriate employee protection methods. The following information, as appropriate, will be obtained by the Project Manager and forwarded to the Site Safety and Health Officer for review:

1. Location, description, and approximate size of the site
2. Description of the work tasks to be performed
3. Site topography
4. Site accessibility by air and roads
5. Any data concerning hazardous substances and other hazards potentially present at the site.

While reviewing this information, efforts will be made to identify conditions that may pose inhalation or skin absorption hazards that are IDLH or other conditions that may cause death or serious harm. The Site Safety and Health Officer, with the advice of the Director of Safety and Health or the Regional Safety and Health Coordinator, will determine:

1. Pathways for hazardous substance dispersion.
2. Present status and capabilities of emergency response teams that would provide assistance, if needed.
3. Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.
4. Whether an initial site entry (reconnaissance inspection) is required.
5. The procedures for and extent of the initial site entry.
6. Whether additional specialized safety and health expertise is needed (e.g., health physicist, ordnance expert).
7. The appropriate format for the site Safety and Health Plan.

No IDLH work will be permitted without approval of the Director of Safety and Health.

12.1.7 Initial Site Entry

During an initial site entry (reconnaissance inspection), special monitoring instrumentation and PPE and clothing may be stipulated by the Site Safety and Health Officer. Safety precautions required during the initial site entry (e.g., environmental monitoring, PPE, specific work practices) will be documented on the Initial Site Survey Form (Figure 12-1) along with a description of reconnaissance findings and environmental measurements.

The presence of the Director of Safety and Health or his/her designee and other technical experts may also be required. In some cases, usually for those sites determined to be of lower risk (e.g., work at gas stations or active industrial sites), the initial site entry may be conducted on the first day of the field work. The Project Manager and Site Safety and Health Officer will determine the scope of the initial site entry.

12.1.8 Site-Specific Safety and Health Plan

Following the preliminary evaluation, a site-specific Safety and Health Plan will be established to delineate the policies and procedures needed to protect site workers, the public, and the environment from the potential hazards posed by the hazardous waste site. EA will use a standard format for OSHA-required Site Safety and Health Plans:

1. **Standard Format**—The standard format will be used for hazardous waste operations covered by OSHA's *Hazardous Waste Operations and Emergency Response* Standard, 29 CFR 1926.65. It will also be used if a client specifies compliance with this standard even if it does not legally apply. This standard format addresses the minimum requirements specified by OSHA, which are described in Section 12.7.

12.2 ORGANIZATIONAL STRUCTURE

12.2.1 Chain of Command

The chain of command for EA's Hazardous Waste Operations Program is illustrated on Figure 12-2, Hazardous Waste Operations Program Management Structure. The Site Safety and Health Officer is responsible for ensuring the requirements of the site-specific Safety and Health Plan are implemented during field operations. On lower risk investigation sites, the Project Manager or Task Manager may perform these functions as a collateral duty.

The Regional Safety and Health Coordinator provides the primary technical advice regarding safety and health issues related to hazardous waste operations.

EA management is ultimately responsible for the safety and health of personnel involved in hazardous waste operations. Project managers are responsible for reviewing and approving site-specific Safety and Health Plans, monitoring compliance with program requirements, and communicating safety and health project or program needs to the Corporate Safety and Health Manager.

12.2.2 Responsibilities

Responsibility for EA's Hazardous Waste Operations Program is delineated below.

12.2.2.1 Chief Engineer/Quality Assurance Officer

The Chief Engineer/Quality Assurance Officer is responsible for:

1. Ensuring the adequate resources are made available to provide for the safety and health of employees.
2. Ensuring the effective application of the policy and procedures delineated in EA's Hazardous Waste Operations Program.

12.2.2.2 Director of Safety and Health/Certified Industrial Hygienist Team

The Director of Safety and Health reports directly to the Chief Engineer/Quality Assurance Officer and the Chief Operating Officer on matters of safety and health. Specific Hazardous Waste Operations Program responsibilities include:

1. Administer and coordinate EA's Hazardous Waste Operations Program.
2. Review site-specific Safety and Health Plans as delineated in this program.
3. Approve site-specific Safety and Health Plans as delineated in this program.
4. Develop and distribute Job Hazard Analysis of specific work operations as requested or determined appropriate.
5. Certify personnel as having satisfied the training requirements for hazardous waste operations.
6. Provide Hazardous Waste Operations Training, Management Training, and Annual Refresher Training.
7. Periodically monitor hazardous waste field activities to evaluate the effectiveness of the site-specific Safety and Health Plan.
8. Perform an annual audit of EA's Hazardous Waste Operations Program.

12.2.2.3 Business Unit Directors

Business Unit Directors are responsible for the safety and health of operations within their regional area. Specific responsibilities include:

1. Designate Site Safety and Health Officers to serve as liaison between Regional Safety and Health Coordinator and the field crews.
2. Ensure adequate resources are made available to provide for the safety and health of employees assigned to their office.
3. Ensure personnel comply with the requirements of this program and site-specific Safety and Health Plan.

12.2.2.4 Regional Safety and Health Coordinator

The Regional Safety and Health Coordinator (or designee) will:

1. Coordinate the office's Hazardous Waste Operations Program, including:
 - Medical surveillance
 - PPE
 - Training
 - Monitoring instruments
 - Recordkeeping.
2. Perform a preliminary evaluation of projects which potentially involve employee exposure to hazardous waste for the purpose of making an initial assessment of the scope of the work necessary to control site safety and health risks.
3. Develop and/or review Site Safety and Health Plans as directed by this procedure.
4. Approve Site Safety and Health Plans as directed by this procedure.
5. Maintain a hazardous waste operations reference library for the Business Group.
6. Maintain and issue PPE and monitoring instruments.

12.2.2.5 Proposal and/or Project Managers

Proposal and/or Project Managers will:

1. Advise the Safety and Health staff of projects which potentially involve employee exposure to hazardous waste. This should be in the proposal stage of the project so that project cost estimates will reflect the cost of safety considerations.
2. Ensure that subcontractors and site visitors who enter the site work zones are apprised of the safety and health requirements of the project and receive a copy of the Site Safety and Health Plan.
3. Periodically monitor the work site to ensure conformance with the site-specific Safety and Health Plan.
4. Advise the Regional Safety and Health Coordinator of any substantive changes in the Work Plan for a particular site.
5. Upon completion of the project, ensure that the master copy of the Site Safety and Health Plan has been forwarded to the Regional Safety and Health Coordinator along with summary results of any analytical findings regarding hazardous substances (Figure 12-3, End-of-Project Data Summary).
6. Approve the Site Safety and Health Plan.

12.2.2.6 Site Safety and Health Officer

The Site Safety and Health Officer is responsible for implementing the requirements of the Site Safety and Health Plan. In addition, he or she will:

1. Ensure that the employees assigned to a specific hazardous waste operations project meet the medical and training requirements of this program.
2. Conduct Pre-Entry Briefings and daily tailgate meetings with field personnel.
3. Maintain the master copy of the Site Safety and Health Plan.
4. Provide project oversight of field operations to ensure conformance with the Site Safety and Health Plan.
5. Investigate and report accidents and/or incidents to the Project Manager.
6. Consult with the Regional Safety and Health Coordinator and/or Director of Safety and Health on matters of safety and health.

12.2.2.7 Field Personnel

Field personnel (including subcontractor personnel) will be responsible for the following:

1. Compliance with the requirements of the Site Safety and Health Plan and the Hazardous Waste Operations Program.
2. Notifying his or her supervisor of any suspected safety or health hazard.
3. Reporting accidents, incidents, injuries, or illnesses to his or her supervisor.

12.3 TRAINING PROGRAM

Prior to assignment to field work involving hazardous waste operations, personnel must complete the necessary training as described in this section. It should be noted that these are the minimum training requirements. Site-specific conditions and anticipated hazards may require additional training, which will be specified in the Work Plan.

12.3.1 Training Certification

The Project Manager will be responsible for verifying that personnel involved in hazardous waste operations have received the required training. For field personnel, the minimum training requirements include the Initial Training and Field Experience. Onsite supervisors and managers will be required to complete the Initial Training, Field Experience, and the Management Training Course.

Recertification will be issued each year upon completion of the Annual Refresher Training Course.

12.3.2 Initial Training

The Initial Training will consist of the following:

1. Hazardous Waste Operations Training—40 hours - mandatory
2. First Aid Training (American Red Cross or equivalent) - desirable
3. Cardiopulmonary Resuscitation Training (American Red Cross or equivalent) – desirable.

At a minimum, the Hazardous Operations Training will satisfactorily cover the topics listed in the course outline in Figure 12-4. Previous training may be substituted if it is determined by Corporate Safety and Health to be equivalent.

Out-of-house training instructors must be qualified, based on academic degrees, training courses, and/or work experience, to instruct employees about the subject matter. This determination will be the responsibility of the Director of Safety and Health.

12.3.3 Field Experience

A minimum of 3 days of field experience under the direct supervision of a trained, experienced Site Safety and Health Officer will be required as part of the training certification.

12.3.4 Management and Supervisor Training

Project Managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive 8 hours of management training. The training will include information on managing site safety and health, field documentation, subcontractor compliance, managing site emergencies, and hazard analysis.

12.3.5 Pre-Entry Briefing

The Site Safety and Health Officer is responsible for briefing site personnel, both EA and subcontractor, on the nature, level, and degree of exposure likely as a result of participation in such hazardous waste operations. This information will also be contained in the Site Safety and Health Plan.

12.3.6 Advanced Respiratory Protection

Employees will be permitted to wear SCBA or airline respirators only after receiving training covering advanced respiratory protection. The training will include procedures for inspecting the equipment and experience in wearing the equipment during field exercises.

12.3.7 Annual Refresher Training

Employees assigned to field operations involving hazardous waste will receive Annual Refresher Training. The training will review topics presented in the Initial Training, significant revisions and interpretations of 29 CFR 1926.65 and EA's Hazardous Waste Operations Program, technological advancements, and any critique of incidents that have occurred in the past year that can serve as training examples of related work, and specific areas of concern to site workers and managers.

12.4 MEDICAL SURVEILLANCE PROGRAM

Personnel assigned to perform field work involving hazardous waste operations must be participants in EA's Medical Surveillance Program for Hazardous Waste Operations as described in Chapter 9.

12.5 PERSONAL PROTECTIVE EQUIPMENT

12.5.1 Site Hazards

The purpose of PPE and clothing is to protect personnel from the chemical, physical, and biological hazards that may be present at hazardous waste sites. Potential site hazards will be evaluated during the preliminary evaluation and the hazards analysis and the need for PPE identified.

12.5.2 Selection

Selection of the appropriate PPE will be performed by the Site Safety and Health Officer, with the advice of the Regional Safety and Health Coordinator. Equipment selected must meet the requirements of 29 CFR 1910, Subpart I. Selection will be based on an evaluation of the:

1. Performance characteristics of the PPE relative to the requirements and limitations of the site
2. Task-specific condition and duration
3. Hazards and potential hazards identified at the site.

Selection of the appropriate protective ensemble will generally conform to the EPA levels of protection as described in the NIOSH/OSHA/U.S. Coast Guard/EPA Occupational Safety and Health Guidance Manual Hazardous Waste Site Activities, October 1985, NIOSH Pub. 85-115. However, the ensemble must be tailored to the specific work conditions in order to provide the appropriate level of protection.

The type of equipment and level of protection must be reevaluated periodically by the Site Safety and Health Officer, in light of any new information about the site. The PPE will be upgraded or downgraded accordingly.

12.5.3 Use

PPE must be used properly or it will not provide the protection for which it was intended.

Use limitations include:

1. Facial hair will not be permitted between the face and the sealing surface of the respirator.
2. Long hair must be effectively contained within protective hair coverings.
3. Eyeglasses with earpiece bars must not be worn with full-facepiece respirators. A spectacle kit must be installed in the facepiece of workers requiring glasses.
4. Gum and tobacco chewing will not be permitted while wearing a respirator.

12.5.4 Work Mission Duration

The duration of each task must be determined prior to commencing each activity in consideration of the following:

1. Air supply consumption (work rate, fitness, body size, breathing patterns)
2. Ambient temperature
3. Permeation and penetration of chemical contaminants through protective clothing
4. Coolant supply for cooling garment.

12.5.5 Maintenance and Storage

Since most PPE used by EA is disposable, maintenance of PPE is primarily limited to respirators. Maintenance of respirators should only be performed by a person who has received specialized training. SCBA must be inspected monthly during periods of anticipated use and be serviced by the manufacturer or authorized facility at least annually. Cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the U.S. Department of Transportation (49 CFR Part 178).

Respirators must be stored in their cases or airtight bags to prevent damage from dust, moisture, sunlight, chemicals, and extreme temperatures. PPE must be stored in a clean area, away from potentially-contaminated equipment and clothing.

12.5.6 Decontamination

Decontamination procedures will be determined based on the anticipated contaminants. Wash tubs containing a detergent-water solution or another appropriate decontaminant solution and soft bristle brush will normally be used to decontaminate reusable personal protective clothing and boots.

Wash tubs containing clean, potable water will be used for the final rinsing. Equipment and solvents used for decontamination must be disposed of properly.

Since respirator facepiece surfaces must be in direct contact with the skin to be effective, respirators should not be washed in the same water as other PPE. Prior to reuse, each respirator must be dismantled and properly sanitized.

12.5.7 Training and Proper Fitting

PPE users will be properly trained in the following:

1. OSHA requirements (29 CFR 1910, Subparts I and Z)
2. Proper use and maintenance of PPE, including capabilities and limitations
3. Nature of the hazards and consequence of not using the PPE
4. Human factors influencing PPE performance

5. Instruction in inspecting, donning, checking, fitting, and using PPE
6. User's responsibility for decontamination, cleaning, maintenance, and repair of PPE
7. Emergency procedures in the event of PPE failure
8. Requirement for use of the buddy system
9. Specific procedures in the Site Safety and Health Plan regarding emergencies.

Proper fitting of PPE is essential if it is to provide adequate protection. If the clothing is too small, it will restrict movement and be subject to tearing. If it is too large, the excess fabric may become snagged on equipment and site obstructions.

Qualitative fit testing will be performed annually on personnel who are issued air purifying respirators and documented.

12.5.8 Donning and Doffing Procedures

A donning and doffing procedure should be established and practiced periodically. Assistance may be needed if SCBA equipment is worn. In general, the donning procedure will include:

1. Inspect the PPE
2. Adjust specific equipment to fit user, e.g., hard hat
3. Step into suit
4. Put on boots and tape leg to boot top
5. Don respirator and perform positive/negative fit test
6. Put on gloves and tape to sleeve
7. Put on hard hat, if needed
8. Raise hood over head and adjust
9. Have assistant check all closures.

Doffing procedures must be established to prevent contaminants from the work area from being transferred to the wearer's body. Direct contact with the outside surfaces of the PPE should be avoided.

Extraneous disposable PPE is usually removed first. Other PPE is removed as it is decontaminated. Respirators or inner gloves, depending on the level of contamination, should be the last piece of PPE to be removed.

12.5.9 Inspection

Inspection of PPE will be performed prior to use and will include those items listed on Figure 12-7. Inspection records will be maintained for self-contained breathing apparatus.

12.5.10 In-Use Monitoring

During equipment use, employees must be alert to conditions which may indicate that the effectiveness of the PPE has been diminished, including:

1. Degradation of the PPE
2. Perception of odors

3. Skin irritation
4. Unusual residues on PPE
5. Discomfort
6. Resistance to breathing
7. Fatigue due to respirator use
8. Interference with vision or communication
9. Restriction of movement
10. Personal responses such as rapid pulse, nausea, dizziness, headaches, and chest pain
11. Heat stress.

12.5.11 Evaluation of the Effectiveness of the Personal Protective Equipment Program

An annual evaluation of the effectiveness of the PPE Program will be conducted by the Director of Safety and Health. The following elements will be considered in the review:

1. Survey of work sites to ensure compliance with applicable regulations and program requirements
2. Accident and illness experience
3. Levels of exposure
4. Adequacy of equipment selection
5. Adequacy of operational guidelines
6. Adequacy of decontamination, cleaning, inspection, maintenance, and storage programs
7. Adequacy and effectiveness of training and fitting programs
8. Coordination with overall safety and health program elements
9. Adequacy of program records
10. Program deficiencies will be identified and recommendations presented to the President for improving the program.

12.5.12 Limitations

The limitations of PPE must be clearly communicated to employees using the equipment.

12.6 COMPREHENSIVE WORK PLAN

Prior to the commencement of onsite work, a Work Plan must be developed which describes the specific objectives of site operations and the logistics and resources required to achieve the goals.

12.6.1 Program Objectives

In providing clients with comprehensive scientific and engineering services, EA performs, or oversees, a variety of field sampling and exploration activities that involve potential exposure to the hazards associated with hazardous waste operation. These activities may include, but are not limited to:

1. Well drilling and ground-water sampling
2. Soil sampling
3. Surface water sampling
4. Geophysical surveys
5. Soil Vapor Contamination Assessment[®]
6. Wastewater sampling
7. Wipe or surface sampling
8. Surveying
9. Test pit excavation and sampling.

Site-specific objectives and each work task that will be performed at a hazardous waste site must be delineated in the Work Plan.

12.6.2 Methods and Work Tasks for Accomplishing Objectives

The methods for accomplishing the identified work tasks, or activities, must be fully described in the Work Plan.

12.6.3 Personnel Requirements

The Work Plan must determine the personnel requirements for performing the defined work tasks. Using the organizational structure described in Section 12.2 as a starting point, the Project Manager must determine the personnel needs for a particular project. Specific Task Managers and the Director of Safety and Health and/or Regional Safety and Health Coordinator should be consulted when determining personnel needs for a specific site and/or project.

For many of EA's investigative-type projects, a single individual will perform a number of the job functions (e.g., Site Manager and Site Safety and Health Officer). Additional specialists may need to be involved in specific projects (e.g., an ordnance expert or health physicist).

12.6.4 Training Requirements

Prior to work assignment involving hazardous waste operations, personnel training must be verified to be complete. However, the Work Plan should address the need for additional training if the work tasks that will be performed, and the conditions that may be encountered, dictate.

12.6.5 Informational Program Requirements

The Project Manager will ensure that employees and subcontractors receive a copy of EA's Site Safety and Health Plan. No personnel will be permitted onsite until they have reviewed the Site Safety and Health Plan and agreed to conform with the requirements of the Plan. Site personnel, both EA and subcontractor, will be briefed by the Site Safety and Health Officer on the nature, level, and degree of exposure likely as a result of participation in such hazardous waste operations.

12.6.6 Medical Surveillance Program Requirements

Personnel required to wear a respirator will have an initial medical exam prior to fit testing and respirator usage. Personnel assigned to perform work involving hazardous waste operations or who wear a respirator for 30 days or more per year must be participants in EA's Medical Surveillance Program for

Hazardous Waste Operations as described in Section 9.4. In some cases, additional medical surveillance tests may need to be performed.

12.7 SITE SAFETY AND HEALTH PLAN

Where required by OSHA or the client, the standard format for Site Safety and Health Plans will be used. The standard format must address to an appropriate degree all of the elements described in this section.

12.7.1 Site Identification and Location

The name of the project site and its address or physical location are identified in this section. An area map should be included.

12.7.2 Key Personnel

Key personnel and alternates responsible for site safety and health will be identified. At a minimum, this section must include the names of the Project Manager, Site Manager, and the Site Safety and Health Officer.

12.7.3 Purpose and Work Scope

Project objectives and the onsite work tasks necessary to meet these objectives must be summarized.

12.7.4 Site Description

Background information about the site (e.g., former uses/activities, hazardous substances involved) will be summarized in the site description section.

12.7.5 Hazard Analysis

Suspected conditions that may pose hazards to site personnel must be evaluated and described. The preliminary evaluation and/or the initial site entry (Sections 12.1.6 and 12.1.7) may identify the presence and concentrations, or potential concentrations, of specific hazardous substances and health hazards. The risks associated with these substances must be identified. The risks which must be evaluated include but are not limited to:

1. Potential physical hazards such as heat/cold stress, ergonomic/vibration, radiation, noise, heavy equipment, unguarded equipment, walking surfaces, and electrical, etc.
2. Exposures to airborne contaminants in excess of established safe limits
3. IDLH concentrations
4. Potential skin absorption and irritation sources
5. Potential eye irritation sources
6. Explosion sensitivity and flammability ranges
7. Potential biological hazards such as bloodborne pathogens, disease vectors, venomous arthropods, allergic reactions, etc.

Information about suspected or known contaminants will be summarized in the Hazardous Substances List in the Site Safety and Health Plan.

12.7.5.1 Employee Access to Information and Original Data

As part of EA's informational program, personnel who will be working at the site will be informed of any known or suspected risks associated with the site. Upon request, the original data which were used to make the risk evaluation will be made available to employees. The original data will be retained by the Project Manager along with the master copy of the Site Safety and Health Plan and other safety-related project documentation.

12.7.6 Employee Training Assignments

Training requirements which must be met prior to assignment to field activities will be identified by the Regional Safety and Health Coordinator and/or Corporate Safety and Health. In addition to the minimum hazardous waste operations training, special training may be required.

12.7.7 Medical Surveillance Requirements

Any requirements for medical surveillance, in addition to routine physical examination, will be included in this section (e.g., blood lead monitoring for lead exposure, RBC cholinesterase screening for pesticide exposure). For additional information see Section 9.4 of this manual.

12.7.8 Personal Protective Equipment

This section will list the specific PPE which must be used by employees for each of the site tasks and operations. EA's Respiratory Protection Program (Appendix A) will be used to develop this section in each Site Safety and Health Plan.

12.7.9 Environmental Monitoring

Appropriate monitoring will be performed in accordance with the following sections to assure proper selection of engineering controls, work practices, and PPE.

12.7.9.1 Direct Reading Instruments

Direct reading instruments will be used, as determined appropriate in the hazard analysis, at the time of initial entry and periodically thereafter. Periodic monitoring will be conducted under the following conditions:

1. When work begins on a different portion of the site
2. When contaminants other than those previously identified are being handled
3. A different type of operation is initiated
4. Personnel are handling leaking drums or containers or working in areas with obvious liquid contamination
5. A sufficient reasonable interval has passed so that exposures may have significantly increased.

The above recognizable indicators notwithstanding, a minimum frequency for the sampling will usually be specified (e.g., every hour).

The appropriate response (e.g., upgrade or downgrade PPE, increase or modification of air monitoring frequency, site evacuation) must also be specified. Typical responses are delineated on Figure 12-8.

Instruments will be issued to employees only after they have been trained in the proper operation, use, limitations, and calibration of the monitoring instrument and has demonstrated the skills necessary to operate the instrument. The Monitoring Instrument Training Record (Figure 12-9) will be used to document training.

12.7.9.2 Personal Air Sampling

Personal air sampling may be necessary to evaluate employee exposure to specific contaminants. This will be determined on a site-by-site basis after review of the anticipated air contaminants and evaluation of the potential for exposure of site workers.

12.7.10 Site Control

Appropriate site control procedures must be established which may include provisions for:

1. Delineation of work zones
2. A site map
3. Use of the “buddy system”
4. Site communications
5. Safe work practices
6. Identification of the nearest medical facility.

12.7.10.1 Work Zones

If, based on the hazard analysis, the definition of work zones is required to control site hazards, the hazardous waste site will be divided into at least three zones:

1. *Zone 1*—Exclusion Zone
2. *Zone 2*—Contamination-Reduction Zone
3. *Zone 3*—Support Zone.

These zones will be established on the basis of contamination potential ranging from the highest levels of contamination in the Exclusion Zone to no contamination in the Support Zone. Where feasible, zones will be defined and marked on the site map. Barricades and placards will be used at the site to control access to work zones, as determined by the Site Safety and Health Officer.

The Exclusion Zone will be the area of greatest environmental contamination and presents the highest risk for worker exposure. Personnel entering this area will be required to wear personal protection. In some instances, more than one level of protection will be required within the same zone, depending on the tasks to be performed. The Contamination Reduction Zone will act as a transition between the contaminated and clean areas. Decontamination of equipment and clothing will occur in this zone. The Support Zone will be considered the non-contaminated or clean area. Support equipment should be located in this zone.

12.7.11 Decontamination

Standard operating procedures for minimizing employee contact with hazardous substances or with equipment that has contacted hazardous substances must be developed and described in this section of the Site Safety and Health Plan. The Site Safety and Health Officer will monitor compliance with the established decontamination procedures, taking appropriate steps to correct any deficiencies.

12.7.11.1 Personnel Decontamination

Personnel leaving a contaminated area must be appropriately decontaminated. If a site worker's non-impermeable clothing becomes wetted with hazardous substances, he or she must immediately remove the clothing and proceed to shower or wash the affected area.

12.7.11.2 Clothing and Equipment Decontamination

Clothing and equipment must be appropriately disposed of or be decontaminated upon leaving a contaminated area or being reused. Decontamination requirements will vary with the level of protection required. In most situations, EA uses disposal protective clothing. For most investigations, the following procedure will be adequate.

- Personnel will complete appropriate decontamination procedures prior to leaving the site. Receptacles will be provided for disposable clothing. The receptacles will be conventional trash cans lined with heavy duty polyethylene trash bags. Wash tubs containing a detergent-water solution or another appropriate solution and soft bristle brush will be used to decontaminate reusable personal protective clothing and boots. Wash tubs containing clean, potable water will be used for the final rinsing.

12.7.11.3 Disposal of Decontamination Materials

Equipment and materials used for decontamination must be disposed of properly.

12.7.12 Emergency Response Plan

As required by the Regional Safety and Health Coordinator, a list of emergency telephone numbers and directions to the nearest hospital will be included in the Site Safety and Health Plan. At hazardous waste cleanup sites and other sites as designated, an emergency response plan, which is a separate section of the Site Safety and Health Plan, will be developed. The plan will address:

1. Pre-emergency planning
2. Personnel roles, lines of authority, training, and communication
3. Emergency recognition and prevention
4. Safe distances and places of refuge
5. Site security and control
6. Evacuation routes and procedures
7. Decontamination
8. Emergency medical treatment and first aid
9. Emergency alerting and response procedures
10. A critique of response and follow-up
11. PPE and emergency equipment.

The plan will also provide a description of the site topography, layout, and prevailing wind conditions and procedures for reporting incidents to local, state, and governmental agencies.

12.7.13 Confined Space Entry Procedures

Prior to entry of any confined or enclosed space (e.g., manholes, vaults, tanks, etc.), precautions must be established to ensure the risk of injury is minimized. Procedures for testing the atmosphere before entry will usually include oxygen level, flammability, and known or suspected toxic substances. Ventilation, PPE, communication system requirements, work practice, and rescue procedure must also be considered and specified. Chapter 13 contains EA's Confined Space Entry Program.

12.7.14 Spill Containment Program

If major spills may be anticipated due to the type of work involved (e.g., overpacking drums, pumping out lagoons), a spill containment program must be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Adequate supplies for containment must be onsite. Procedures for notification of key personnel will also be delineated.



Job Site: _____
Survey Conducted by: _____

[illegible]

Figure 12-1. Initial Site Survey Form.

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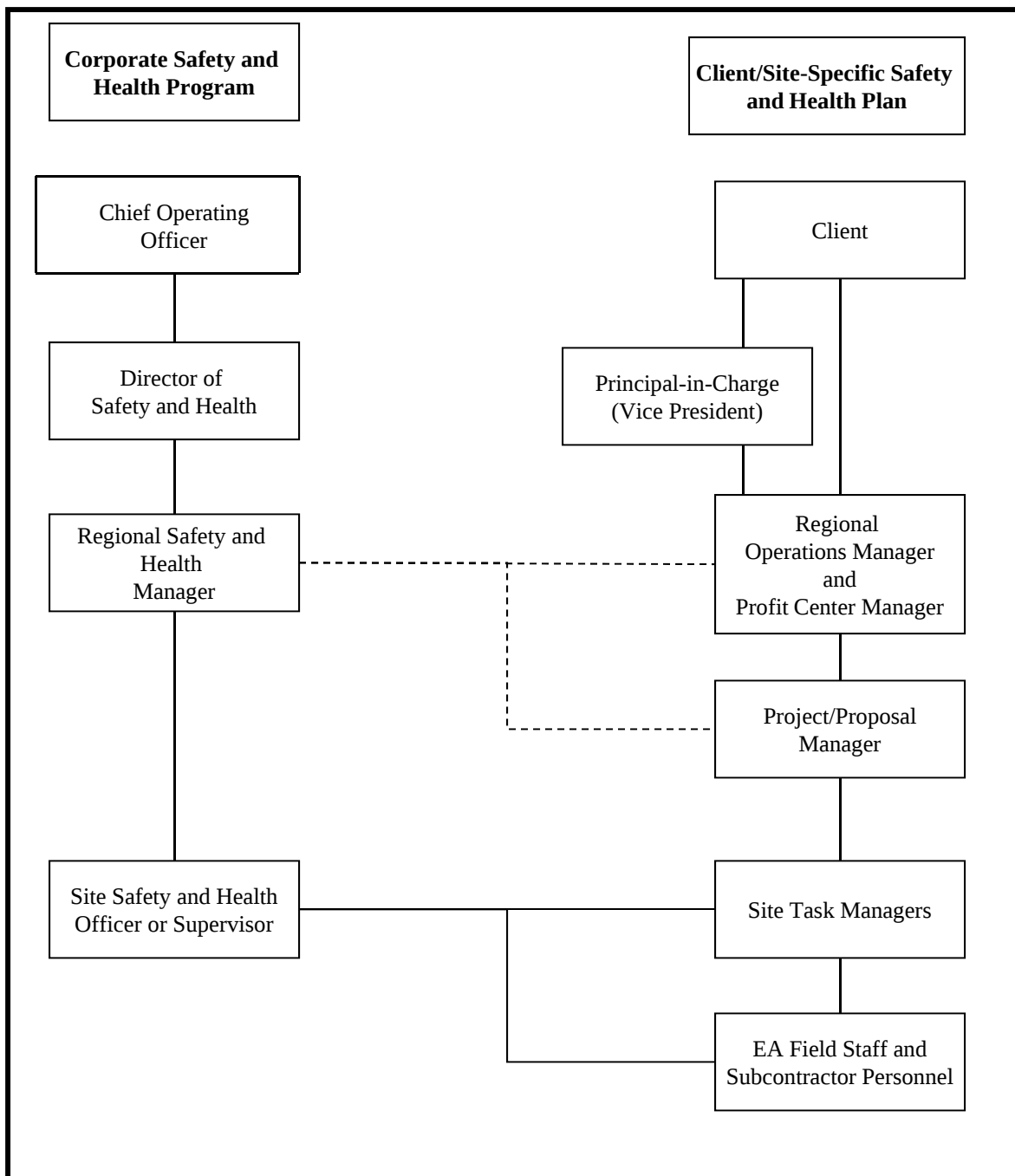
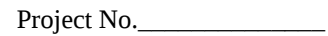


Figure 12-2. Hazardous Waste Operations Program Management Structure.

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Site: _____
Location: _____

Prepared by:

Project Manager Date

Reviewed by:

Regional Safety and Health Coordinator Date

Figure 12-3. End-of-Project Data Summary.

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EA HAZARDOUS WASTE OPERATIONS TRAINING COURSE OUTLINE

Introduction:

- EA's Hazardous Waste Operations Program
- Certification Requirements
- Course Requirements

Implications of OSHA Regulation 29 CFR 1910.120:

- Superfund Amendments and Reauthorization Act
- 29 CFR 1910.120 Document Review

Toxicology:

- Definitions and Terminology
- Exposure Limits
- Routes of Exposure
- Factors Influencing Toxicological Effects
- Effects of Combined Chemicals

Health Hazards:

- Chemical Exposures
- Effects of Extreme Temperatures
- Oxygen Deficient/Enriched Atmospheres
- Radiation
- Safety Hazards
- Hazard Assessment

Medical Surveillance:

- Personnel Covered
- Onsite Health Monitoring

Personal Protective Clothing:

- Situations Requiring Use
- Selection Procedure
- Types of Personal Protective Clothing
- Levels of Protection

Respiratory Protection:

- Respiratory Hazards
- Selection Procedure
- Protection Types

Monitoring:

- Purpose
- Direct Reading Instruments
- Personal Sampling Equipment

Decontamination:

- Purpose
- Decontamination Equipment
- Decontamination Procedures

Site Control:

- Personnel
- Responsibilities
- Site Work Zones
- Site Communications
- Site Map
- Safe Work Practices

Site Characterization and Analysis:

- Preliminary Evaluation
- Initial Site Survey

Site Safety and Health Plan:

- Applications
- Contents

Figure 12-4. EA Hazardous Waste Operations Training Course Outline.

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FIELD EXPERIENCE RECORD

Site: _____

Location: _____

_____ performed satisfactorily during ____ day(s) of supervised onsite activities.

Work tasks performed: _____

Personal protective equipment worn: _____

Safety equipment used: _____

Comments: _____

Site Safety and Health Supervisor Signature

Date

Employee Signature

Date

Figure 12-5. Field Experience Record.

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RESPIRATOR FIT TEST RECORD

Name: _____
Company/Office: _____
Fit Test Date: _____

Social Security No: _____
Last Medical Exam: _____

Corrective Lenses Needed Yes _ No _

Briefed on fundamental principles of respiratory protection, use selection, inspection, cleaning, maintenance, and storage of equipment Yes _ No _

Isoamyl acetate odor recognition. Pass _ Fail _

	<u>Respirator 1</u>	<u>Respirator 2</u>	<u>Respirator 3</u>
Equipment Type			
Manufacturer			
Model			
Size			
Facepiece composition (Rubber/Silicone)			
<u>Test performed</u>	<u>Respirator 1</u>	<u>Respirator 2</u>	<u>Respirator 3</u>
Negative Pressure Test	Pass _ Fail _	Pass _ Fail _	Pass _ Fail _
Positive Pressure Test	Pass _ Fail _	Pass _ Fail _	Pass _ Fail _
Isoamyl Acetate Test	Pass _ Fail _	Pass _ Fail _	Pass _ Fail _
Irritant Smoke Test	Pass _ Fail _	Pass _ Fail _	Pass _ Fail _

The individual named above has been fit tested according to procedures specified according to EA Engineering, Science, and Technology Safety and Health protocols. This qualitative fit test protocol has been adapted from OSHA 29 CFR 1910 and 29 CFR 1926.

Examiner's Name

Examiner's Signature

Date

Employee's Name

Employee's Signature

Date

Figure 12-6. Respirator Fit Test Record.

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CLOTHING	
Before use: • Determine that the clothing material is correct for the specified task at hand • Visually inspect for: — Imperfect seams — Non-uniform coatings — Tears — Malfunctioning closures • Hold up to light and check for pinholes • Flex product: — Observe for cracks — Observe for other signs of shelf deterioration • If the product has been used previously, inspect inside and out for signs of chemical attack: — Discoloration — Swelling — Stiffness During the work task, periodically inspect for: • Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without visible any effects • Closure failure • Tears • Punctures • Seam discontinuities	
GLOVES	
• BEFORE USE, pressurize gloves to check for pinholes. Either blow into gloves, then roll gauntlet toward fingers, or inflate glove and hold under water; in either case, no air should escape.	
FULLY-ENCAPSULATING SUITE	
Before use: • Check the operation of pressure relief valves • Inspect the fitting of wrists, ankles, and neck • Check faceshield, if so equipped, for: — Cracks — Crazing — Fogginess	
RESPIRATORS	
SCBA • Inspect SCBAs — Before and after each use — At least monthly when in storage — Every time they are cleaned • Check all connections for tightness • Check material conditions for: — Signs of pliability — Signs of deterioration — Signs of distortion • Check for proper setting and operation of regulators and valves (according to manufacturer's recommendations) • Check operation of alarm(s) • Check faceshields and lenses for: — Cracks — Crazing — Fogginess	
SOURCE: NIOSH/OSHA/USCG/EPA. 1985. Occupational Safety and Health Guidance Manual Hazardous Waste Site Activities. NIOSH Publication 85-115. October.	

Figure 12-7. Inspection of Personal Protective Equipment.

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GUIDELINES FOR ATMOSPHERIC HAZARDS^(a)

Hazard ^(b)	Monitoring Equipment ^(c)	Measured Level	Action
Explosive atmosphere	Combustible gas indicator	$<10\%$ LEL ^(d) 10-25% LEL >25% LEL	Continue investigation. Continue onsite monitoring with extreme caution as higher levels are encountered. Explosion hazard. Withdraw from area immediately.
Oxygen	Oxygen concentration meter	$<19.5\%$ 19.5%–25% >25%	Monitor wearing self-contained breathing apparatus. NOTE: Combustible gas readings are not valid in atmospheres with $<19.5\%$ oxygen. Continue investigation with caution. Deviation from normal level may be due to the presence of other substances. Fire hazard potential. Discontinue investigation. Consult a fire safety specialist.
Radiation	Radiation survey equipment	≈ 2 mREM/hour ^{(e)(f)} >2 mREM/hour	Radiation above background levels (normally 0.01-0.02 mREM/hour) ^(g) signifies the possible presence of radiation sources. Continue investigation with caution. Perform thorough monitoring. Consult with a health physicist. Potential radiation hazard. Evacuate site. Continue investigation only upon the advice of a health physicist.
Inorganic and organic gases and vapors	Colorimetric tubes Chemical-specific instruments, including halide meter, hydrogen sulfide detector, carbon monoxide monitor, and mercury meter	Depends on chemical	Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. ^(h)
Organic gases and vapors	Portable photoionizer Organic vapor analyzer (1) Operated in gas chromatography mode (2) Operated in survey mode	Depends on chemical	Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. ^(h)

(a) Based on *Standard Operating Guides*. U.S. EPA. December 1984.

(b) These are general classes of hazards. Not all components of these classes can be measured.

(c) Consult manufacturers' literature for use limitations associated with the specific equipment and for the specific substances the equipment can detect.

(d) LEL = Lower explosive limit.

(e) mREM/hr = milliRoentgen Equivalent in Man per hour.

(f) Source: U.S. Nuclear Regulatory Commission Rules and Regulations. 10 CFR Chapter 1, Part 20.105.

(g) Source: Sax, I.N. 1979. *Dangerous Properties of Industrial Materials*. Fifth Edition, p. 167. Van Nostrand Reinhold Company, New York.

(h) PEL = OSHA permissible exposure limit.

REL = NIOSH recommended exposure limit.

TLV = ACGIH threshold limit value.

NOTE: Adapted from NIOSH/OSHA/USCG/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985.

Figure 12-8. Guidelines for Atmospheric Hazards.

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MONITORING INSTRUMENT TRAINING RECORD

(Name) _____ has been trained in the proper operation, calibration, and limitations of the following monitoring instrument(s) and has demonstrated the skills necessary to operate the instrument(s) during field investigations.

Instrument	Date of Training	Instructor	Trainee
Foxboro OVA flame ionization detector			
HNu photionization detector			
TIP photoionization detector			
Draeger sampling pump			
Combustible gas indicator/oxygen analyzer			
OTHER:			

Figure 12-9. Monitoring Instrument Training Record.

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13. CONFINED SPACE ENTRY PROGRAM

13.1 INTRODUCTION

Confined spaces present unique hazards due to their configuration and/or contents. If air circulation is restricted, hazardous atmosphere may accumulate quickly. There may be entrapment hazards. The limited space can increase the risk of injury or death by making employees work closer to hazards than they otherwise would. Workplace hazards encountered elsewhere, such as electrical shock and contact with machinery and chemicals, may also be encountered in confined spaces, but may be intensified by the conditions of confined space work. Asphyxiation, fire(s) and explosion, toxic atmosphere, engulfment, and mechanical hazards have been identified as causes of fatalities in confined space entries. Historically, the largest number of fatalities have been untrained rescuers.

Confined space entry is to be avoided whenever possible. If confined space entry at a specific location is anticipated, the Project Manager will be notified prior to entry. If it is deemed that confined space entry is necessary, the program that follows will be implemented.

13.2 SCOPE

The purpose of this program is to ensure that permit-required confined space operations are conducted in a manner that will protect worker health and reduce accidental injury, illness, and death associated with personnel entering, working in, and exiting from confined spaces. The procedures and requirements of this section apply to personnel working in and around confined spaces (see Section 13.3).

This confined space program contains the following policies designed to protect employees:

1. Only trained personnel who are familiar with the requirements of this program will be authorized to participate in permit-required confined space operations.
2. Prior to obtaining a confined space entry permit, confined spaces will be certified as ready for entry by a qualified or competent person.
3. A confined space entry permit (Figure 13-1) will be issued by a competent person and approved by the Director of Safety and Health or designee before the performance of any work within a confined space. This permit will become a part of the permanent record of the project site. A copy of the permit will be posted at entrances to the space.
4. The Site Manager may also serve as a confined space attendant if no other site operations that remove the manager's attention from the confined space operation take place.
5. The buddy system will be strictly enforced—no personnel may work alone at a confined space site. At least one attendant will be in position each time a worker enters the confined space.
6. Access and egress for confined spaces will meet the requirements of the OSHA standard for means of egress, 29 CFR 1910.37. Portable ladders used to gain access to a confined space will meet the requirements of 29 CFR 1910.25, 1910.26, and 1910.27.
7. Any deviation from these confined space entry procedures requires the prior written approval of the Director of Safety and Health, Program Safety and Health Officers, or designees.

13.3 DEFINITIONS

Action Level—Atmospheric concentrations at which action will be taken to reduce, limit, or eliminate worker exposure to the substance(s) of concern. Action levels may be set by OSHA or, in the absence of standards, by the Director of Safety and Health, Program Safety and Health Officers, or designees, based on an evaluation of hazards and OSHA exposure limits or other standards and guidelines.

Confined Space—An enclosed space that meets all of the following characteristics:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work.
2. Has limited or restricted means for entry or exit.
3. Is not designed for continuous employee occupancy.
4. Permit-required confined space meets all of the above and has one or more of the following characteristics.

Confined Space Attendant—An individual stationed outside the confined space assigned to monitor the activities of personnel working within a confined space. The confined space attendant monitors and provides external assistance to those inside the confined space, and summons rescue personnel in the event of an emergency and assists the rescue team. The Confined Space Attendant at no time enters the confined space to attempt a rescue. Also known as the “Top Watch.”

The attendant may also be the Site Safety and Health Officer if no other site operations take place simultaneously that may remove his or her attention from the confined space.

Dangerous Atmosphere—An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (i.e., escape unaided from a confined or enclosed space), injury, or acute illness.

Double Block and Bleed—Physically closing, locking, and tagging two in-line valves on a piping system and opening a “vented-to-atmosphere” relief or drain valve between them.

Entry—The action by which any part of the entrant’s body breaks the plane of an opening into a confined space. Only those personnel authorized by the confined space entry permit may be confined space entrants.

Entry Permit (Section 13.5)—A written authorization and approval to grant worker entry. The permit is written by the Director of Safety and Health or designated representative and signed by the Project Manager or Site Manager after a hazard evaluation has been conducted by the Director of Safety and Health or designated person. It is issued for a specific type of job and location and defines the conditions under which the space may be entered and specific practices and procedures to minimize known or potential hazards; states the reasons for entry and the anticipated hazards of the entry; lists eligible attendants, entrants, and personnel in charge of entry (i.e., management personnel who are directly responsible for oversight of planned entry operations); and establishes the length of time for which the permit may remain valid.

Hazardous Atmosphere (Section 13.3)—Atmosphere that exposes employees to a risk of death, incapacitation, injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist concentrations exceeding 10 percent of the lower explosive limit.
- Dust or fog at concentrations obscuring vision at a distance of less than or equal to 5 ft.
- Oxygen concentrations less than 19.5 percent or greater than 23.5 percent.
- Toxic gas concentrations exceeding OSHA regulatory requirements (i.e., permissible exposure limits [PELs] and/or other guidelines, criteria, or action limits).
- Concentrations that are immediately dangerous to life and health.

Isolation—A process in which the confined space is removed from service and completely protected against the inadvertent release of material during one or more of the following procedures: placing a skillet-type metal blank between flanges; misaligning sections of lines and pipes; using a double block and bleed system; locking out sources of power or electricity; and blocking or disconnecting mechanical linkages.

Lockout—The placement of a lock/tag on an energy-isolating device in accordance with OSHA regulations, indicating that the energy-isolating device will not be operated until removal of the lock/tag according to an established procedure.

Lower Explosive Limit—The minimum concentration of a combustible gas or vapor in air (usually expressed in percent by volume at sea level) that will ignite if an ignition source or sufficient ignition energy is present. (The lower explosive limit is also referred to as the lower flammable limit).

Non-Permit Required Confined Space—A space which, after evaluation, does not contain a toxic or flammable atmosphere, has an oxygen level between 19.5 and 23.5 percent, and presents little potential for generation of hazards.

Oxygen-Deficient Atmosphere—An atmosphere containing less than 19.5 percent available oxygen by volume.

Oxygen-Enriched Atmosphere—An atmosphere containing greater than 23.5 percent available oxygen by volume.

Permissible Exposure Limit—The exposure limit specified in 29 CFR 1910, Subparts G and Z. An 8-hour time-weighted average (TWA) PEL is defined as the TWA concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Permit-Required Confined Space—A confined space that:

- Contains or potentially contains a hazardous atmosphere
- Contains a material with the potential for engulfment of an entrant

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor that slopes downward and tapers to a smaller cross-section
- Contains any other recognized serious safety or health hazard.

Purging—Displacement of gases, vapors, or other airborne contaminants from a confined space. Method may include inerting, a process by which the atmosphere is displaced by a non-reactive gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible (and also becomes oxygen-deficient).

13.4 ROLES AND RESPONSIBILITIES

Specific responsibilities of personnel under this Confined Space Entry Program are discussed below.

13.4.1 Director of Safety and Health and Regional Safety and Health Coordinator

The Director of Safety and Health and Regional Safety and Health Coordinators may designate a qualified person to authorize confined space entry. The Director of Safety and Health or other designated individual performs the following tasks:

1. Administer and coordinate the Confined Space Entry Program.
2. Ensure that confined space entry training is provided to personnel entering, attending, working near, managing, or otherwise participating in confined space operations. Certify that project personnel have satisfied training requirements for confined space operations.
3. Evaluate proposed confined space operations and determine need for entry and prepares Confined Space Entry Permits as needed. In conjunction with the Project Manager, authorize entry by approving (signing) permits for confined space operations.
4. Review and approve any deviation from confined space entry procedures presented in this Confined Space Entry Program.
5. Conduct initial site reconnaissance to evaluate confined space hazards, as needed.
6. Provide safety and health technical support on confined space projects.

13.4.2 Project Manager

The Project Manager will:

1. Inform the Regional Safety and Health Coordinator of any operations potentially involving entry into a space that meets the confined space definitions presented in Section 13.3(b) and 13.3(o) and supply Regional Safety and Health Coordinator with scope of work and available information for review. Obtain all available information from the client on potential hazards, workplace safety rules, and emergency procedures.
2. Aid in preparation and review of the Confined Space Entry Permit, in conjunction with the Regional Safety and Health Coordinator.

3. Require that subcontractors who enter confined spaces submit evidence of confined space training.
4. Submit a copy of the Confined Space Entry Permit to subcontractors who will enter confined spaces prior to each entry.
5. Delegate authority to the Site Manager to implement the Confined Space Entry Permit.
6. Periodically audit the work site to ensure conformance with the Permit requirements.
7. Advise the Regional Safety and Health Coordinator of any substantive changes in scopes of confined space work or of changes in working conditions.
8. Cancel the entry authorization and terminate entry whenever conditions unacceptable to entry (as defined in the Confined Space Entry Permit) are present.
9. Upon completion of the project, at the end of the shift, or upon cancellation of the permit, ensure that the Confined Space Entry Permit is removed from the site, canceled, and placed in the project file.

13.4.3 Site Manager

1. The Site Manager is responsible for implementing the Work Plan in the field and for supervising other employees.
2. Site Managers will:
 - Sign the Confined Space Entry Permit immediately before entry and post it in a conspicuous location at the entry site
 - Conduct a pre-entry briefing with all entrants and attendants
 - Enforce the Confined Space Entry Permit requirements
 - Cancel the entry authorization and terminate entry whenever conditions unacceptable to entry are present
 - Upon completion of the entry, remove the permit and forward it to the Project Manager
 - Upon completion of the entry, ensure that the space is properly closed and secured and returned to its original condition or is treated in accordance with the Work Plan.

13.4.4 Confined Space Attendant

Duties include:

1. Establish and instruct personnel concerning standardized hand signals, horn or siren signals, and/or tugs on lifeline signals for situations when verbal communication is hampered (see Section 13.10).

2. Ensure that conditions of the permit are met before allowing entry and during activities inside the space.
3. Recognize potential confined space hazards and monitor activities inside and outside confined spaces to determine if it is safe for entrants to enter or remain in the space.
4. Maintain visual and/or audible contact with confined space entrants at all times while person(s) are inside confined spaces.
5. Initiate evacuation and emergency procedures as judged necessary.
6. Summon rescue and other services in the event of an emergency. Do not enter the confined space for any reason prior to arrival of back-up rescue service(s).
7. Ensure that no unauthorized personnel enter the confined space. If unauthorized personnel do gain entry to the space, notify the Site Manager and the Project Manager.
8. Ensure that site-specific methods for contacting personnel are in place onsite. Inspect and test rescue equipment and practice rescue procedures before entry.
9. Consult with the Director of Safety and Health or the Regional Safety and Health Coordinator on matters of safety and health.

13.4.5 Confined Space Entrants

1. Know potential hazards of confined spaces, recognize signs and symptoms of exposure to those hazards, and understand the consequences of such exposure.
2. Use assigned PPE properly.
3. Comply with the requirements of the Confined Space Entry Permit and this Confined Space Entry Program.
4. Maintain contact with the confined space attendant. Notify the attendant when entrants self-initiate evacuation of a confined space.
5. Notify Site Manager immediately of any suspected safety or health hazards.
6. Report accidents, injuries, illnesses, and incidents to the Site Safety and Health Officer.

13.5 HAZARD EVALUATION

The purposes of the hazard evaluation are to protect workers against confined space hazards by controlling the hazard as much as possible, and to determine if a permit is required. Among the hazards associated with confined spaces are hazardous atmospheres, engulfment hazards, mechanical hazards, and hazards associated with rescue in cases of emergency. Hazards will be evaluated before entry by identifying: past and current uses of the confined space; the physical characteristics of the space; existing and potential hazards and the probability and magnitude of these hazards occurring; and the impact of the hazard occurrence on entrants. The Project Manager will obtain available information from the client point-of-contact.

13.5.1 Hazardous Atmospheres

A hazardous atmosphere is defined as any atmosphere having one or more of the following characteristics:

1. Concentrations of flammable gases, vapors, or mists exceeding 10 percent of the lower explosive limit. OSHA defines a flammable atmosphere as an atmosphere posing a hazard due to the presence of flammable gases, vapors, or dusts at concentrations exceeding 10 percent of their lower explosive limit. A flammable atmosphere may arise from enriched oxygen atmospheres, volatilization of flammable liquids, byproducts of work, chemical reactions, concentrations of combustible dusts, and desorption of chemicals from inner surfaces of the confined space. In many situations, the initial concentrations of certain chemicals inside the space may be too high (i.e., too rich) to pose an explosion hazard. However, flammable concentrations may be reached during the dilution of these chemicals through ventilation of the space or other “vapor-freeing” operations. In addition, many gases are heavier than air and will accumulate in low-lying areas in pits, sewers, and storage tanks; therefore, it is important to test all confined space areas to be occupied, not simply the entry point air.
2. Dust or fog at concentrations that cause vision to be obscured at a distance of 5 ft or less. OSHA established this criterion to estimate the point at which dust concentrations may be sufficiently high to cause a combustion hazard. Also, loss of visibility to this degree may inhibit the ability of entrants to evacuate rapidly in case of an emergency. In addition, confined space hazards such as slip, trip, and fall hazards may not be seen, leading to injuries and accidents.
3. Oxygen concentrations below 19.5 percent or greater than 23.5 percent. The oxygen level in a confined space can decrease due to: the displacement of oxygen by another gas (e.g., methane or gasoline vapors); the type of work being done (e.g., welding or cutting); certain chemical reactions (e.g., rusting); or through bacterial action (fermentation). Physiological effects of oxygen deficiency, which occur extremely rapidly upon exposure to such atmospheres, include: impaired judgment, attention, and coordination; increased respiration and heart rate; nausea and vomiting; brain damage; heart damage; unconsciousness; and death.
4. Toxic concentrations of chemicals exceeding occupational exposure limits (e.g., OSHA-PEL, NIOSH-recommended exposure limits, or American Conference of Government Industrial Hygienists threshold limit values). OSHA defines a toxic atmosphere as an atmosphere with gases, vapors, dusts, or fumes known to have poisonous physiological effects regardless of the oxygen concentration. Common sources of toxic atmospheres in confined space include the product stored in space (e.g., gasoline), operations performed in the space (e.g., welding), or products of chemical reactions taking place inside the tank (e.g., carbon monoxide, carbon dioxide, and hydrogen sulfide). Carbon monoxide is formed from incomplete combustion of organic materials such as wood, coal, gas, oil, and gasoline. It may also be a product of microbial decomposition of organic materials in sewers, silos, and fermentation tanks. It is particularly hazardous since it is undetectable without monitoring equipment, being both colorless and odorless. Poor work practices (e.g., placing vehicles with engines running near intakes for confined space ventilation systems) may cause exhaust toxicants, such as carbon monoxide, to be transferred into the space and have led to fatalities.

Specific physiological effects due to toxic atmospheres depend on the toxicity characteristics of the chemicals of concern.

5. Atmospheres that are IDLH. IDLH means any condition that poses an immediate threat of loss of life; may result in irreversible or immediate, severe health effect (e.g., loss of consciousness); may result in eye damage; and/or causes irritation or other condition that could impair escape from a confined space.

13.5.2 Engulfment Hazards

Personnel involved in confined space operations may become trapped or enveloped, usually by dry bulk materials such as collapsing soils in trenches or test pits or grain in a storage silo. These personnel are subject to asphyxiation by inhalation of the enveloping materials, by compression of the body's torso by the material, or by the physical characteristics of the material (e.g., its corrosivity).

13.5.3 Mechanical Hazards

These hazards usually result when personnel fail to isolate equipment from electrical or mechanical energy sources that, if activated, may cause injury or death. Before workers enter a confined space, isolation of such equipment may be required to prevent such hazards.

13.5.4 Structural-Related Hazards

Structures that are abandoned, under construction, or not intended for human occupancy may be unsound and present hazards of collapse or falls through openings or weaknesses in the flooring, stairs, ramps, etc. Insufficient lighting could contribute to injury and impair escape. Chemical or flammable hazards may be present, including asbestos-containing building materials. Partitions and debris may hamper escape or rescue. The presence of unauthorized personnel in such structures may threaten the safety of employees. Small or narrow openings for entry and egress may hamper rescue operations. When the opening is 24-in. diameter or less, special provisions and procedures are required to ensure entry by rescuers.

13.5.5 Hazards to Untrained Rescuers

OSHA has noted that in several confined space incidents, entrants would not have been harmed if proper rescue equipment and procedures had been available and used. In addition, according to NIOSH, approximately 60 percent of worker fatalities in confined spaces have involved personnel attempting to rescue injured or ill workers from the space. Rescuers with good intentions but poor training and preparation may be injured, become ill, or be killed while attempting rescue operations. Other hazards associated with rescue may include communications breakdown between rescue personnel and entrants or physical barriers that hamper or prevent rescue.

13.6 MINIMUM REQUIREMENTS FOR CONFINED SPACE ENTRY

Steps to be followed for entry into a confined space are as follows:

1. The Project Manager will inform the Regional Safety and Health Coordinator of work operations potentially involving entry into a confined space. The Project Manager will obtain available information concerning the space as specified in Section 13.5.
2. The Regional Safety and Health Coordinator or designee conducts a preliminary evaluation based on information supplied by Project Manager. Such information may include planned work tasks and purpose: confined space characteristics, uses and hazards, analytical data, etc. If necessary,

the Regional Safety and Health Coordinator or designee will conduct a site survey to observe site conditions and to conduct preliminary air monitoring to identify potentially hazardous conditions.

3. The Regional Safety and Health Manager or designee determines whether personnel will be allowed to enter the confined space. If no entry is allowed due to extremely serious safety and health hazards, the Regional Safety and Health Coordinator or designee will work with the Project Manager to develop alternatives for safely conducting work.
4. If entry is allowed, the Regional Safety and Health Coordinator or designee will determine whether a permit is required based on the hazard evaluation. A permit is required if the confined space meets one or more of the following conditions:
 - Known or potentially hazardous atmospheres
 - Engulfment hazard
 - Internal configuration such that entrants may become trapped or asphyxiated
 - Other recognized serious safety or health hazards.
5. If the confined space is a non-permit-required space, then as a precaution, the confined space atmosphere is tested for oxygen deficiency and combustible gas levels throughout the area to be occupied during work operations, and ventilation is introduced as needed. Workers may then enter the space and conduct their work, continuously monitoring for oxygen and combustible gas. If confined space activities or work conditions change, then work will stop, and the evaluation process will be repeated, starting with Step 2.
6. If a permit is required, it is prepared by the Site Safety and Health Officer or designee and reviewed and signed by the Project Manager and the Regional Safety and Health Coordinator or designee. In signing the permit, the Project Manager acknowledges direct responsibility for ensuring that personnel are adequately protected and are following permit requirements. The Project Manager or designee will periodically monitor the work site to ensure conformance. Frequency of monitoring will depend on the type of site and project duration.
7. The Site Manager verifies that permit-required isolation, ventilation, etc. procedures have been successfully completed, and that all permit-required equipment is available and in good working condition.
8. The Site Manager remotely checks the atmospheric conditions of the confined space, including oxygen and combustible gases, as required by the Permit, and verifies that levels are below action limits.
9. The Site Manager verifies that means to communicate with onsite personnel and with rescuers are readily available.
10. The Site Manager gives pre-entry briefing, and the confined space team performs rescue drills.
11. Site personnel will sign the permit, acknowledging their understanding and agreement to follow the Permit requirements and procedures. They then don required PPE.

12. The Site Manager ensures one final time that permit requirements have been met, signs the Permit to authorize confined space work to begin, and posts the Permit in a conspicuous place close to the confined space entrance.
13. Team members enter and conduct their work, monitoring the atmosphere as required by the permit. If confined space activities or work conditions change, then work will stop, the existing permit is canceled, and the evaluation process will be repeated starting with Step 2.
14. The posted permit will be removed by the Site Manager and submitted to the Project Manager at the completion of the job, the end of the shift, or upon permit cancellation.
15. Upon work completion or when the planned work scope is aborted, the Project Manager cancels the permit. Canceled permits will be kept (with the copy of the Site Safety and Health Plan) by the Site Manager in the project file.

13.7 CONFINED SPACE ENTRY PERMIT SYSTEM

Entry into confined spaces that meet one or more of the criteria delineated in Section 13.6 item 4 will be allowed only by permit.

The Site Manager will be responsible for securing the Permit, which will be developed by the Site Safety Officer or designee, and will be signed by both the Project Manager and the Regional Safety and Health Coordinator, or designee. The Site Manager is responsible for implementing the signed Permit. The Permit will be reviewed, updated, or canceled upon any changes in the planned scope of work or work conditions. The Project Manager is responsible for informing the Regional Safety and Health Coordinator of these work scope or work condition changes.

The following information will be completed on the Confined Space Entry Permit Form, shown on Figure 13-1:

1. Location and description of the confined space and purpose of entry, including effective start and end dates. Permits will be in effect only for the duration of work for which they have been developed.
2. List of authorized entrants, attendants, rescue team, Site Manager, and Project Manager. No other personnel may be involved in permitted space operations.
3. Identification of specific confined space hazards.
4. Measures for removing and/or controlling potential hazards, including equipment and procedures for isolating, purging, inerting, ventilating, and flushing.
5. PPE, including respirators and clothing. Specific types of respirators and clothing will be delineated on permit.
6. Emergency, rescue, and communication equipment to be provided onsite.
7. Emergency procedures. These procedures will be rehearsed before any personnel enter the confined space.

8. Communication signals for confined space entrants and attendants.
9. Acceptable environmental conditions; i.e., action limits and actions to be taken.
10. Testing and monitoring equipment to be used to verify that acceptable environmental conditions are maintained during confined space entry.
11. Other necessary information.
12. Signatures of Director of Safety and Health and Project Coordinator. Signature of Site Manager and confined space attendant after ensuring that all Permit requirements are in place onsite.
13. Signatures of employees involved in confined space operations, acknowledging their understanding and agreement to comply with requirements.
14. Signature of the Site Manager authorizing cancellation upon completion of project.

13.8 CONFINED SPACE OPERATIONS TRAINING REQUIREMENTS

Personnel involved in confined space operations will be trained according to the minimum requirements described in this section. The Project Manager is responsible for ensuring that employees who work as entrants, attendants, Site Managers, and/or Site Safety and Health Officer receive the appropriate training.

13.8.1 Pre-Placement Training

Before participating in any Permit-required confined space operations, entrants, attendants, and the Site Manager will receive training which will consist of a minimum of 4 hours of instruction and include the following topics:

1. Overview of regulatory requirements and Confined Space Entry Permit Program.
2. Responsibilities of entrants, attendants, and persons in charge of confined space operations.
3. Hazard recognition, including the hazards potentially associated with entering confined spaces, and how to recognize signs and symptoms of overexposure to these hazards and necessary precautions.
4. Methods of communication during confined space operations, including communication between entrants, between entrants and attendants, with emergency response personnel, etc.
5. Need for, proper use of, and limitations of PPE for confined space operations, including respiratory protection.
6. Rescue and other emergency response procedures.
7. Requirements for exiting based on orders, alarms, or signals or perceived danger.
8. Air monitoring, isolation, and ventilation procedures, including instruction in the use, calibration, and limitations of equipment.

13.8.2 First Aid/CPR

At least two employees involved in field confined space operations, including attendants, maintain current certification in First Aid/CPR in accordance with American Red Cross or equivalent requirements.

13.8.3 Rescue Training

Depending on the characteristics of the confined space and Permit requirements, either an in-house or outside rescue team may be used at confined space sites. Each employee or outside personnel who serve as rescue personnel will be fully trained in the rescue procedures designed for the confined space entry. Such teams will be trained to use the PPE properly, including SCBA and rescue equipment necessary for making rescues from the confined space. The Project Manager will ensure that planning meetings are held to inform entrants, attendants, and rescuers of the hazards they may confront when called on to perform rescues. Before starting work operations at a specific site, rescue teams, attendants, and entrants will rehearse rescue and emergency procedures specified in the permit, including hands-on simulations of rescues using the retrieval equipment.

13.9 MEDICAL SURVEILLANCE REQUIREMENTS

Confined space entrants and attendants will participate in a medical surveillance program for respirator usage, at a minimum. Before signing the confined space entry permit, the Director of Safety and Health or designee will verify that each participant has a valid medical clearance and has no medical restrictions for this work.

13.10 COMMUNICATION REQUIREMENTS

When verbal communication is hampered, standardized hand signals will be used to maintain communications between personnel throughout the duration of confined space entry operations. Such hand signals include:

1. Thumbs up: OK, yes
2. Thumbs down: No
3. Hand on throat: Can't breathe
4. Hand on buddy's wrist: Evacuate immediately.

The permit will also specify other signals, such as audible signals or lifeline signals, as needed. As required by the Permit, legible warning signs will be posted immediately outside the confined space portal. An alarm system (e.g., an air horn) sufficiently loud to be heard inside the confined space and over equipment noise, will be available onsite. As specified in the Confined Space Entry Permit, other communications devices will be supplied to attendants while watching confined space entrants.

Before work may begin, effective means of communication will be identified between personnel outside the space (e.g., attendants) and emergency response personnel located at the local hospital, fire department, police department, and ambulance services. The ability to communicate with emergency personnel will be present and immediately available. If a telephone or other communication device is not immediately available, the Project Manager will rent or use a mobile phone for use during confined space operations.

13.11 AIR MONITORING AND VENTILATION DURING CONFINED SPACE OPERATIONS

The Confined Space Entry Permit will specify air monitoring and ventilation requirements by work task.

13.11.1 Air Monitoring Procedures

When required, airborne monitoring of confined space operations will be conducted to assess employee exposure to air contaminants and to ensure that oxygen levels and combustible gas concentrations are within action limit ranges set in the permit. At a minimum, oxygen and combustible gas monitoring will be performed both before anyone enters a confined space and while persons are inside the space.

As required by the Confined Space Entry Permit, initial remote and continuous atmospheric testing of the confined space will be conducted using real-time monitors to ensure that the atmospheric conditions are met. Such testing will occur immediately prior to each entry and periodically during operations within the space, and throughout the entire area that will be occupied, using extensions on equipment for remote testing. If levels are not within acceptable limits for entry, then no entry will be permitted, and the Project Manager will be contacted immediately. The Project Manager, in conjunction with the Regional Safety and Health Coordinator or designee, will determine the appropriate course of action.

Personal air monitoring also may be necessary to evaluate employee exposure to specific contaminants. This will be determined on a site-specific basis by the Regional Safety and Health Coordinator or designee after review of the anticipated air contaminants in the confined space, evaluation of the potential for exposure of confined space entrants and attendants, and evaluation of historical data.

Monitoring instruments may be used only by trained personnel. Instruments will be inspected and calibrated by field personnel immediately prior to use in a confined space, following the procedures recommended by the manufacturer.

13.11.2 Purging and Ventilation

Purging and ventilation will be performed to remove hazardous atmospheres whenever they are detected prior to or during a confined space entry. Ventilation, if required for entry, will continue during entry, even if monitoring indicates a safe atmosphere. Every reasonable effort will be made to provide sufficient ventilation for a safe atmosphere; but if ventilation is not completely effective, it will be supplied to reduce the atmospheric hazard and entrants will wear appropriate respiratory and other PPE.

The permit will specify the necessary purging and ventilation procedures to be used for the confined space operation, if any. If required by the Confined Space Entry Permit, mechanical ventilation such as fans or blowers will be provided prior to initial entry and for the duration of the Permit to ensure that an atmosphere contains sufficient oxygen, is not explosive, and does not contain toxic chemical levels. When ventilation is performed, the blower controls will be at a safe distance from the confined space. Initial testing of the atmosphere will be performed from outside the space to determine precautions needed for purging and ventilation. Ventilation systems will be designed to protect workers in the surrounding area from exposure to contaminated air. If flammable concentrations are present, electrical equipment will comply with the requirements of the National Electrical Code. Permit-required continuous general ventilation will be maintained where toxic atmospheres are produced as part of the work procedure or are likely to develop due to the nature of the confined space. When ventilation is not possible or feasible, other protective measures will be specified in the permit.

13.12 EMERGENCY PROCEDURES

Written procedures covering confined space entry under emergency conditions will be provided in the Confined Space Permit and will include methods of rescue appropriate for the confined space and type of work being done. In the event of an emergency, the attendant will immediately summon designated rescue and other emergency services. The attendant will coordinate rescue and other emergency teams until relieved by the permit-designated rescuers. Attendants will never enter confined spaces to attempt rescue of entrants until backup rescue service has arrived. From outside the space, they will properly use available remote rescue equipment (e.g., lifelines to remove victim from space) and perform any other assigned rescue and emergency duties.

In the event of an emergency, entrants may initiate evacuation on their own if they judge that a hazardous situation exists. In addition, the attendant, Site Manager, or rescue team may order the evacuation of entrants, if they believe that conditions warrant it.

13.12.1 Rescue Teams

The need for an in-house or outside rescue team (e.g., fire department rescue squad) to be present during site operations will be specified in the Confined Space Entry Permit. Outside rescue teams will be able to respond to an emergency promptly (e.g., in 4 minutes). If a rescue team is required onsite as standby during confined space activities, then no personnel may enter the space until the rescue team is in place and states its readiness. Before beginning work operations at confined space sites, the attendant will ensure that the rescue team is aware of the space hazards, so that the outside rescue team can equip, train, and conduct itself appropriately. Rescue operations will be rehearsed before starting work operations.

13.12.2 Emergency Equipment

Emergency equipment will be specified in the permit and will be immediately available onsite. At a minimum, SCBA (for an emergency “person-down” rescue) and first aid kits will be required at entrances to confined spaces. Fire extinguishers will be required at potential fire hazard sites. Other emergency equipment may include lighting, portable eye washes, and an alarm system.

A harness with attached lifeline is required. When required by the permit, fall arresting systems that comply with OSHA regulation 29 CFR 1926.104 will be used by confined space entrants. Attendants will be trained in the use of such equipment and practice use before beginning work operations. Rescue equipment will be designed specifically for rescue from the type of confined space where the work is being performed. A tripod with block and tackle or winch is required if the confined space is more than 6 ft deep.

Prior to confined space entry, employees will be aware of how to obtain emergency assistance and medical attention. Communication equipment for entrants, attendants, and emergency services will be available as specified in the permit.

13.13 SAFE WORK PRACTICES

The following safe work practices will be implemented during confined space operations:

1. For confined space operations, a barricade will be erected if inadvertent entry poses a problem. The barricade will have a mechanism to prevent closure of the escapeway, signs warning of the danger present, a physical barrier to keep the area clear, and an adequate platform for entry or exit. The attendant is responsible for maintaining the barricade systems onsite.

2. No entry is permitted into any confined space without first testing the atmosphere for oxygen deficiency, combustible gases, and any other parameters specified in the Confined Space Entry Permit.
3. No eating, drinking, or smoking is permitted within the confined space or in the immediate vicinity.
4. Neither vehicles nor any type of internal combustion engine will operate near the entrance to confined spaces or near air-moving equipment being used for confined space ventilation. A vehicle exclusion perimeter will be identified in the permit.
5. The entrants will ensure that walkways and entry ways are clear of trip/slip/fall hazards.
6. If flammable liquids, vapors, or other materials may be contained within the confined space, equipment used in the confined space will be intrinsically safe.
7. Hand tools used in confined spaces will be in good repair and selected according to intended use.
8. Hand-held lights and other lighting used in confined spaces, if required to be intrinsically safe, will be equipped with guards to prevent contact of the bulb with items in the confined space, and have batteries or a heavy-duty electrical cord with safe connections and insulation (i.e., no exposed electrical wires to be contacted by personnel and meeting requirements of the National Electrical Code). Lights will not be suspended from their cords. Portable lights used in moist or other hazardous locations such as a drum, tank, or vessel, will be operated at a maximum of 12 volts.

13.14 PERSONAL PROTECTIVE EQUIPMENT

Employees will wear PPE selected in accordance with the project requirements and hazards. The entry permit will include a list of necessary protective equipment to be used in the confined space as determined by the Regional Safety and Health Coordinator, or designee. The attendant is in charge of the inspection and maintenance of safety equipment used onsite and will ensure that safety equipment and clothing are properly used. The Site Manager will distribute equipment designated on the permit.

13.14.1 Personal Protective Clothing

Equipment that may be required by the permit for entrants and attendants includes:

1. Eye and face protection—safety glasses or goggles
2. Hard hats
3. Chemical-resistant safety boots with steel toes and steel shanks
4. Chemical-resistant clothing (if potential for contact with contaminated materials exists)
5. Hearing protection (if noise hazards exist)
6. Chemical-resistant gloves (if potential for contact with contaminated materials exists)
7. Life jackets if workers are working over or near water where the danger of drowning exists.

13.14.2 Respiratory Protection

If ventilation does not adequately reduce or remove a hazardous atmosphere, respiratory protection will be worn by confined space entrants. Respiratory protection requirements will be specified in the permit. Respirators and the respiratory protection program will meet the requirements of 29 CFR 1910.134.

When supplied air (with emergency escape air supply) will be used for rescue purposes, rescue personnel will use supplied air respirator systems that are on a separate system from that used by confined space entrants. SCBA or supplied air (with emergency escape air supply) is required for rescue personnel entering the space, unless it may be readily established that the cause of the emergency is not a hazardous atmosphere.

13.15 REFERENCES

The following standards and technical references were used in developing this program:

1. American National Standards Institute. 1989. *Safety Requirements for Confined Spaces*. ANSI Z117.1.
2. American Petroleum Institute. *Cleaning Petroleum Storage Tanks*, 3rd edition, September 1985. API Publication 2015.
3. American Petroleum Institute. *Removal and Disposal of Used Underground Petroleum Storage Tanks*, 2nd edition, December 1987. API Recommended Practice 1604.
4. National Institute for Occupational Safety and Health *Criteria for a Recommended Standard: Working in Confined Spaces*. U.S. Department of Health, Education, and Welfare, December 1979. DHEW Publication Number 80-106.
5. National Institute for Occupational Safety and Health. *A Guide to Safety in Confined Spaces*, U.S. Dept. of Health and Human Services, July 1987. DHHS (NIOSH) Publication No. 87-113.
6. Occupational Safety and Health Administration. *Permit-Required Confined Spaces* (29 CFR 1910.146).
7. Occupational Safety and Health Administration. *Occupational Safety and Health Standards* (29 CFR 1910.1000).



CONFINED SPACE ENTRY PERMIT

Date and Time Issued: _____ Date and Time Expires: _____
Job Site/Space I.D.: _____ Job Supervisor: _____
Equipment to be Worked on: _____ Work to be Performed: _____
Standby Personnel _____

1. Atmospheric Checks	Time	_____	%	
	Oxygen	_____	%	
	Explosive	_____	% LFL	
	Toxic	_____	ppm	
2. Tester's Signature _____				
3. Source Isolation (No Entry):	N/A	Yes	No	
Pumps or lines blinded, disconnected, or blocked	()	()	()	
4. Ventilation Modification:	N/A	Yes	No	
Mechanical	()	()	()	
Natural ventilation only	()	()	()	
5. Atmospheric check after isolation and ventilation:				
Oxygen	_____	%	> 19.5	%
Explosive	_____	%LFL	< 10	%
Toxic	_____	ppm	< 10	ppm H ₂ S
Time	_____			
Tester's Signature _____				
6. Communication procedures: _____				
7. Rescue procedures: _____				

8. Entry, standby, and backup persons:	Yes	No	
Successfully completed required training?	()	()	
Is it current?	()	()	
9. Equipment:	N/A	Yes	No
Direct reading gas monitor – tested	()	()	()
Safety harnesses and lifelines for entry and standby persons	()	()	()
Hoisting equipment	()	()	()
Powered communications	()	()	()
SCBAs for entry and standby persons	()	()	()
Protective clothing	()	()	()
All electric equipment listed: Class I, Division I, Group D, and non-sparking tools	()	()	()
10. Periodic atmospheric tests			
Oxygen	_____	%	Time _____
Oxygen	_____	%	Time _____
Explosive	_____	%	Time _____
Explosive	_____	%	Time _____
Toxic	_____	%	Time _____
Toxic	_____	%	Time _____

We have reviewed the work authorized by this permit and the information contained herein. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Figure 13-1. Confined Space Entry Permit.



Permit Prepared by (Supervisor): _____
Approved by (Unit Supervisor): _____
Reviewed by (CS Operations Personnel): _____
(printed name) (signature)

PERMIT VALID FOR 8 HOURS ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED

DATE ____/____/____ SITE LOCATION/DESCRIPTION: _____
PURPOSE OF ENTRY _____

SUPERVISOR(S) IN CHARGE OF CREWS	TYPE OF CREW	PHONE NUMBER
_____	_____	_____
_____	_____	_____

COMMUNICATION PROCEDURES _____
RESCUE PROCEDURES (PHONE NUMBERS AT BOTTOM) _____

BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lockout/de-energize/tryout	_____	_____	Full body harness with "D" ring	_____	_____
Line(s) broken-capped-blank	_____	_____	Emergency escape retrieval equipment	_____	_____
Purge-Flush and Vent	_____	_____	Lifelines	_____	_____
Ventilation	_____	_____	Fire extinguishers	_____	_____
Secure area (post and flag)	_____	_____	Lighting (explosive proof)	_____	_____
Breathing apparatus	_____	_____	Protective clothing	_____	_____
Resuscitator – Inhalator	_____	_____	Respirator(s) (air purifying)	_____	_____
Standby Safety Personnel	_____	_____	Burning and welding permit	_____	_____

NOTE: Items that do not apply under N/A in the blank.

**** RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS****

CONTINUOUS MONITORING ** Permissible Entry Level _____

TEST(S) TO BE TAKEN										
PERCENT OF OXYGEN	19.5% to 23.5%	_____	_____	_____	_____	_____	_____	_____	_____	_____
LOWER FLAMMABLE LIMIT	Under 10%	_____	_____	_____	_____	_____	_____	_____	_____	_____
CARBON MONOXIDE	+35 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____
Aromatic Hydrocarbon	+1 ppm * 5 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____
Hydrogen Cyanide	(Skin) * 4 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____
Hydrogen Sulfide	+10 ppm * 15 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____
Sulfur Dioxide	+2 ppm * 5 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____
Ammonia	*35 ppm	_____	_____	_____	_____	_____	_____	_____	_____	_____

* Short-term exposure limit: employees can work in the area up to 15 minutes

+ 8-hour time weighted average: employee can work in area 8 hours (longer with appropriate respiratory protection).



REMARKS: _____

GAS TESTER NAME AND CHECK NO.		INSTRUMENT(S) USED		MODEL AND/OR TYPE		SERIAL AND/OR UNIT NO.	
SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK							
SAFETY STANDBY PERSON(S)	CHECK NO.	CONFINED SPACE ENTRANT(S)	CHECK NO.	CONFINED SPACE ENTRANT(S)	CHECK NO.		
_____	_____	_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	_____	_____	
SUPERVISOR AUTHORIZATION – ALL CONDITIONS SATISFIED _____ DEPARTMENT/PHONE _____							
AMBULANCE 2800 FIRE 2900		Safety 4901	Gas Coordinator 4529/5387				

Figure 13-1 (Continued).

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14. BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

14.1 PURPOSE, SCOPE, AND APPLICATION

The purpose of this Bloodborne Pathogens Exposure Control Plan is to make available important information regarding occupational exposure to bloodborne pathogens and other potentially infectious materials to all employees of EA.

EA believes that employees who may come in contact with bloodborne pathogens and other potentially infectious materials during the conduct of the company business have a right to education, training, and PPE necessary to reduce or prevent contact with disease-causing organisms such as Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV). In certain situations, additional measures such as vaccinations and/or testing may be conducted.

This plan, which has been developed in accordance with the requirements of OSHA 29 CFR 1910.1030, will be reviewed and revised annually or more often if regulations change. Periodic inspections will be conducted by the Program Administrator to evaluate program effectiveness. Changes will be made as needed.

The Director of Safety and Health is the Bloodborne Pathogens Exposure Control Program Administrator who responsible for overall program development and implementation. The Regional Safety and Health Coordinator for each EA office location is responsible for implementation of this program in his/her area. The designated Field Supervisor is responsible for implementation of this program during field operations.

EA will make this written bloodborne pathogens exposure control plan available to all employees in “Corporate fp,” folder “healthsafety.” It is also available, upon request, to employees, their designated representatives, OSHA, NIOSH, and other appropriate parties in accordance with 29 CFR 1910.20(e). Requests should be made in writing to the Regional Safety and Health Coordinator, the Field Supervisor, or the Director of Safety and Health.

Copies of this plan will be maintained at each fixed location by the Regional Safety and Health Coordinator and at field job site locations by the Field Supervisor. The locations will be made known through site tailgate meetings or site-specific safety and health plans to all employees and other persons as appropriate.

If further information or clarification regarding this Bloodborne Pathogens Exposure Control Plan is needed, the Regional Safety and Health Coordinator, the Field Supervisor, or the Director of Safety and Health will be consulted as necessary.

This program covers employees who are or may be exposed to bloodborne pathogens and other potentially infectious materials, as defined herein, during typical activities of EA business.

This includes those employees engaged in construction operations, although 29 CFR 1910.1030 does not presently address these employees. OSHA does require that construction employees be trained in the recognition and avoidance of unsafe job site conditions.

The scope of this program applies to all EA Businesses, including those listed below:

1. Engineering and Remediation Services
2. Laboratory Services
3. Science and Technology

14.2 DEFINITIONS

Key words or phrases as defined by OSHA that affect application and implementation of this program are outlined below.

Blood—Human blood, human blood components, and products made from human blood.

Bloodborne Pathogens—Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, HBV and HIV.

Exposure Incident—A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral (skin piercing) contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Occupational Exposure—Reasonably anticipated skin, eye, mucous membrane, or parenteral (skin piercing) contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Other Potentially Infectious Materials—

1. The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
2. Any unfixed tissue or organ (other than intact skin) from a human (living or dead).
3. HIV-containing cell or tissue cultures, and HIV- or HBV-containing culture medium or other solutions.
4. Blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Universal Precautions—An approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

14.3 REQUIRED ELEMENTS OF THE WRITTEN PLAN

According to OSHA 29 CFR 1910.1030, each employer having employees with occupational exposure as defined above is required to establish a written Exposure Control Plan designed to eliminate or minimize employee exposure. This document serves to fulfill that requirement for EA.

Required Plan elements that pertain to EA operations are listed below:

1. Exposure determination
2. Schedule and method of implementation outlining methods of compliance, HBV vaccination and post-exposure evaluation and follow-up, communication of hazards to employees, and recordkeeping
3. Procedure for the evaluation of circumstances surrounding exposure incidents.

14.4 EXPOSURE DETERMINATION

OSHA requires that each employer who has employees with occupational exposure to bloodborne pathogens and other potentially infectious materials prepare an exposure determination. This exposure determination for EA was made without regard to the use of PPE.

EA job classifications in which all employees in that job classification have occupational exposure are listed below:

- None.

EA job classifications in which some employees have occupational exposure are listed below:

- EA laboratory personnel who handle sanitary waste treatment sludge samples
- EA field personnel who handle sanitary waste treatment samples.

In addition, the following job classifications may have occupational exposure in the future if EA undertakes such projects:

1. EA personnel who are specifically designated as confined space rescuers
2. EA personnel who are involved in hazardous waste site remediation activities involving medical waste, blood, or other potentially infectious materials
3. EA personnel specifically designated in the site-specific Safety and Health Plan as being required to perform First Aid/CPR for a remote project site.

EA tasks and procedures in which occupational exposure occurs and that are performed by employees in job classifications listed above.

- See above.

Technically, only those employees listed above are covered by this program. EA employees who are trained in First-Aid and CPR are NOT covered unless EA has specifically designated them as responsible for providing medical assistance as part of his/her job duties. At this time, no EA employees are required to render First Aid or CPR as part of his/her job duties. The rendering of First Aid or CPR is NOT a condition of employment and is up to the discretion of the employee (Appendix A).

However, EA will make available education, training, and PPE to all employees whether or not they are legally covered by OSHA 29 CFR 1910.1030. Certain other provisions of the standard such as HBV vaccinations and post-exposure evaluation, treatment, and follow-up may be made available to non-covered employees in certain circumstances as deemed appropriate by the Director of Safety and Health.

14.5 METHODS OF COMPLIANCE

To prevent occupational exposure, universal precautions will be used whenever feasible to prevent contact with blood or other potentially infectious materials. This means that blood, sanitary waste treatment sludge samples, and other potentially infectious materials will be treated as if infectious.

It is the policy of EA that all employees who become cut or injured in some way where blood or other potentially infectious materials could be transmitted to other employees or contaminate surfaces or equipment will cover the wound as soon as feasible to prevent transmission.

Wherever possible, engineering controls and work practices will be used to eliminate or minimize employee exposure. Where occupational exposure remains after institution of engineering controls, PPE will also be used.

Where feasible, hand-washing facilities which are readily accessible to employees will be provided. When provision of hand-washing facilities is not feasible, an appropriate antiseptic hand cleanser, in conjunction with clean cloth/paper towels or antiseptic towelettes, will be provided. When antiseptic hand cleansers or towelettes are used, hands will be washed with soap and running water as soon as feasible.

Employees will wash their hands immediately or as soon as feasible after removal of gloves or other PPE that may have contacted bloodborne pathogens or other potentially infectious materials.

Employees will wash their hands and any other skin with soap and water, or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.

EA does not utilize needles or other sharps that may become contaminated so detailed safety procedures will not be provided herein. If such procedures become necessary in the future, the Director of Safety and Health will be consulted and appropriate procedures developed. This plan will then be amended as necessary.

EA does utilize glassware for sample collection that may be broken. Therefore, all samples will be handled delicately to avoid breakage. If glassware that may be contaminated becomes broken, it will be picked up only by using mechanical means such as tongs, brush and dust pan, or forces and never with bare or gloved hands.

Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink will not be kept in refrigerators, freezers, shelves, cabinets, or on countertops or benchtops where blood or other potentially infectious materials are present.

14.5.1 Personal Protective Equipment

PPE will be provided, as appropriate, at no cost to the employee where there is occupational exposure.

It is the policy of EA that nitrile gloves, respirators, face shields, pocket mouth-to-mouth guards, glasses with side shields, goggles, or other PPE will be used as appropriate to reduce or eliminate the hazard. Nitrile gloves and a face shield are required at a minimum when handling sanitary waste treatment sludge samples. Personnel will wash with soap and water and/or antiseptic as soon as feasible after removing PPE or when contact or exposure has occurred.

To facilitate the use of PPE, all first aid kits will be equipped with at least 2 pair of nitrile gloves, a pocket mouth-to-mouth guard, and antiseptic towelettes. Replacement supplies will be provided as necessary so that the necessary supplies are available when needed. It is the responsibility of the Office Administrator or the Regional Safety and Health Coordinator and the Field Supervisor to make the necessary PPE available.

Where there is occupational exposure, EA Regional Safety and Health Coordinators and Field Supervisors will require that employees use appropriate PPE.

However, in life-threatening situations, the employee has the right to forego the use of PPE as he/she determines.

EA Regional Safety and Health Coordinators (fixed locations) and Field Supervisors (field operations) will ensure that appropriate PPE in the appropriate sizes is readily accessible. Hypo-allergenic gloves, glove liners, powderless gloves, or other similar alternatives will be readily accessible to those employees who are allergic to the gloves normally provided.

EA will clean, launder, and/or dispose of PPE required by this plan at no cost to the employee.

If a garment is penetrated by blood or other potentially infectious materials, the garment will be removed immediately or as soon as feasible. When PPE is removed, it will be placed in an appropriately designated area or container for storage, washing, decontamination, or disposal.

Gloves will be worn when it can be reasonably anticipated that the employee may have hand contact with blood or other potentially infectious materials and when handling or touching contaminated items or surfaces.

Disposable (single use) gloves, i.e., surgical or examination gloves, will be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised.

Disposable (single use) gloves will not be washed or decontaminated for re-use.

Masks in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, will be worn whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.

Other PPE will be worn as appropriate. This determination will be made by the Regional Safety and Health Coordinator, the Field Supervisor, or the Director of Safety and Health.

14.5.2 Housekeeping and Disinfection

Housekeeping and disinfection are an important part of preventing contact with blood and other potentially infectious materials. Work areas will be kept in a clean and sanitary condition. All equipment and working surfaces will be cleaned and decontaminated with an appropriate disinfectant after contact with blood or other potentially infectious materials. EA has not developed a schedule and method for cleaning as required by the standard because there are no routine situations where blood and other potentially infectious materials are contacted. Laboratory sample equipment utilized for sanitary waste treatment sludge samples will be washed in automatic programmed dishwashers and then dried in annealing ovens as soon as feasible after use to kill possible infectious agents. The procedures are provided as Appendix A. In addition, surfaces which may have been contaminated by sanitary waste treatment sludge samples or blood from emergency medical situations will be disinfected with sodium hypochlorite (bleach) solution as soon as feasible after contact.

14.5.3 Regulated Waste

Regulated waste includes liquid, semi-liquid blood, or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

EA does not anticipate generating, transporting, or disposing of regulated waste that meets the above definition. Therefore, EA has not included such procedures in this plan. If such practices become necessary, they will be developed by the Director of Safety and Health in accordance with the requirements of 29 CFR 1910.1030 (d)(4)(iii) and appended to this plan. Contaminated sharps are not utilized by EA so procedures are not included herein.

14.5.4 Laundry

Laundry that is contaminated with blood or other potentially infectious materials is not anticipated to be required for EA operations. If it becomes necessary, contaminated laundry will be placed in red bags and labeled with the required “Biohazard” labels. EA will specify to the laundry facility that Universal Precautions should be used.

14.5.5 Human Immunodeficiency Virus and Hepatitis B Virus Research Laboratory and Production Facility Operations

HIV and HBV Research Laboratory and Production Facility Operations are not conducted by EA so procedures are not included herein.

14.6 HEPATITIS B VACCINATION

EA will make available the HBV vaccination series, including all related medical evaluations and procedures to all employees who have occupational exposure. This includes those persons and job classifications specified in Section 14.3.

At the present time, HBV vaccine and vaccination series will not be offered to those employees trained in First Aid and CPR who are not required by EA as part of their job duties to perform medical treatment.

However, if an EA employee feels that it is likely they will administer first aid/CPR as part of their job and would like an HBV vaccine, they should contact the Director of Safety and Health.

The HBV vaccination will be made available to those employees and job classifications specified in Section 14.3 after the employee has received the training required by this plan and within 10 working days of initial assignment, unless the employee has previously received the complete HBV vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons.

EA will not make participation in a prescreening program a prerequisite for receiving an HBV vaccination.

If an employee initially declines HBV vaccination but at a later date, while still covered under the standard decides to accept the vaccination, EA will make it available at that time.

EA will assure that employees who decline to accept HBV vaccination offered by EA sign a statement that reads verbatim as outlined below:

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination at no charge to me.

If routine booster dose(s) of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to all employees with occupational exposure.

HBV vaccine and vaccination series will be made available at no cost to employees with occupational exposure, will be made available to the employee at a reasonable time and place, and will be performed by or under the supervision of a licensed physician or healthcare professional, and will be provided in accordance with current U.S. Public Health Service recommendations. All laboratory tests will be conducted by an accredited laboratory at no cost to the employee.

14.7 POST-EXPOSURE REPORTING, EVALUATION, AND FOLLOW-UP

HBV vaccine can be effective if administered immediately after exposure. Time is of the essence in reporting and treatment.

Each EA employee will immediately report all exposure incidents to their supervisor. Supervisors will report all exposure incidents to the Director of Safety and Health or in the absence of that person to the Human Resources Department. This will be done before the end of the work shift during which the incident occurs. EA will, in turn, contact EA's medical provider so the Medical Director may advise EA of appropriate procedures. If advised by the physician, EA will make available post-exposure medical evaluation, treatment, and follow-up to employees who have had an exposure incident. The full HBV immunization series will be offered as soon as possible not later than 24 hours following an exposure incident.

Written reports of exposure incidents will include the names of all persons involved and a description of the circumstances of the incident, including date and time as well as a determination of whether an exposure incident, as defined by OSHA, has occurred.

Following a report of an exposure incident, EA will make available to the exposed employee a confidential medical evaluation to be conducted by a physician, treatment, and follow-up including at least the following elements:

1. Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred
2. Identification and documentation of the source individual, unless EA can establish that identification is infeasible or prohibited by state or local law.

The source individual's blood will be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, EA will establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, will be tested and the results documented.

When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.

Results of the source individual's testing will be made available to the exposed employee, and the employee will be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

The exposed employee's blood will be collected as soon as feasible and tested after consent is obtained.

If the employee consents to baseline blood collection, but does not give consent at the time for HIV serologic testing, the sample will be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing will be done as soon as feasible.

Post-exposure treatment, when medically indicated, as recommended by the U.S. Public Health Service will include counseling and evaluation of reported illnesses.

Medical evaluations and procedures for post-exposure evaluation and follow-up, including treatment, will be made available at no cost to employees who have had an exposure incident. In addition, they will be made available to the employee at a reasonable time and place, and will be performed by or under the supervision of a licensed physician or healthcare professional, and will be provided in accordance with current U.S. Public Health Service recommendations. All laboratory tests will be conducted by an accredited laboratory at no cost to the employee.

14.7.1 Information Provided to the Healthcare Professional

The Director of Safety and Health, the Corporate Human Resources Department, or the Office Administrator will ensure that the healthcare professional responsible for the employee's HBV vaccination and/or evaluation is provided:

1. Copy of OSHA 29 CFR 1910.1030
2. Description of the exposed employee's duties as they relate to the exposure incident
3. Documentation of the route(s) of exposure and circumstances under which the exposure occurred
4. Results of the source individual's blood testing, if available
5. All medical records relevant to the appropriate treatment of the employee, including vaccination status.

14.7.2 Healthcare Professional's Written Opinion

EA will obtain and provide the employee with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation.

The healthcare professional's written opinion for HBV vaccination will be limited to whether HBV vaccination is indicated for an employee, and if the employee has received such vaccination.

The healthcare professional's written opinion for post-exposure evaluation and follow-up will be limited to the following information:

1. That the employee has been informed of the results of the evaluation
2. That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

All other findings or diagnoses will remain confidential and will not be included in the written report.

14.8 LABELS AND SIGNS

EA does not routinely generate any waste or materials containing potentially infectious materials regulated by OSHA under the Bloodborne Pathogens Standard. In addition, EA does not routinely store, transport, or ship blood or other potentially infectious materials.

If, however, such materials are generated, they will be labeled, packaged, stored, and transported in accordance with the requirements set forth in 29 CFR 1910.1030 (g)(1). Contaminated equipment will also be labeled as outlined by OSHA. At a minimum, the required fluorescent orange or orange-red "biohazard" labels and/or red bags or red containers will be used.

If such materials are generated, the Director of Safety and Health will be consulted regarding proper handling and disposal.

Sample containers which hold sanitary waste treatment sludge samples, blood, or other potentially infectious material will be identified with the required "biohazard" label. Refrigerators or freezers and containers for storage, transport, or shipping of the above-referenced sample containers will also be identified with the required "biohazard" label. These labels must contain the biohazard symbol and must have the word "biohazard" on it.

EA does not typically have any work areas where bloodborne pathogens and other potentially infectious materials present a hazard so signs are not required. However, when sanitary waste treatment sludge samples are being handled, signs will be posted in the work area and the samples will be marked with the required “biohazard” label.

14.9 INFORMATION AND TRAINING

Training is required for all employees with occupational exposure and will be conducted by the Regional Safety and Health Coordinator, the Field Supervisor, or the American Red Cross Preventing Disease Transmission Course. At a minimum, training will be provided as outlined below for those employees with occupational exposure and designated in Chapter 4:

1. At the time of initial assignment to tasks with occupational exposure
2. At least annually thereafter
3. When procedures or hazards change.

For the above-referenced employees, the EA Training Program will contain, at a minimum, the following elements:

1. An accessible copy and explanation of 29 CFR 1910.1030
2. An explanation of the epidemiology and symptoms of bloodborne diseases
3. An explanation of the modes of transmission of bloodborne pathogens
4. An explanation of EA’s Exposure Control Plan and the mechanisms for employees to obtain a copy of the plan
5. Hazard recognition
6. An explanation of appropriate engineering controls, work practices, and PPE including use and limitations
7. Information on the types, proper use, location, removal, handling, decontamination, and disposal of PPE
8. An explanation of the basis for selection of PPE
9. Information regarding the HBV vaccine
10. Information of the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials
11. Information on the post-exposure evaluation and follow-up that EA is required to provide for the employee following an exposure incident
12. An explanation of signs and labeling

13. An opportunity for interactive questions and answers with the person conducting the training session.

Technically, only those EA employees with occupational exposure specified in Chapter 4 are required to meet the training elements listed above.

However, EA believes that all of its employees have a right to know the content of this Exposure Control Plan and to be trained in basic hazard recognition, safe work practices, and personal protection procedures.

EA will make such training available to all interested employees on an annual basis. The training will be conducted by the Regional Safety and Health Coordinator, the Field Supervisor, or the American Red Cross. In-house training materials and content will be specified by the Director of Safety and Health. Records of employee training will be maintained by the Office Administrator and the Safety and Health Department.

14.10 RECORDKEEPING

In accordance with 29 CFR 1910.20 and 29 CFR 1910.1030, EA is required to establish and maintain records for those employees with occupational exposure specified in Section 14.4. For these employees, medical records will be maintained offsite by the Medical Director and will include:

1. The name and social security number of the employee
2. A copy of the employee's Hepatitis B vaccination status including the dates of all the Hepatitis B vaccinations and any medical records relative to the employee's ability to receive the vaccination
3. A copy of all related results of examinations, medical testing, and follow-up procedures
4. EA's copy of the healthcare professional's written opinion
5. A copy of the information provided to the healthcare professional by EA.

The above-referenced records will be kept confidential and not reported without the employee's express written consent to any person within or outside the workplace except as required by OSHA or NIOSH or as may be required by law.

EA will maintain the above-referenced records for at least the duration of employment plus 30 years in accordance with 20 CFR 1910.20.

For those employees having occupational exposure outlined in Section 14.4, training records will be maintained by the Office Administrator and the Director of Safety and Health and will include the following:

1. Dates of the training sessions
2. Contents or a summary of the training session
3. Names and qualifications of the persons conducting the training
4. Names and job titles of all persons attending the training sessions.

These training records will be maintained for 3 years from the date on which the training occurred.

Employee training records will be provided upon request for examination and copying to employees, employee representatives, and to OSHA or NIOSH.

Employee medical records required by 29 CFR 1910.1030 will be provided upon request for examination and copying to the subject employee, to anyone having written consent of the subject employee, and to OSHA or NIOSH in accordance with 29 CFR 1910.20.

Transfer of records will be conducted in accordance with 29 CFR 1910.20 in the event that EA ceases to do business.

Any questions, comments, concerns, or requests for copies of this Bloodborne Pathogens Exposure Control Plan should be directed to the Regional Safety and Health Coordinator, the Field Supervisor, or the Director of Safety and Health.

15. HEARING CONSERVATION PROGRAM

15.1 INTRODUCTION

The hearing of persons exposed to high noise levels is vulnerable to damage that can result in a significant loss of hearing acuity. EA employees work in various environments that expose them to high levels of noise. These environments include areas around drill rigs, heavy construction equipment, portable powered tools such as chain saws and bush whackers, airfields and airports, portable power generators, etc.

15.2 SCOPE

The purpose of this program is to ensure that operations conducted around hazardous noise sources or that generate hazardous noise are conducted in a manner that will protect workers from the damaging effects of high noise levels. This program has been developed in accordance with the requirements of OSHA Standards for General Industry (29 CFR 1910.95) and the Construction Industry (29 CFR 1926.52). The program comprises five basic components: monitoring, audiometric testing, hearing protection, employee training, and record keeping.

15.3 DEFINITIONS

Action Level—An 8-hour TWA of 85 decibels (dB) measured on the A-scale (dBA), slow response, or equivalently, a noise dose of 50 percent.

Audiogram—A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Baseline Audiogram—The audiogram against which future audiograms are compared.

Decibel (dB)—The unit of measurement of sound level.

Eight-Hour Time-Weighted Average Sound Level—That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured. Thus, the 8-hour TWA sound level is equivalent to the noise dose over an 8-hour period if the noise dose were at a constant level for that time.

Permissible Exposure Limit—The noise dose that would result from an exposure at or above an 8-hour, TWA to a sound level of 90 dB measured on the A-scale (dBA), slow response, or equivalently, a noise dose of 100 percent.

15.4 MONITORING

The General Industry Standard (OSHA 29 CFR 1910.95) requires a hearing conservation program for an employee noise exposure at or above the Action Level (85 dBA) while the Construction Standard requires a program for employee exposures at or above the PEL. EA has adopted the General Industry Standard requirement for a hearing conservation program for construction activities and requires a hearing conservation program for construction workers exposed at or above the Action Level. Sound level measurements of selected noise sources typical of the equipment found at EA work sites have shown that

EA employees have the potential to be exposed to hazardous noise. EA has a conservative program in that people working around potentially hazardous noise areas are enrolled in the Hearing Conservation Program.

15.5 EMPLOYEE NOTIFICATION

Employees exposed at or above the Action Level will be notified of the results of the noise monitoring.

15.6 AUDIOMETRIC TESTING PROGRAM

EA will make audiometric testing available at no cost to all employees whose exposures equal or exceed the Action Level. The audiometric tests will be provided as part of EA's Medical Monitoring Program.

15.6.1 Baseline Audiogram

Within 6 months of an employee's first exposure at or above the action level, EA will establish a valid baseline audiogram against which subsequent audiograms can be compared.

15.6.2 Annual Audiogram

At least annually after obtaining the baseline audiogram, employees exposed to sound levels above the action level will receive repeat audiograms. These annual audiograms are provided as part of EA's Medical Monitoring Program.

15.6.3 Audiogram Evaluation

Each employee's annual audiogram will be compared to that employee's baseline audiogram to determine if a shift in hearing acuity has occurred. If a shift has occurred, the employee will be retested following the protocol in OSHA (29 CFR 1910.95).

15.7 HEARING PROTECTORS

Employees exposed to noise levels above the Action Level or who have the potential for exposure above the Action Level but have not yet received a baseline audiogram will be provided hearing protectors at no cost. The hearing protectors will be selected to attenuate noise levels at least to the PEL. Hearing protectors for employees who have experienced a shift in hearing acuity will attenuate noise levels at least to the Action Level.

15.8 TRAINING PROGRAM

All employees who are exposed to noise levels at or above the Action Level will participate in a training program that will be repeated annually. The training program will provide information on the following:

1. The effects of noise on hearing
2. The purpose of hearing protectors; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care
3. The purpose of audiometric testing, and an explanation of the test procedures.

15.9 RECORDKEEPING

EA will keep a copy of all employee exposure measurements and audiometric tests. Records will be maintained for at least 2 years for noise exposure measurements and for at least the duration of employment plus 30 years for audiometric tests. All records required by Paragraph (m) Recordkeeping in OSHA (20 CFR 1910.95 and 20 CFR 1926.52) will be provided to employees and former employees upon request as provided for in OSHA (29 CFR 1910.20).

Chapter 15—Hearing Conservation Program

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16. LOCKOUT/TAGOUT PROGRAM

16.1 INTRODUCTION

In accordance with OSHA's standard for The Control of Hazardous Energy (29 CFR 1910.147 - Lockout/Tagout), protective measures will be taken when servicing or conducting maintenance operations on machines and equipment in which the unexpected energization or startup of the machines or equipment, or release of stored energy could pose risks to workers of electric shock, burns, and other physical injuries.

EA personnel are not permitted to work on parts of equipment that have not been de-energized, locked out, and/or tagged by an authorized employee trained in proper lockout and tagout procedures. PPE designed to protect against safety hazards may be specified for certain work operations. The Project Manager is responsible for ensuring that appropriate safety measures are implemented to protect against safety hazards on their sites.

When energy-isolating devices are not lockable, tagout may be used, provided that employees comply with the provisions of the standard that require additional training and more rigorous periodic inspections. When tagout is used and the energy isolating devices are lockable, EA will provide full employee protection, additional training, and more rigorous periodic inspections as required. For more complex systems, fully comprehensive procedures may need to be developed, documented, and utilized.

16.2 SCOPE

The purpose of this program is to establish the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is performed on machines or equipment in order to meet the requirements of 29 CFR 1910.147. It will be used to ensure that the machine or equipment is stopped, isolated from potentially hazardous energy sources, and locked out before employees perform servicing or maintenance where the unexpected energization or startup of the machine or equipment or release of stored energy could cause injury.

This program applies to field operations where electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, or other energy exists that may be activated or unsecured and create a hazard to EA employees. EA field supervisors will conduct training to ensure that workers are capable of recognizing hazards associated with stored energy, conduct inspections of energy sources prior to service or maintenance activities, and implement and enforce adherence to safe energy control procedures. Due to the nature of hazardous waste remediation, this program cannot specifically identify possible work situations where hazardous energy may be present. Therefore, workers will review the site-specific safety and health plan lockout/tagout requirements for more complete information.

16.3 DEFINITIONS

Affected Employee—An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee—A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Capable of Being Locked Out—An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized—Connected to an energy source or containing residual or stored energy.

Energy-Isolating Device—A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and similar devices used to block or isolate energy. Push buttons, selector switches, and other control circuit type devices are not energy-isolating devices.

Energy Source—A source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot Tap—A procedure used in the repair, maintenance, and services activities which involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout—The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device—A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal Production Operations—The utilization of a machine or equipment to perform its intended production function.

Servicing and/or Maintenance—Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning, or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Setting Up—Work performed to prepare a machine or equipment to perform its normal production operation.

Tagout—The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device—A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

16.4 RESPONSIBILITIES

Employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with the following or other approved procedures. Employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance, will not attempt to start, energize, or use that machine or equipment.

Onsite supervision and the Site Safety and Health Officer are responsible for ensuring that hazardous energy sources are locked out before work begins. The Site Safety and Health Officer is responsible for verifying that lockouts are in place prior to the commencement of work.

Onsite supervision is responsible for providing initial and annual refresher training in this procedure and ensuring documentation of that training.

The Regional Safety and Health Coordinator may assist supervision as necessary and will conduct inspections to establish compliance with the program.

16.5 SEQUENCE OF LOCKOUT

16.5.1 Removing Equipment from Service

The following is the recommended sequence to be taken to remove equipment from service:

1. Establish if machine or equipment is capable of being locked out.
2. Identify employee(s) that may be affected by the servicing or maintenance required on a machine or equipment and how to notify affected employee(s).
3. Notify affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment will be shut down and locked out to perform the servicing or maintenance.
4. The authorized employee will refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.
5. Identify the type(s) and location(s) of machine or equipment operating controls.

6. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
7. Identify the type(s) and location(s) of energy isolating devices.
8. De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
9. Lock out the energy isolating device(s) with assigned individual lock(s).
10. Identify the type(s) of stored energy and the method(s) to dissipate or restrain.
11. Stored or residual energy (such as that in capacitors; springs; elevated machine members; rotating flywheels; hydraulic systems; and air, gas, steam, or water pressure, etc.) will be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
12. Identify the method(s) of verifying the isolation of the equipment.
13. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

Caution: Return operating control(s) to neutral or “off” position after verifying the isolation of the equipment.

14. The machine or equipment is now locked out.

16.5.2 Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps will be taken:

1. Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine or equipment.

NOTE: The removal of some forms of blocking may require re-energization of the machine before safe removal.

5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

16.6 ENERGY CONTROL PROCEDURES

- Identify hazardous energy sources. Look for combinations of energy sources. Review plans, prints, drawings, manuals, or schematics as necessary to help identify energy sources and paths.
- Identify the control devices for each energy source. Look for circuit breakers, control valves, backup generators, batteries, etc. Also identify those energy control points that will be locked in a safe position to prevent re-build up of energy, such as vent valves, relief valves and electrical shorting bars.
- Evaluate the control device to verify that a lockout device can be physically put in place.
- If the control point can be locked out (PREFERRED METHOD):
 - Turn off energy at the control point(s). (Open circuit breakers, close valves, etc.)
 - Apply the lockout device and locks to each energy control device. Each person working on the equipment will apply his own lock. Do not rely on limit switches or interlock devices to shut down hazardous energy sources.
 - Dissipate stored energy. This includes electrical energy that will be shorted or grounded, relieving pressure in fluid lines and springs, and blocking off mechanical devices. To prevent re-build up of energy, apply grounding and bonding cables.
 - Block parts that may cause injury or damage if they are accidentally moved. Blocking devices will be locked in place.
 - Break or remove mechanical links in systems to block the flow of energy. This may include removing drive chains, links, rods, or shafts. To break the energy flow path in piping systems, the line will be split open at a joint or valve and the ends of the pipe will be physically misaligned. Blanking lines or closing valves may leak.
 - Verify that persons are clear of the area.
 - Attempt to restart equipment that was locked out.
 - Attempt to re-energize electrical circuits that were locked out. Verify that circuits have zero energy with circuit testers or voltmeters.
- If it is physically impossible to lockout the control point:
 - The control point will be tagged out. Secure the control point in some manner to prevent re-energization. This may include removing fuses, disconnecting wires, taping circuit breakers open, etc. Do not rely on limit switches or interlocks.
 - A warning tag is placed on the energy control point(s). The tag will specifically warn against restarting the system, i.e., “DO NOT START,” “DO NOT OPEN,” “DO NOT OPERATE.”
 - Post a guard at the energy control point to prevent tampering or removal of tagouts.

- Removal of locks and tags.
 - The removal of a lock or tag will be in reverse order of installing it. Once the work is finished, the work area will be checked to verify that it is clean and clear of workers before re-applying energy to the system.
 - Energy paths will be restored. Mechanical links will be put back in place, hazardous lines will be reconnected or unblocked, valves will be repositioned.
 - Blocking devices will be unlocked and removed.
 - With the area still clear of workers, the lock/tag will be removed and the system will be reactivated.

16.7 LEAVING THE AREA BEFORE WORK IS FINISHED

If an employee will leave the area before work is finished, the lock will remain in place. The employee's lock may be removed at this point if the onsite supervisor or Site Safety and Health Officer applies his own lock or tag to the energy control point. Then the employee may remove his lock or tag. If a substitute employee completes the job, the substitute will put his own lock or tag on the energy control device before the supervisor's or Site Safety and Health Officer's lock is removed.

16.8 ADDITIONAL OPERATIONS

If additional work will be done on the locked-out equipment, new employees in the work area will put their own locks and tags on the energy control device. The employees will NOT try to restart the equipment. They will check with the first employee on the job to ensure that he tested his lockout before starting work.

16.9 SHIFT CHANGES

Work operations frequently take more than one shift to finish. In this case, the incoming worker will put his lock and tag on the energy control device BEFORE the outgoing worker removes his lock or tag. The outgoing worker will go over the entire job with the incoming worker and show him blocking devices that were used to block off parts of the equipment.

16.10 FAILURE TO CLEAR A LOCKOUT

If an employee leaves work without exchanging locks and tags with his replacement, and the job is finished, the onsite supervisor or Site Safety and Health Officer is responsible for checking the equipment to be sure that other blocking devices and lockouts have been removed, and it is safe to re-activate the equipment. The onsite supervisor or Site Safety and Health Officer may then cut off the last lock and re-activate the equipment.

16.11 WORK ON CLIENT JOB SITES

- EA employees will not operate the client's process equipment or machinery. The client is responsible for shutting off and locking out their equipment.

- Onsite supervision or the Site Safety and Health Officer is responsible for working with the client to make sure each source of hazardous energy and energy control devices is identified and locked out. The onsite supervisor will inspect the locked out equipment with the client to be sure energy sources are disconnected.
- After the client's lockouts are in place, EA employees working on the system will put their own locks or tags on the energy control devices. This will ensure that a client's employee cannot re-activate the equipment while EA is working on it.
- Electric charges and pressurized lines will be discharged or de-pressurized and grounding and bonding cables will be in place prior to the commencement of maintenance or repair activities.
- When lockouts are in place, the client will try to restart his equipment in order to be sure that it is safely shut off.
- For demolition work, EA employees will check electrical circuits with voltmeters or circuit testers to be sure there is no power in the system.
- After the work is finished, EA employees will remove their locks or tags. The onsite supervisor or Site Safety and Health Officer may then assist the client to restart the equipment once they have removed their locks or tags from the equipment.

16.12 SUBCONTRACTORS

The EA onsite supervisor will be familiar with the scope of work for subcontractors on a job site. The supervisor will be sure that contractors use proper lockout and tagout procedures. Supervisors should also put an EA lock and tag on systems that are locked out by a subcontractor so that the contractor will check with the onsite supervisor before restarting the equipment.

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17. NON-HAZARDOUS WASTE PROJECT SAFETY

17.1 INTRODUCTION

Personnel involved in field sampling and exploration at sites that are not considered hazardous waste operations are still potentially exposed to a variety of hazards including:

1. Physical hazards inherent to field operations (e.g., working near heavy equipment or at remote locations)
2. Skin contact with chemicals
3. Presence of flammable/combustible vapors
4. Oxygen-deficient atmospheres
5. Heat stress due to protective clothing and environmental conditions.

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

A generic checklist of safety and health considerations for remote field sites is provided in Table 17-1.

17.1.1 Purpose

The purpose of this chapter is to communicate EA's basic policies and procedures regarding safety and health during the performance of work involving projects not associated with the Hazardous Waste Operations Program.

17.1.2 Applicability

The procedures and requirements in this section apply to EA and subcontractor personnel involved in the field aspects not covered under hazardous waste operations. Visitors who enter the work zones at the site will also be required to follow these requirements.

17.1.3 Policy

A Site Safety and Health Plan should be prepared for field work involving projects not covered under Chapter 12 (Hazardous Waste Operations). The Project Manager should approve this plan prior to commencement of the work.

17.1.4 Preliminary Evaluation

A preliminary evaluation of site characteristics should be made to aid in the selection of appropriate employee protection methods. The following information, as appropriate, should be obtained by the Project Manager and forwarded to the Site Safety and Health Officer for review:

1. Location, description, and approximate size of the site
2. Description of the work tasks to be performed

3. Site accessibility by air and roads
4. Any other hazards potentially present at the site.

17.2 ORGANIZATIONAL STRUCTURE

17.2.1 Chain of Command

The Site Safety and Health Officer is responsible for ensuring that the requirements of the site-specific Safety and Health Plan are implemented during field operations. On lower risk investigation sites, the Project Manager or Task Manager may perform these functions as a collateral duty.

The Regional Safety and Health Coordinator provides the primary technical advice regarding safety and health issues related to non-hazardous waste operations.

EA management is ultimately responsible for the safety and health of personnel involved in any operations. Project managers are responsible for reviewing and approving site-specific Safety and Health Plans, monitoring compliance with program requirements, and communicating safety and health project or program needs to the Corporate Safety and Health Manager.

17.2.2 Responsibilities

Responsibility for EA's Non-Hazardous Waste Operations Program is delineated below.

17.2.2.1 Director of Safety and Health

The Director of Safety and Health reports directly to the President of EA on matters of safety and health. Specific responsibilities include:

1. Assist with the review and approval of site-specific Safety and Health Plans as delineated in this program
2. Assist in the development and distribution of Job Hazard Analysis of specific work operations as requested or determined appropriate
3. Certify personnel as having satisfied training requirements
4. Periodically monitor field activities to evaluate the effectiveness of the site-specific Safety and Health Plan.

17.2.2.2 Business Unit Directors

Business Unit Directors are responsible for the safety and health of operations within their regional area. Specific responsibilities include:

1. Designate Site Safety and Health Officers to serve as liaison between Regional Safety and Health Coordinator and the field crews
2. Ensure adequate resources are made available to provide for the safety and health of employees assigned to their office

3. Ensure personnel comply with the requirements of this program and site-specific Safety and Health Plan.

17.2.2.3 Regional Safety and Health Coordinator

The Regional Safety and Health Coordinator (or designee) will:

1. Coordinate with field personnel, the office's:
 - PPE
 - Training
 - Monitoring instruments
 - Recordkeeping.
2. Perform a preliminary evaluation of projects for the purpose of making an initial assessment of the scope of the work necessary to control site safety and health risks.
3. Develop and/or review Site Safety and Health Plans as directed by this procedure.
4. Approve Site Safety and Health Plans as directed by this procedure.
5. Maintain and issue PPE and monitoring instruments.

17.2.2.4 Proposal and/or Project Managers

Proposal and/or Project Managers will:

1. Advise the Safety and Health staff of projects, which potentially involve employee exposure to safety and health hazards. This should be in the proposal stage of the project so that project cost estimates will reflect the cost of safety considerations.
2. Ensure that subcontractors and site visitors who enter the site are apprised of the safety and health requirements of the project and receive a copy of the Site Safety and Health Plan.
3. Periodically monitor the work site to ensure conformance with the site-specific Safety and Health Plan.
4. Advise the Regional Safety and Health Coordinator of any substantial changes in the Work Plan for a particular site.
5. Approve the Site Safety and Health Plan.

17.2.2.5 Site Safety and Health Officer

The Site Safety and Health Officer is responsible for implementing the requirements of the Site Safety and Health Plan. In addition, he or she will:

1. Ensure that the employees assigned to a specific project meet the medical and training requirements of this program.

2. Conduct Pre-Entry Briefings and daily tailgate meetings with field personnel.
3. Maintain the master copy of the Site Safety and Health Plan.
4. Provide project oversight of field operations to ensure conformance with the Site Safety and Health Plan.
5. Investigate and report accidents and/or incidents to the Project Manager.
6. Consult with the Regional Safety and Health Coordinator and/or Director of Safety and Health on matters of safety and health.

17.2.2.6 Field Personnel

Field personnel (including subcontractor personnel) will be responsible for the following:

1. Compliance with the requirements of the Site Safety and Health Plan.
2. Notifying his or her supervisor of any suspected safety or health hazard.
3. Reporting accidents, incidents, injuries, or illnesses to his or her supervisor.

17.3 MEDICAL SURVEILLANCE PROGRAM

Personnel assigned to perform field work are not required to be participants in EA's Medical Surveillance Program for Hazardous Waste Operations.

17.4 PERSONAL PROTECTIVE EQUIPMENT

17.4.1 Site Hazards

The purpose of PPE and clothing is to protect personnel from the chemical, physical, and biological hazards that may be present at work sites. Potential site hazards will be evaluated during the preliminary evaluation and the hazards analysis and the need for PPE identified.

17.4.2 Selection

Selection of the appropriate PPE will be performed by the Site Safety and Health Officer, with the advice of the Regional Safety and Health Coordinator. Equipment selected must meet the requirements of 29 CFR 1910, Subpart I. Selection will be based on an evaluation of the:

1. Performance characteristics of the PPE relative to the requirements and limitations of the site
2. Task-specific condition and duration
3. Hazards and potential hazards identified at the site.

The type of equipment and level of protection must be re-evaluated periodically by the Site Safety and Health Officer, in light of any new information about the site. The PPE should be upgraded or downgraded accordingly.

17.4.3 Use

PPE must be used properly or it will not provide the protection for which it was intended.

17.4.4 Maintenance and Storage

Since most PPE used by EA is disposable, maintenance of PPE is primarily limited to respirators. A person who has received specialized training should only perform maintenance of respirators.

Respirators must be stored in their cases or airtight bags to prevent damage from dust, moisture, sunlight, chemicals, and extreme temperatures. PPE must be stored in a clean area, away from potentially contaminated equipment and clothing.

17.4.5 Training and Proper Fitting

PPE users will be properly trained in the following:

1. OSHA requirements (29 CFR 1910, Subparts I and Z)
2. Proper use and maintenance of PPE, including capabilities and limitations
3. Nature of the hazards and consequence of not using the PPE
4. Human factors influencing PPE performance
5. Instruction in inspecting, donning, checking, fitting, and using PPE
6. Emergency procedures in the event of PPE failure
7. Specific procedures in the Site Safety and Health Plan regarding emergencies.

17.4.6 Inspection

Inspection of PPE will be performed prior to use.

17.4.7 In-Use Monitoring

During equipment use, employees must be alert to conditions that may indicate that the effectiveness of the PPE has been diminished, including:

1. Degradation of the PPE
2. Perception of odors
3. Skin irritation
4. Unusual residues on PPE
5. Discomfort
6. Personal responses such as rapid pulse, nausea, dizziness, headaches, and chest pain
7. Heat stress.

17.5 COMPREHENSIVE WORK PLAN

Prior to the commencement of onsite work, a Work Plan should be developed which describes the specific objectives of site operations and the logistics and resources required to achieve the goals.

17.5.1 Program Objectives

In providing clients with comprehensive scientific and engineering services, EA performs, or oversees, a variety of field sampling and exploration activities that involve potential exposure to the hazards associated with non-hazardous waste operations. These activities may include, but are not limited to:

1. Well drilling and groundwater sampling
2. Soil sampling
3. Surface water sampling
4. Geophysical surveys
5. Soil Vapor Contaminant Assessment[®]
6. Wastewater sampling
7. Wipe or surface sampling
8. Surveying
9. Test pit excavation and sampling.

Site-specific objectives and each work task that will be performed at a non-hazardous waste site must be delineated in the Work Plan.

17.5.2 Methods and Work Tasks for Accomplishing Objectives

The methods for accomplishing the identified work tasks, or activities, must be fully described in the Work Plan.

17.5.3 Personnel Requirements

The Work Plan must determine the personnel requirements for performing the defined work tasks. For many of EA's investigative-type projects, a single individual will perform a number of the job functions (e.g., Site Manager and Site Safety and Health Officer). Additional specialists may need to be involved in specific projects (e.g., an ordnance expert or health physicist).

17.5.4 Informational Program Requirements

The Project Manager will ensure that employees and subcontractors receive a copy of EA's Site Safety and Health Plan. No personnel will be permitted onsite until they have reviewed the Site Safety and Health Plan and agreed to conform with the requirements of the Plan. Site personnel, both EA and subcontractor, will be briefed by the Site Safety and Health Officer on the nature, level, and degree of exposure likely as a result of participation in such hazardous waste operations.

17.6 SITE SAFETY AND HEALTH PLAN

It is recommended that a standard format for Site Safety and Health Plans be used for Non-Hazardous Waste projects. The standard format should address, to an appropriate degree, all of the elements described in this section.

17.6.1 Site Identification and Location

The name of the project site and its address or physical location are identified in this section. An area map may be included.

17.6.2 Key Personnel

Key personnel and alternates responsible for site safety and health should be identified. At a minimum, this section should include the names of the Project Manager, Site Manager, and the Site Safety and Health Officer.

17.6.3 Purpose and Work Scope

Project objectives and the onsite work tasks necessary to meet these objectives must be summarized.

17.6.4 Site Description

Background information about the site (e.g., former uses/activities, substances involved) will be summarized in the site description section.

17.6.5 Hazard Analysis

Suspected conditions that may pose hazards to site personnel must be evaluated and described. The preliminary evaluation and/or the initial site entry may identify the presence and concentrations, or potential concentrations, of specific hazardous substances and health hazards. The risks associated with these substances must be identified. The risks which should be evaluated include but are not limited to:

1. Potential physical hazards such as heat/cold stress, ergonomic/vibration, radiation, noise, heavy equipment, unguarded equipment, walking surfaces, and electrical, etc.
2. Exposures to airborne contaminants in excess of established safe limits
3. Immediately dangerous to life and health concentrations
4. Potential skin absorption and irritation sources
5. Potential eye irritation sources
6. Explosion sensitivity and flammability ranges
7. Potential biological hazards such as bloodborne pathogens, disease vectors, venomous arthropods, allergic reactions, etc.

17.6.6 Employee Access to Information and Original Data

As part of EA's informational program, personnel who will be working at the site will be informed of any known or suspected risks associated with the site. Upon request, the original data, which were used to make the risk evaluation, will be made available to employees. The original data should be retained by the Project Manager, along with the master copy of the Site Safety and Health Plan and other safety-related project documentation.

17.6.7 Employee Training Assignments

Training requirements which must be met prior to assignment to field activities will be identified by the Regional Safety and Health Coordinator and/or Corporate Safety and Health.

17.6.8 Personal Protective Equipment

This section will list the specific PPE which must be used by employees for each of the site tasks and operations.

17.6.9 Environmental Monitoring

Appropriate monitoring will be performed in accordance with the following sections to assure proper selection of engineering controls, work practices, and PPE.

17.6.10 Site Control

Appropriate site control procedures must be established which may include provisions for:

1. Site communications
2. Safe work practices
3. Identification of the nearest medical facility.

17.6.11 Emergency Response Plan

As required by the Regional Safety and Health Coordinator, a list of emergency telephone numbers and directions to the nearest hospital will be included in the Site Safety and Health Plan.

The plan will also provide a description of the site topography, layout, and prevailing wind conditions and procedures for reporting incidents to local, state, and governmental agencies.

17.6.12 Confined Space Entry Procedures

Prior to entry of any confined or enclosed space (e.g., manholes, vaults, tanks, etc.), precautions must be established to ensure the risk of injury is minimized. Procedures for testing the atmosphere before entry will usually include oxygen level, flammability, and known or suspected toxic substances. Ventilation, PPE, communication system requirements, work practice, and rescue procedure must also be considered and specified. Chapter 13 contains EA's Confined Space Entry Program.

17.6.13 Spill Containment Program

If major spills may be anticipated due to the type of work involved (e.g., overpacking drums, pumping out lagoons), a spill containment program must be implemented to contain and isolate the entire volume of the substance being transferred. Adequate supplies for containment must be onsite. Procedures for notification of key personnel will also be delineated.

**Table 17-1—Generic Checklist of Safety and Health
Considerations for Remote Field Sites**

Corporate Safety and Health Program Manual
October 2013

**TABLE 17-1 GENERIC CHECKLIST OF SAFETY AND HEALTH
CONSIDERATIONS FOR REMOTE FIELD SITES**

Item	Remarks/Considerations
WILDERNESS FIRST AID TRAINING	
Wildlife Hazards	• General wildlife safety. • Bear safety, the use of bear bells, whistles, and pepper spray. • Snake safety, including snakebite kits. • Tick, spider, and insect safety, including bee sting kits. • Gun safety, including gun safety training (requested by the U.S. Forest Service to carry guns in remote Alaska because of the Black Bear).
Survival Basics	• How to contact each other if lost (whistles are good for this too). • Flagging a trail to get back to base. • Use of map and compass. • Survival supplies. • Giardia – Carry iodine tablets to disinfect the water for drinking in an emergency.
Forest Fire Hazards	• Weather conditions and general fire safety. • Including the hazard of falling branches in burned areas.
Water Hazards	• Including swift water and ice.
Communication	• In areas of no cell phone service, use of satellite phones and hand-held radios.
Chain Saw Safety	• When blazing trails to bring in heavy equipment such as a drill rig.
Helicopter Safety	• DO NOT approach the helicopter after landing; the crew will approach you when they are ready and free to do so. • Remain clear of the helicopter unless a crew member is with you. • When approaching the aircraft, always approach and depart the area from the front of the aircraft, where you are in view of the pilot. NEVER approach or depart to the rear of the aircraft (DANGER ZONE). • When approaching the aircraft on a slope, NEVER approach from the uphill side. Always approach from the downhill side because the rotor clearance is greater. • NEVER walk near the tail rotor (DANGER ZONE). • Unauthorized personnel should be kept from the landing area. • NO SMOKING near the aircraft. • No vehicular traffic near the aircraft.
All Terrain Vehicle (ATV) Safety	• Never operate an ATV on pavement or on a public road. Almost 10 percent of injuries and over 25 percent of deaths occurred while the ATV was on a paved road. • Always wear protective gear. Helmets are especially important in reducing the risk of head injury. Protective gloves and heavy boots can also help reduce injuries. • Do not operate at excessive speeds or after dark. ATVs are difficult to control and collisions with other vehicles can result in severe injuries or death.
NOTE: This checklist should be used as a guide. Each project, site, conditions, and type of equipment to be used varies. The project team must develop a project-specific Safety and Health Plan as required by the EA Corporate Safety and Health Program Manual.	

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Appendix A

Respiratory Protection Program

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APPENDIX A

RESPIRATORY PROTECTION PROGRAM

A.1 SCOPE

This respiratory protection policy applies to all Company employees who wear respirators on the job. Improper use of respirators can be hazardous to the employee's safety and health. Selection of the wrong equipment may result in the employee being unknowingly exposed to the hazard and thus inhaling harmful concentrations. Respirators that are not properly maintained, inspected, and cleaned can reduce the protection afforded, as well as cause skin irritation and place a greater strain on the respiratory system. An improper respiratory protection program may give the employee a false sense of security that could lead to harmful exposures. The purposes of this policy are to ensure that employees who must wear respirators are adequately protected and that respirator usage complies with the requirements of the Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard (29 CFR 1910.134).

The Company will supply appropriate respiratory protection to its employees. In order to assure appropriate respiratory protection, the Company requires that the Regional Safety and Health Manager, or designee, approve a written task-specific safety plan or standard operating procedure before a respirator is to be worn. This plan or procedure describes the anticipated respiratory hazard, the feasible engineering and work practice controls to reduce the hazard, the monitoring to measure the hazard, the correct respirator for each job, action levels for upgrading or downgrading respiratory protection, and personnel authorized to perform each task requiring respiratory protection. This policy applies to all Company worksites, including client-owned facilities.

A.2 DEFINITIONS

Adequate Warning Properties—A detectable and persistent odor, taste, or irritant effect at concentrations at or below the OSHA permissible exposure limit (PEL) or other recognized exposure limits. Warning properties would warn the respirator wearer of leakage or cartridge breakthrough prior to the wearer suffering adverse health effects.

Air Line Respirator—An air line respirator (ALR) delivers breathable air from a stationary source via a high pressure hose that is not more than 300 ft in length.

Air Purifying Respirator—An air purifying respirator (APR) relies on air-purifying elements such as filters, cartridges, or canisters to remove contaminants from inhaled air.

Immediately Dangerous to Life and Health (IDLH)—An immediately dangerous to life and health (IDLH) is an atmosphere that poses an immediate threat of loss of life, immediate or delayed irreversible adverse effects on health, or effects that would prevent escape, such as blindness or loss of consciousness. The National Institute of Occupational Safety and Health (NIOSH) sets IDLH exposure limits to represent maximum concentrations from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing (e.g., severe eye irritation) or irreversible health effects.

Oxygen Deficient Atmosphere—An atmosphere containing less than 19.5 percent available oxygen by volume.

Protection Factor—The minimum anticipated protection provided by a properly functioning respirator to a given percentage of properly fitted and trained users. The protection factor is a ratio between the ambient concentration and the inhaled concentration of a contaminant.

Respiratory Protection—Any device worn to protect the wearer from inhaling hazardous atmospheres, including half-facepiece and full-facepiece APRs, self-contained breathing apparatus (SCBA), and supplied air respirators (SAR).

Self-Contained Breathing Apparatus—A respirator that delivers breathable air from an air supply worn by the user.

Supplied Air Respirator—A respirator that delivers breathable air from an external source.

A.3 RESPONSIBILITIES

A.3.1 Supervisors/Project Managers

- Inform the Regional Safety and Health Managers or the Director of Safety and Health of those operations for which respiratory protection may be required, including emergency situations. In conjunction with the Regional Safety and Health Manager, or designee, determine whether engineering controls or administrative controls can be used to limit the hazard to workers involved.
- In conjunction with the Regional Safety and Health Manager or designee, prepare, approve, and implement a safety plan or standard operating procedure whenever the Company employees may be exposed to a respiratory hazard.
- Inform potentially affected employees about the safety plan or standard operating procedure.
- Provide adequate resources for respiratory protection, including staffing, equipment, and training.
- When a supervisor or Project Manager is made aware of unsafe or potentially unsafe workplace atmospheres, take immediate measures to protect safety and health and promptly investigate to determine the degree of hazard.
- Ensure that authorized personnel appropriately wear the assigned respiratory protection.
- Conduct frequent, random inspections of workers' respiratory protection during work operations.
- Ensure that subcontractors to the Company who must wear respiratory protection submit evidence of medical approval for respirator usage and training in respirator usage including a fit test, within the prior 12 months, and are apprised of the respiratory protection requirements for their assigned work. The Company will not provide clients or subcontractors with respiratory protection devices.

A.3.2 Regional Safety and Health Managers

- Maintain, distribute, and store respiratory protection equipment, including cartridges for air-purifying respirators and breathing air tanks for SCBAs.

- Conduct periodic inspections of respiratory protection equipment as specified in Section A.6.
- Issue respirators and associated equipment to authorized employees.
- Perform respirator fit tests, as needed.

A.3.3 Company Personnel

- Only authorized Company personnel will wear respirators. Authorized personnel have successfully completed an initial training course in respirator usage, are annually re-trained, and are medically certified for respirator usage annually or biennially depending on work requirements. All personnel who wear respirators will be fit-tested annually.
- Non-authorized Company employees will not wear respirators and will not be exposed to potentially hazardous atmospheres. If a non-authorized employee suspects that an atmosphere is unsafe, the employee will leave the area and immediately report to his/her supervisor.
- Properly inspect, use, maintain, clean, and store assigned respiratory protection equipment in compliance with the requirements of this Program.
- Notify Supervisor immediately of any suspected safety/health hazards associated with the use of respiratory protection.
- Use respirators in accordance with instructions provided by the Company.
- Personnel must be clean-shaven wherever the respirator facepiece seals to the wearer's skin. Personnel may not have facial hair that impairs the function of the respirator valves.
- If corrective lenses are required, personnel will wear a respirator spectacle kit whenever they wear a full-face respirator.
- Personnel will not alter or modify respirators in any way.
- Read the site safety plan or standard operating procedure prior to undertaking any tasks which may require respiratory protection.

A.4 SELECTION AND ASSIGNMENT

The Company will purchase only those respirators that are certified by NIOSH. The Company will not mix or replace components of a respirator system with parts from different manufacturers, unless such interchanges have been specifically approved by NIOSH.

The Company will furnish all respirators worn by Company employees at no cost to the employee. Company employees will not wear respirators supplied by clients or subcontractors, except in a training class in a safe atmosphere or in special situations approved by the Regional Safety and Health Manager or their designated representative. The Company will not permit clients or subcontractors to wear Company-owned or leased respirators.

No Company employee will be assigned a respirator unless the Site Safety and Health Officer has determined that the employee is authorized to wear a respirator by virtue of current training and medical certificates. For APRs, the Site Safety and Health Officer must also determine that the employee has been properly fit tested within 12 months with the specific make and model being issued. At the discretion of the Site Safety and Health Officer, respirators may be individually assigned or may be issued from a pool on a need-to-use basis. When a respirator is assigned to an employee, the Site Safety and Health Officer will also provide written instructions for the inspection procedure that the wearer will perform before and after each use.

All assigned respirators remain the property of the Company and must be returned to the Company upon demand. No employee will remove a respirator from inventory without the prior approval of the Site Safety and Health Officer.

A.4.1 Air Purifying Respirators

The Company has selected Mine Safety Appliance, North, and Scott respirators for its inventory of APRs. The Company inventory is limited to these three manufacturers in order to provide company-wide consistency in training, fit testing, and inventory of spare parts and cartridges. If an employee who requires a respirator cannot be successfully fit tested with the respirator models in the Company inventory, the Company will provide the opportunity for the employee to be fit tested with other respirators and will supply a respirator that provides a proper fit. Except for this type of individual need, any decision to purchase a respirator make and model not in the Company's inventory must be approved by the Regional Safety and Health Manager.

A.4.2 Fit Testing

At a minimum, qualitative fit testing using isoamyl acetate and irritant smoke must be conducted annually on all individuals who will wear an APR. Such qualitative fit tests must follow the procedures outlined in Appendix A to 29 CFR 1910.134: Fit Testing Procedures (Mandatory) published in the *Federal Register* 8 January 1998. They will be conducted by the manufacturer's representative, the Site Safety and Health Officer, Regional Safety and Health Manager, or an experienced person designated by the Regional Safety and Health Manager. Additional fit testing, such as more frequent intervals or modified protocols, will be specified in the site safety plan or standard operating procedure, when applicable. A fit-test certificate will be issued upon successful completion and will include the respirator size and type, manufacturer name, and the signatures of the person performing the fit test and the person fit tested. Personnel are authorized to wear only those respirators for which they have been successfully fit tested.

A.4.3 Supplied Air Respirators

The Company has selected Mine Safety Appliance and Scott for its inventory of SCBAs and ALRs. SARs will be full face and pressure demand. Because of the relative infrequency of use and the correspondingly small inventory, it is particularly important that all purchases of SAR equipment be compatible with existing Company inventory in order to control costs and maximize flexibility. Accordingly, the Regional Safety and Health Manager will approve all purchases and leases of SARs. Parts from one respirator manufacturer will not be interchanged with parts from another manufacturer under any circumstances. This includes high pressure filling hoses and high pressure air hoses.

A.4.4 Specific Selection Criteria

A written and approved site safety plan or standard operating procedure will be prepared prior to each project or task requiring respirator usage. Examples of such projects or tasks include hazardous waste site field work, asbestos surveys and abatement oversight, underground storage tank investigation or remediation, confined space entries, client property visits that entail potential respiratory hazards, and disposal of hazardous wastes by the Company laboratories. In preparing and approving such plans and procedures, the following will apply at a minimum:

- Tasks will be described.
- Hazard(s) will be identified for each task.
- Engineering and work practice controls will be evaluated.
- Hazard monitoring will be specified.
- Specific respirator(s) will be specified for each task and for various ranges of hazard monitoring results.
- Authorized personnel will be named and any restrictions on their ability to perform the tasks or wear respiratory protection will be noted.
- Site safety plan or standard operating procedure will be approved via signature of the Project Manager and Regional Safety and Health Manager or the Regional Safety and Health Manager's designee.

In prescribing respiratory protection, the following selection criteria will apply, at a minimum:

- The buddy system is required whenever respirators are worn.
- Use of SCBAs or ALRs requires a standby person located outside the hazard area who is in constant communication with the respirator wearer(s) and who is equipped with proper rescue equipment and an SCBA.
- Oxygen deficient or IDLH atmospheres will require the use of pressure demand SCBAs with a 30 minutes' supply of air or more or ALRs with a minimum escape auxiliary tank of air.
- Respirators will be worn whenever the PEL is exceeded and whenever 50 percent of the PEL is exceeded for a period of 1 hour or longer during a work shift.
- APRs will not be permitted when atmospheric contaminants exceed the OSHA PEL by a factor of 10, unless the wearer has successfully completed a quantitative fit test within the prior 12 months which demonstrates a higher protection factor.
- APRs will not be selected for protection against substances that lack adequate warning properties, unless the service life of the cartridge is specified and field concentrations do not exceed specified amounts or the cartridge/canister has an end-of-service indicator.

- Full facepiece respirators will be selected whenever concentrations may be irritating to eyes or the contaminants may be absorbed through the skin.
- Cartridges/canisters will be selected that remove the contaminants present in the hazardous atmosphere. Laboratory breakthrough data will be consulted. APRs will not be used for protection against those contaminants for which the respirator manufacturer warns that its cartridges are not effective.
- An emergency escape respirator will be required whenever there is a possibility of a rapid increase in atmospheric contamination or decrease in oxygen that would result in employee exposure to hazardous levels during escape from the affected area.

A.5 TRAINING AND MEDICAL REQUIREMENTS

A.5.1 Medical Surveillance Requirements

Personnel will not be assigned to tasks requiring the use of respirators unless it has first been medically determined that they are physically able to perform the work and use the equipment. The protocol for the medical examination will be determined by the Company Corporate Medical Director (a board certified occupational physician with Continuum Healthcare) with approval of the Director of Safety and Health.

The medical examination will be performed by a licensed physician, preferably one who is experienced or board-certified in Occupational Medicine, and will include, at a minimum:

- OSHA Respiratory Medical Evaluation Questionnaire (Mandatory) in Appendix C of 29 CFR 1910.134 published in the *Federal Register* on 8 January 1998.

In addition, the Company will provide further examination if the employee answers yes to any question among Questions 1 through 8 in Section 2, Part A of Appendix C (29 CFR 1910.134) or whose initial examination demonstrates the need for follow-up examination.

Upon receipt of a satisfactory Preliminary Assessment signed by the examining physician, a Company employee may participate in respirator training. No Company employee will wear a respirator in a hazardous atmosphere until the Regional Safety and Health Manager has received a Final Assessment signed by the Corporate Medical Director. Any limitations or restrictions noted by the Corporate Medical Director will be observed. Respirator users must renew their medical certification at an interval recommended by the Corporate Medical Director.

If employees who wear respirators are also involved in the Company's Hazardous Waste Operations Program, the requirements for the above medical examination are satisfied by the examination received under that program and need not be duplicated.

Corrective Lenses—Wearing of contact lenses while using full-face respirators is not permitted. Respirator users who must wear corrective lenses, as confirmed by the examining physician, will, with the written approval of the Regional Safety and Health Manager, be issued corrective safety lenses in a respirator spectacle kit that are designed to fit inside the facepiece of their full-face respirator. An authorization form for prescription corrective lenses is issued by the Regional Safety and Health Manager, Human Resources, Office Administrators, or the Director of Safety and Health.

A.5.2 Training

Personnel must be trained in proper use and limitations of respirators according to the requirements of this section. Both supervisors and workers will be trained. The Site Safety and Health Officer must also be trained to ensure that he/she is able to correctly maintain and issue respiratory protection equipment.

Prior to wearing respirators, Company personnel will receive training which will include, at a minimum:

- Overview of regulatory requirements and the Company's Respiratory Protection Program
- Responsibilities of individuals involved in the Program
- Nature, extent, and effects of respiratory hazards to which the employee may be exposed
- Operation, limitations, and capabilities of the respirators selected
- Proper inspection, maintenance, care, and storage of respirators
- Procedures for respirator failure or emergency situations
- Demonstrations and hands-on training in how to wear, fit, and adjust respirators and how to test the face-to-facepiece seal to determine proper fit
- Exercises in which personnel wear respirator(s) in a safe air environment to become familiar with feel and fit
- Fit testing.

Training will be updated annually. Training certificates signed by the instructor will be issued to each trained employee. The Regional Safety and Health Manager and Site Safety and Health Officer will maintain copies of each training certificate in their respective office safety and health file.

Pre-Use Briefing—If more than 3 months have passed since the employees received training or have worn respirators, or upon request of the employee, a “hands-on” pre-use briefing will be provided by the Site Safety and Health Officer or other person designated by the Regional Safety and Health Manager. This briefing will cover the safe use of respirators in normal operations and emergencies. The pre-use briefing is mandatory for the use of SCBAs and ALRs if more than 3 months have elapsed since the prior pre-use briefing.

A.6 INSPECTION, CLEANING, MAINTENANCE, AND STORAGE OF RESPIRATORS

Respiratory protection equipment will be properly inspected, cleaned, maintained, and stored to retain its original effectiveness. All persons who are assigned a respirator will be personally responsible for regularly cleaning, disinfecting, inspecting, and storing their assigned respirators as required by this section. The Site Safety and Health Officer will be responsible for inspecting, storing, and distributing the respirators kept in the office supply.

Inspection by Wearer—Respirator wearers will inspect their respirators for defects **before and after each use** as delineated in the written inspection procedures that accompanied their respirator upon assignment.

Defective or ill-fitting respirators will not be used and will be returned to the Site Safety and Health Officer immediately for replacement or repair. Personnel who cannot obtain an adequate fit check will inform the Site Safety and Health Officer and be fit-tested according to the requirements of Section A.4.2. Respirators which are not adequately clean will be returned to the most recent wearer who is responsible for cleaning and disinfecting the respirator according to the manufacturer's instructions.

Inspection by Site Safety and Health Officer—On a quarterly basis, the Site Safety and Health Officer will inspect individually assigned respirators and office supply respirators according to the inspection procedures provided by the respective respirator manufacturer. The Site Safety and Health Officer will inspect respirators kept ready for emergencies at least monthly. The Site Safety and Health Officer will keep records of these inspections and note findings in a logbook. The Site Safety and Health Officer will also check the cleanliness of the respirators. Personnel whose respirators have not been maintained in good working order will be reported to their supervisor, who will issue appropriate disciplinary action.

Inspections by Supervisors—Since supervisors are responsible for ensuring that their workers comply with this program, supervisors will conduct frequent random inspections of respiratory protection worn by their employees during work operations and take appropriate disciplinary action when necessary. A review of the supervisor's enforcement of this program will be included in his/her annual performance evaluation.

Repair—Replacement or repair of respirators will be performed only by the manufacturer's representative or a trained individual with parts designed for the respirator according to the manufacturer's instructions. No attempt will be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators will be returned to the manufacturer for adjustment or repair. All replacement parts must be identical to the original parts in order to maintain the NIOSH certification. Only factory-trained technicians are authorized to attempt high pressure side SAR repairs. Repairs or attempts at repair of the high pressure system of SARs by unauthorized personnel may void the certification and could endanger future users of that unit.

Cleaning and Disinfecting—After each use, respirators will be cleaned by the wearer according to these minimum cleaning requirements:

1. Wash in warm (110°F maximum) water with mild detergent, rinse, dry, and reassemble. Submerge for 2 minutes in a disinfecting solution of 50 ppm hypochlorite.
2. Wash or wipe with materials recommended by the respirator manufacturer.
3. Place the facepiece in a plastic bag, seal it with tape, and initial the sealing tape.

Respirators will not be transferred from one employee to another until the most recent wearer has cleaned and disinfected it according to the manufacturer's instructions.

Storage—After inspection, cleaning, and necessary repair, the wearer(s) will store respirators in labeled plastic bags and protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Prior to storage in lockers, cabinets, desks, or other location, the wearer must place the bagged respirator in a clean storage carton, packing it so that the facepiece rests in a normal position and is not distorted.

APRs will not be stored with cartridges attached.

Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in marked compartments built for that purpose.

Maintenance and Storage of SCBA and SAR Equipment—SCBAs may be individually assigned for the duration of a project, but are otherwise part of the office supply inventory and will be inspected monthly by the Site Safety and Health Officer. At project sites, the Site Safety and Health Supervisor will check the SCBAs weekly and perform the inspection monthly. Before and after each use, the wearer will check the SCBA and tank according to directions supplied with the units. The Site Safety and Health Officer will ensure that SCBA tanks and compressed air tanks are tested and maintained as prescribed by the manufacturer and in accordance with applicable U.S. Department of Transportation specifications for shipping containers (49 CFR Parts 173 and 178). Prior to use, the wearer will ensure that SCBA tanks are fully charged (at least 90 percent of rated capacity) with air according to the manufacturer's instructions. If a SCBA tank is filled to less than 90 percent of capacity, it will be removed from service until it is charged.

Compressed Air—Compressed air used for respiration will be of high purity, meeting at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1989. The moisture content in compressed air cylinders will not exceed 27 milliliters per cubic meter. Compressed oxygen will not be used in ALRs or in SCBAs that have previously used compressed air.

Compressed air cylinders that are purchased or leased from a reputable source and fitted with a suitable regulator to reduce air pressure to meet the respirator hose inlet requirements will be preferred over the use of onsite air compressors. Compressors used for SARs will be specifically designed and intended for the compression of breathing air. Compressors will be situated so as to avoid entry of contaminated air into the system, and suitable in-line air purifying sorbent beds and filter will be installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in the event of compressor failure and alarms to indicate compressor failure and overheating will be installed in the system. If an oil-lubricated compressor is used, it will have a carbon monoxide alarm.

APR Cartridges—Cartridges will not be used if their packaging is open or torn. Upon receipt of new cartridges, the Site Safety and Health Officer will mark each package with the date received. Chemical cartridges or canisters that are more than 1 year old will be discarded without using. Cartridges with marred, torn, or missing labels will be crushed and discarded without using. Cartridges will not be used for longer than 1 working day and, in some instances, the duration of use may be less than 1 working day, as specified in the site safety plan or standard operating procedure. Cartridges will not be cleaned with any solution, including water or alcohol. Transfer of used cartridges between personnel is not permitted. After use, APR cartridges will be crushed and discarded by the wearer according to site safety plan or standard operating procedure instructions. In some instances, used cartridges may be considered to be hazardous waste and will be handled accordingly.

A.7 USE

Company personnel will wear only the respirator makes and models for which they have received hands-on respirator training or retraining. For SARs, this training must have occurred within 3 months prior to use, and for APRs, within 12 months prior to use. In addition, for APR usage, a fit test with the specific make and model must have been successfully completed and documented within 12 months prior to use.

Respirators will not be worn when conditions prevent a good face-to-facepiece seal. Such conditions may include but are not limited to:

- Growth of beard or sideburns, or a skull cap, hat, or other headgear that projects under the facepiece
- Absence of one or both dentures, or facial scars/deformities which affect the fit of the facepiece
- Corrective glasses or temple bars extending through the sealing edge of full facepiece.

As part of the donning procedure, the wearer will perform positive and negative pressure checks on the face-to-facepiece seal. If these fit checks indicate a possible leak, the user will re-adjust the facepiece and re-check. If the re-adjustment fails to correct the fit problem, the wearer will report this problem to the Supervisor, who will either issue another respirator or perform fit testing using the qualitative fit-test procedure, until a satisfactory fit is obtained.

If ambient temperatures are at or below freezing, a noseclip will be worn when full-face respirators are used.

Employees will return to a safe area to replace APR cartridges whenever breathing resistance increases or chemical breakthrough is detected or to wash their faces and respirators as necessary in order to prevent skin irritation.

In any operation requiring respiratory protection, the onsite supervisor will have at least 5 days of prior experience in wearing the specified respirator.

At a minimum, respirator wearers will take a break every 2 hours during which they will return to a safe area and remove the respirator. The site safety plan or standard operating procedure will specify any decontamination steps necessary for these breaks. More frequent breaks may be specified.

At the end of the workday, respirators will be cleaned and disinfected. Used cartridges will be crushed and properly disposed of.

A.8 RECORDKEEPING AND PROGRAM EVALUATION

Medical and training certificates, as well as respirator fit test records, will be stored by the Regional Safety and Health Manager and respective Site Safety and Health Officer (as appropriate) for the duration of employment, plus 1 year. Medical certificates and records must be stored in accordance with the Company's policy on medical records (Chapter 9 of the Safety and Health Program Manual).

Monitoring results will be permanently recorded in the Supervisor's logbook. Real time monitoring results are verbally communicated to affected employees at least once per day, while other monitoring results are distributed to affected employees within 5 working days of receipt.

Respirator inspection records will be kept by the Site Safety and Health Officer on the job site and from 1 year (for APRs) to 5 years (for SARs) in project files. Inspections conducted in the field by Supervisors will be submitted to the Site Safety and Health Officer.

The Site Safety and Health Officers will monitor the effectiveness of this respirator program by maintaining frequent communications with respirator wearers and conducting periodic inspections of the respirators. Problems identified will be resolved by the Site Safety and Health Officers with assistance

Appendix A—Respiratory Protection Program

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from the Regional Safety and Health Manager, as needed. Site Safety and Health Officers may make unscheduled site audits of field activities that require respiratory protection. Any observed deficiencies will be reported to the Project Manager and Regional Safety and Health Manager.

The Regional Safety and Health Manager may audit any portion of the Respiratory Protection Program. Such audits include records reviews, office audits, and field visits.

Any injury and accident report involving respiratory hazards will be promptly and thoroughly investigated by the Site Safety and Health Officer and Regional Safety and Health Manager. A written report will be prepared which analyzes the incident and recommends preventative and follow-up actions.

Appendix A—Respiratory Protection Program

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Appendix B

Corporate Diving Procedures and Safe Practices Manual

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EA Engineering, Science,
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Corporate Diving Procedures and Safe Practices Manual

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Corporate Diving Procedures and Safe Practices Manual

REVIEWED AND APPROVED BY:

A handwritten signature in blue ink, appearing to read 'Peter Garger'.

Peter Garger, CIH, CSP
Corporate Safety and Health Officer

1 October 2013

Date

October 2013

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1. INTRODUCTION

1.1 PURPOSE

The purpose of this Manual is to provide written operational procedures for diving performed or conducted on EA project sites. EA's Corporate Safety and Health Officer shall periodically review this Manual to determine if it contains adequate safety procedures and checklists for diving operations, assignments, and responsibilities of the dive team members, equipment procedures and checklists, and emergency procedures (at a minimum: fire, equipment malfunction or failure, adverse environmental conditions, and medical illness and injury). This Manual must be supplemented with additional information specific to each diving operation.

Additionally, this Manual will become part of all project site-specific work plans for the projects performing diving and thus does not include information on the other aspects of the actual work to be performed at (site). Thus, this Manual is to be used in conjunction with the site-specific work plan with its attachments for the specific project site.

EA conducts or supervises diving operations through a variety of regulations covering all phases of diving. Rules and regulations established by the U.S. Coast Guard, Association of Diving Contractors, and Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) Part 1910, Subpart T, as well as those established by State governments, have been used as guidelines in preparation of this Manual. Whenever conflicts between regulations occur, the more conservative shall apply. When diving operations are conducted in areas not covered by this Manual, local regulations must be ascertained. If a conflict between regulations or subcontractors exists, EA management will act as arbiter.

Changes and additions to the rules and regulations governing commercial diving operations occur periodically. As these changes to existing rules occur, or as proposed rules are finalized, areas which are in conflict with this Manual will be brought to the attention of the users and, as required, changes will be issued.

1.2 SCOPE

This Manual applies to all diving operations conducted by EA. Included are detailed rules and procedures to be followed when conducting open ocean diving from small craft and pier-side locations utilizing Self-Contained Underwater Breathing Apparatus (SCUBA). Additional information concerning diving-related subjects (e.g., physics, physiology, etc.) are contained in the U.S. Navy Diving Manual and CFR – Commercial Diving Operations.

1.3 RELATED PUBLICATIONS

The following publications are related to the subject matter contained in this Manual:

- CFR, Title 29-Labor, Subpart T – Commercial Diving Operations 1910.401
- NAVSEA 0994-LP-001-9010, Rev. 2, U.S. Navy Diving Manual
- Diving Safety Advisory Messages (AIG). Norfolk, Virginia: Naval Safety.

- Instructor's Manual for Basic Life Support (Cardiopulmonary Resuscitation [CPR]). Journal of the American Heart Association
- Recompression Chamber Operational Procedures and Emergency Procedures
- American Heart First Responder Advanced First Aid
- Standard Organization and Regulations Manual OPNAVINST 3120.Series
- Safety and Health Requirements Manual, U.S. Army Corps of Engineers EM 385-1-1, Section 30 Diving Operations.

1.4 DIVE TEAM SIZE REQUIREMENTS

SCUBA air diving with one diver in the water requires a minimum of three dive team members: designated person-in-charge (DPIC), standby diver, and line-tended diver. SCUBA diving with two divers in the water requires a minimum of four dive team members: DPIC, standby diver, and two divers.

NOTE: In establishing the number of dive team members required for a dive, proper consideration must be given to planning and assessment of the dive and any hazardous activities that may be performed. This latter provision requires employers to provide a means to assist an injured diver from the water (i.e., small boat, or stokes basket, land evacuation).

1.5 QUALIFICATIONS OF THE DIVE TEAM

The level of experience or training required by the standard depends upon the job the employees are required to do. All dive team members must have either experience or training in the use of tools, equipment, systems, techniques, operations, operational procedures, and emergency procedures that are pertinent to, and necessary for, the assigned tasks for the diving method i.e., SCUBA. It is essential that those dive team members who are exposed to hyperbaric conditions, or those members who control the exposure of others, have knowledge of the physiological effects of diving and the related effects of pressure. Accordingly, this standard also requires that employees be trained in diving-related physics and physiology. Employee qualifications achieved through field experience or classroom training, or both, may be used to meet the requirements of the standard. For example:

- Most divers begin as tenders and advance to diving status after a period of field experience and/or classroom training. A diving tender trainee performing on-the-job training will be assigned as a tender only under the supervision of a qualified diver.
- Tenders are members of the dive team who provide surface support to divers at the diving location. A tender employed in shallow water air diving is required to have a basic understanding of the breathing air system, the operating and emergency procedures, and knowledge of the care and use of equipment.

- Each dive team member must be trained in CPR and standard first aid. The American Red Cross standard course or equivalent training as specified by the standard. Employees completing this training are issued a card certifying that they have successfully completed the course. Any first aid training meeting the requirements of 29 CFR 1910.151(b) and 1926.50(c) will meet the requirements of the standard (i.e., first-aid courses offered by the American Heart Association, American Petroleum Institute, National Safety Council, U.S. Bureau of Mines, and American College of Orthopedic Surgeons).

1.6 RESPONSIBILITIES

This section details the responsibilities of EA personnel and subcontractors directly involved with diving operations, as related to those operations. It does not cover general responsibilities of all EA employees, such as a safety-conscious attitude. All diving personnel should read and completely understand the duties, responsibilities, and standards of their particular job.

1.6.1 Designated Person-in-Charge

The DPIC (commonly referred to as the “Diving Supervisor” or “Diving Foreman”) is immediately responsible for the safety and health of the dive team. The DPIC can be the employer or an employer representative chosen by the employer. The DPIC shall have experience in, and knowledge of, all phases of the diving operation for which he/she is responsible. The DPIC shall be stationed at the dive location, and shall not be stationed at another dive location (i.e., he/she must be stationed at one dive location and be responsible only for the diving operation at that location). The DPIC can be a diver, when qualified as a diver, and when another dive team member is available at the dive location. This dive team member must be trained and capable of performing the necessary functions of the DPIC’s duties, when the DPIC is a diver in the water. The qualifications of the DPIC can be checked using the same methods listed in Section XV, Paragraph C.2, of CFR, Title 29-Labor, Subpart T – Commercial Diving Operations 1910.401.

A DPIC will be appointed in writing from the EA Operations Manager for each project where diving is to be performed or supervised by EA. The DPIC will ensure that divers assigned to the job are physically and mentally capable of performing designated tasks. The DPIC will be responsible for ensuring strict compliance with applicable safety parameters and policy and will promptly report any accident, injury, or variation of policy or regulation to the EA Operations Manager.

The DPIC will have complete authority to conduct those tasks as may be assigned to him. If there are any pre-existing, unsafe conditions or if unsafe conditions develop during the operation, he may postpone or abort the dive and report this action to the Dive Team Leader. Any condition which might cause postponement or cessation of a dive will be resolved prior to resumption of dive operations.

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2. SPECIFIC OPERATIONAL REQUIREMENTS AND PROCEDURES

2.1 SCUBA DIVING

EA personnel or subcontractors will perform SCUBA diving only.

Because a SCUBA diver has a limited breathing supply, does not usually have voice communication, and often is not monitored or controlled by surface support personnel, the limits on this mode of diving are more stringent than for other types of diving methods.

Limits:

1. EA limits the depth of diving to 100 ft of seawater (fsw).
2. No diving will be performed in enclosed or confined spaces without the express written approval of the EA Operations Manager.
3. Dives will be conducted per U.S. Navy Diving Manual, “No Decompression Limits.”
4. All dives will be made with compressed air from a source that has been tested within 6 months and passes OSHA standards.
5. Each SCUBA diver must be line-tended when the current exceeds one knot. Three basic types of currents affect diving operations: river or major ocean currents, currents produced by the ebb and flow of the tides (which may add or subtract from any existing current), and underwater or rip currents caused by the rush of water returning from waves breaking along a shoreline. The Corporate Safety and Health Officer, by reviewing the dive plan, shall determine that the employer has ascertained the strength of the local currents at the dive site from Tide and Current Tables, Coast and Geodetic Survey Charts, Coast Pilot Publications, or other sources. A SCUBA diver is seriously encumbered when swimming against a current exceeding 1 knot, and the standard prohibits such activity unless the diver is line-tended. A SCUBA diver may, however, swim downstream with a current when means are provided to pick the diver up (i.e., retrieval with a boat).

NOTE: When two SCUBA divers are in the water, one tending line to the surface is sufficient when the two divers are connected by a “buddy line.”

6. Each SCUBA diver must be line-tended when diving in an enclosed or physically confining space (i.e., any underwater location where the diver cannot ascend directly to the surface; commonly referred to as “free access to the surface”).

2.2 PROCEDURES

2.2.1 SCUBA Diver

A SCUBA diver must be line-tended when in the water or that SCUBA diver is accompanied by, and in continuous visual contact with, another diver during the diving operation.

NOTE: While line-tending the SCUBA diver from the dive location is considered preferable to “buddy diving,” it is recognized that “buddy diving” is an accepted practice. The safety advantage of having two divers in the water tending each other (“buddy diving”) is lost if they cannot maintain continuous visual contact; without visibility, divers cannot tend each other adequately.

2.2.2 Reserve Air Supply

Each SCUBA diver is required to have: (1) a diver-carried reserve breathing-gas supply that consists of a manual reserve (J-valve), or (2) an independent reserve cylinder that has a separate regulator or that is connected to the underwater breathing apparatus. The valve of the reserve breathing-gas supply must be in the closed position prior to the dive to ensure that the air reserve will not be depleted inadvertently during the dive.

NOTE: A Spare Air® bottle, or equivalent device, that is attached positively to the diver by a suitable line (so that the bottle is not lost if dropped) is sufficient as an independent reserve cylinder, provided that it meets the emergency air volume requirements for the dive profile. Spare Air® is the trade name for a small, high pressure air bottle with an attached breathing regulator that is designed for use as an emergency air source.

2.2.3 Standby Diver

A standby diver will be available for all SCUBA diving operations. An “available” standby diver means that the diving gear for the standby diver is at the dive location and ready for use (i.e., set up and fully checked out), with a qualified diver at the dive location available to be the standby diver. **A second diver (“buddy diver”) in the water does not satisfy the requirement for a standby diver.** As a minimum, one employee can be both the standby diver and tender, provided that this employee is a **qualified diver**; for a three-person dive team, the DPIC would assume tending duties when the standby diver (tender) is in the water. A DPIC who is a qualified diver also can be the standby diver, provided that another dive team member is at the dive location. This dive team member must be trained and capable of performing the necessary functions of the DPIC, when the DPIC is in the water serving as the standby diver. The standby diver is required be line-tended from the surface when deployed in the water by a qualified tender as per Section 1.4.

2.3 DIVE TEAM REQUIREMENTS

Each dive team member must have, as a prerequisite, training in the following:

1. Diving procedures and techniques
2. Emergency procedures
3. Diving medical procedures
4. Diving equipment
5. CPR.

2.4 DESIGNATED PERSON-IN-CHARGE

1. The DPIC shall be thoroughly knowledgeable in all aspects of the operation to which they are assigned and shall have a complete knowledge of diving medical procedures. He/she will be thoroughly familiar with all OSHA regulations governing diving operations, U.S. Army Corps of Engineers 385-1-1, Section 30, as well as with the contents of this Manual.

2. For training purposes, a potential DPIC may, under direct supervision of a qualified DPIC who will have no other duties, supervise diving operations.
3. The DPIC shall have full authority to conduct diving operations to which they are assigned.
4. An employee designated as DPIC shall be qualified in writing and approved by the EA Operations Manager. Qualification for DPIC will be at the discretion of the EA Operations Manager and will be based upon demonstrated knowledge, experience, and ability.
5. The DPIC shall maintain a complete record of each dive supervised.

2.5 DIVERS

1. All divers employed or subcontracted by EA must be at least 18 years old and meet physical standards as established in CFR Title 29-Labor, Subpart T-Commercial Diving Operations. Additionally, every diver must meet the following criteria:
 - a. Have training and experience working at depths up to 100 fsw
 - b. Be trained and proficient in the use of diving equipment and tools, including specialized tools required to perform assigned tasks
 - c. Have a thorough understanding of the job to be performed
 - d. Have a working knowledge of Diving Medical Procedures and be proficient in the use of decompression schedules as outlined in 0994-LP-001-9010, Current Revision, U.S. Navy Diving Manual, Volume I, Air Diving
 - e. A graduate of U.S. Naval School Explosive Ordnance Disposal, if engaged in munitions response diving or snorkel operations
 - f. Must demonstrate that at least one of the four qualification dives was performed in the last 6 months prior to the contract award date
 - g. Have completed at least four working dives using the diving techniques and equipment to be used
 - h. 40-hour Hazardous Waste Operations training with an 8-hour annual refresher training as required.

2.6 STANDBY DIVERS

Only divers qualified in accordance with Sections 1.4 and 2.3 shall be designated as standby divers.

2.7 DIVE TENDERS

Only personnel that meet or exceed the requirements of Sections 1.4 and 2.3 shall be designated as dive tenders.

2.8 PLANNING

The DPIC is responsible for planning specific dive jobs to which he is assigned in accordance with this Manual.

As a minimum, the DPIC will:

1. Familiarize themselves with the procedures and tools to be used in the operation
2. Be cognizant of all safety considerations
3. Conduct a pre-dive brief with divers (and support personnel, if required) outlining the task, procedures, and safety considerations.

2.9 PRE-DIVE PROCEDURES

1. The DPIC will conduct a pre-dive brief in accordance with the above paragraph.
2. The diver's ability to perform the task will be determined during the pre-dive brief and adjustments will be made if required.
3. An equipment check will be conducted by the DPIC prior to departing for the job site. A final check of all dive equipment will be made immediately prior to commencing the dive.

2.10 IN WATER PROCEDURES

1. Upon entering the water, the divers will perform an operational check of their equipment. If any equipment deficiencies are discovered, they will be corrected before proceeding any further into the operations. If the equipment is operating properly, the divers will give the "okay" sign to the DPIC who will acknowledge. The divers will then signal "ready to leave the surface" and set their watches. When satisfied, the DPIC will set his watch and return the signal. The divers will then proceed with the dive.
2. Upon completion of the task, the divers will check their bottom time and return to the surface.
3. When they reach the surface, they will report "diver okay" and go to the dive station. The DPIC will then ascertain the divers' conditions and record these conditions in the log.

NOTE: Divers will maintain their own dive times. The DPIC will record leaving and reaching the surface as backup only.

2.11 POST-DIVE PROCEDURES

1. A debriefing will be conducted by the DPIC to ascertain the progress of the job and any difficulties encountered. Input from the divers should be solicited during the debriefing.
2. All equipment will be returned to a "ready" status.
3. Notification of completion of dive operations will be made as required. The work, however, is not complete until the paperwork is done and the equipment is returned to a "ready" status.

2.12 RECORDKEEPING

A rough profile of every dive will be maintained at the dive site and will contain the following information:

1. Purpose of the dive
2. Date
3. Name of the DPIC, divers, and standby divers
4. Breathing media
5. Type of equipment (dress)
6. Time left surface
7. Time reached bottom
8. Time left bottom
9. Time reached surface
10. Total bottom time
11. Total decompression time
12. Total time of dive
13. Divers' condition
14. Repetitive dive group
15. Remarks.

The rough dive profile will be transferred to the smooth dive log at the end of the diving day by the DPIC. The pre-dive checklist will be attached to the dive profile.

If required, a repetitive-dive worksheet will also be attached to the dive profile. The worksheet must be used if the surface interval exceeds 10 minutes and less than 12 hours.

Accidents will be reported in accordance with EA policy and in strict compliance with OSHA requirements. Whenever possible, a representative of the EA Safety department will be summoned to the scene to perform an accident investigation.

Equipment failure shall be reported in accordance with EA policy.

Chapter 2 – Specific Operational Requirements and Procedures

Corporate Diving Procedures and Safe Practices Manual

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3. OPERATIONS PLANNING

3.1 GENERAL

The initial and extremely important phase of any diving operation is its planning. Proper planning will eliminate unnecessary delays and contribute to the overall success and safety of the task. Operations planning can be broken down into the following four major areas:

1. Definition of task
2. Collection and evaluation of data
3. Establishment of requirements
4. Preparation for the operations.

3.2 DEFINITION OF TASK

The initial step in the planning of any operation is the definition of the task to be accomplished. This includes an in-depth breakdown of all elements required to complete the task, location, and timeframe in which it is to be accomplished. All parties involved in the task, diving and non-diving, should take an active role in establishing diving requirements. Once the requirements have been established, planning for their accomplishment can begin.

3.3 COLLECTION OF DATA

With the tasks established, work can begin collecting data for areas that will affect the operation. The extent and type of information required will be influenced by such factors as the size of the operation, location of the dive site, and the time of year. Some operations are of a recurring nature with most information already available. Areas to be considered when planning an operation include government regulations affecting diving and resources (logistical and emergency) available to support the operation. Three areas that have a continuous effect on the operation, and in which data are to be collected are: meteorological, oceanographic, and bottom conditions.

3.3.1 Meteorological Conditions

During the planning stages of the operation, past meteorological data and long-range forecasts should be evaluated to determine the probable effect the weather will have on diving operations. This information will permit the planner to determine special equipment requirements and, if the option is available, when weather conditions will be best for the operation. During diving operations, weather reports should be monitored continuously.

If weather extremes are encountered in the area of operation, they must be addressed. If the weather is continuously hot or cold, preparations should be made to ensure that equipment which could be affected is properly prepared for the exposure or replaced with equipment that will operate satisfactorily. In areas that are continuously hot, arrangements should be made so that temperatures do not become unbearable. Shade should be provided for personnel working outdoors to prevent severe sunburn, heatstroke, dehydration, or other heat-related illnesses. Extremes of cold require special consideration. Personnel exposed to outside conditions must be provided with adequate protection from the environment. In cold, windy weather, the wind chill will have an effect equivalent to a much colder temperature. Failure to provide for these and other extremes can seriously affect an operation and result in severe personal injury.

3.3.2 Oceanographic Conditions

Probably the single, most variable element that will affect diving operations is the sea itself. There are a number of oceanographic factors that will affect diving operations and must be considered when planning an operation. They are as follows.

3.3.2.1 Sea State

Few factors can be less predictable and have more effect on diving operations than the state of the sea. Heavy seas can result in numerous conditions that make diving hazardous. The vessel from which diving operations are being conducted, even if properly moored, can move in its moor and consequently move off the dive site. Wave action will cause the vessel to pitch and roll, resulting in a potentially hazardous surge on lines, to divers and equipment on or near the bottom. It can also result in seasickness among the crew members and divers. While divers on the bottom are not usually affected by wave action, surge can be extremely noticeable and uncomfortable to divers entering or leaving the water. Diving operations should be terminated when, in the opinion of the Diving Supervisor, weather conditions make diving hazardous.

3.3.2.2 Water Temperature

Prior to beginning diving operations, data relating to the water temperature in the dive area must be obtained. Few factors will more rapidly fatigue a diver than continued exposure to cold water. Even in moderately warm water (60-70°F), heat loss to the water can bring on excessive fatigue. If the diver becomes cold, his ability to concentrate and his working efficiency will drop off rapidly.

Anticipated water temperature (when combined with the projected duration of the dive) will enable the planner to determine what type of thermal protection is required by the diver.

3.3.2.3 Tide and Current

Tidal conditions generally have little effect on diving operations except when they result in a strong current. A strong current can severely limit diving and make conditions extremely hazardous for a diver. Currents can be especially dangerous to an untethered diver, a lightweight diver with a long umbilical, or a diver working around a platform or other area where his umbilical could be fouled. If currents in the area are questionable or unknown, they should be checked to determine if they are sufficient to affect operations.

3.3.2.4 Visibility

A lack of visibility will reduce the diver's effectiveness and increase the time required to accomplish a task. If the lack of visibility is due to an absence of light (such as when diving inside structures), some visibility can be restored by the use of an underwater light. The use of a light will be determined by its overall contribution to the task and the diver's ability to handle it while working underwater. Generally, good visibility can be considered a luxury, and divers should become accustomed to and proficient in operating with limited visibility.

3.3.2.5 Bottom Conditions

The type of bottom which the diver will be working and any unusual conditions that the diver will encounter at the work site must be taken into consideration when planning an operation. The type of bottom can affect available visibility and the diver's ability to work. Obstructions such as a wreck or large amounts of debris, if not taken into consideration, can cause costly changes in plans or delays. Potential hazards that the diver might encounter in and around the work site must be considered and planned for. This includes isolation of impressed current cathodic protection systems or structures on which they are installed. Advanced knowledge of bottom conditions is important in planning work, selection of the diving technique, and in anticipating possible hazards.

3.4 ESTABLISHMENT OF REQUIREMENTS

With the definition of tasks and evaluation of collected data completed, the assets required to accomplish the job in a safe and economical manner can be determined. Major areas of consideration are types of diving and support equipment, and logistical and personnel requirements.

3.4.1 Diving Equipment

There are two primary factors which will determine the type of equipment necessary to accomplish a job. They are depth of water and tasks to be accomplished.

3.4.1.1 Depth of Water

The depth of water is of prime importance in determining the type of diving system required for the job. In many cases, the depth will dictate the breathing medium and necessary equipment to be used. Depth also directly affects the dive duration, gas requirements, and decompression schedule, all of which must be considered when selecting the dive system and support equipment to be used.

3.4.1.2 Tasks to be Accomplished

The tasks to be accomplished must be considered when selecting the type of diving equipment to be used. The diver must be able to safely and efficiently perform the required work in the equipment selected. The requirements of the job also greatly influence the bottom time in each dive, the frequency with which the diver is required on the bottom, and the total time required to complete the job, each of which must be considered when selecting the diving mode to be used.

3.4.2 Support Equipment

Two primary factors influencing the type of required support equipment are the diving system being used and the job to be accomplished. The requirements for power, water, and fuel will vary between diving systems, and provisions must be made for an adequate supply of each, whether obtained directly from the surface support platform or from auxiliary equipment. The job to be accomplished must also be considered. The tools and equipment that allow the diver to accomplish the task will vary, but must be planned for and supplied.

Failure to do so can result in costly delay. Both factors influence the selection of a surface support platform. Ideally, the surface support platform selected should be capable of providing most of the services and equipment required, as well as adequate space and a firm mooring capability. If a platform of opportunity must be used, the assets available must be evaluated, and arrangements must be made to procure those assets that are not available.

3.4.3 Logistics

The logistical requirements for every job will vary with the diving system used and the task to be performed. Failure to adequately plan this phase of an operation can result in work stoppage. The initial task to be planned for is getting all equipment, supplies, and personnel onsite at the proper time. Once on the scene and operating, the problem becomes one of maintaining an adequate supply of required materials. This will take prior planning by the Diving Supervisor so that required parts, breathing gas, and other consumables are ordered in sufficient time to be procured and transported before the onsite supply is exhausted.

3.4.4 Personnel

An evaluation of the system to be used and the type and duration of the tasks to be accomplished will establish the requirement for personnel. Prior planning in this area is required to ensure that personnel with the proper qualifications are available in sufficient quantity to safely and efficiently complete the task.

3.5 PREPARATION

As the requirements for a particular job are determined, preparations should begin to ensure that assets are ready and in the required location at the required time. Preparations should include, but not be limited to, the following:

1. Consultation with the person in charge of the platform from which operations are to be conducted. All vessel requirements should be conveyed so there is time to make the necessary preparations to ensure that the craft is ready on time and the divers are aware of exactly what facilities and support are available. Arrangements must also be made for the placement of diving equipment on board in a manner that will not affect the stability or operability of the craft and to ensure that the equipment is satisfactorily located for hookup of power, water, or other required facilities.
2. Complying with requirements established by the government in whose waters diving operations are to be conducted. All local regulations and requirements must be complied with before operations begin.
3. Making arrangements for required supplies and support services. These might include an adequate supply of breathing gas, messing and berthing arrangements, transportation for personnel and supplies, spare parts, and expendables. Many of these items might require significant lead time.
4. Ensuring that all required equipment is available and ready. This includes ensuring there is sufficient quantity available to meet anticipated requirements, which might require additional equipment be brought in from other locations, or the purchasing of new equipment. All equipment should be checked to ensure it is operational. Required maintenance should be performed and equipment tested to ensure it operates satisfactorily and meets required standards.

5. Arrangements for required personnel. This not only includes arranging for a sufficient number of qualified personnel of all levels, but arranging for backups in the event scheduled personnel are unable to make it, ensuring all personnel know when and where they are to be and what type of special equipment they are to bring. If required, arrangements will be made to transport personnel to the job site.
6. Conduct a pre-dive briefing with the dive team and/or support personnel.

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4. SAFETY

4.1 GENERAL

This section is intended to cover general safety rules and regulations relating to operations and equipment not previously addressed in other sections. EA diving personnel should become intimately familiar with this section. Safety is a full-time job, and the more conscientious each employee is regarding safety, the safer each job becomes. Remember, if someone is careless and ignores established safety procedures, everyone could suffer.

- The procedures contained in this Manual represent the minimum acceptable diving safety procedures to be employed in commercial diving operations. No set of standard procedures can anticipate all operating situations that might be encountered and, consequently, no employer or employee may assume safe operation by merely following these guidelines.
- No standards will ever exist that can substitute for common sense, sound judgment, and a continuing concern for maximum safety. **“SAFETY IS NOT A RULE BOOK – IT IS A STATE OF MIND.”**
- It is recommended that deviation from these procedures should only be undertaken when, in the opinion of the Diving Supervisor, an emergency situation exists.
- Decompression procedures established in this Manual or the U.S. Navy Dive Manual will be used as guidelines. In order to establish a safe and healthful working environment, the responsibility of all diving personnel is to know and understand these procedures.

4.2 EMERGENCY SERVICES

At all times while diving operations are being carried out, emergency services must be available and able to proceed by the fastest means of transport to the location of the diving operations when required. Emergency services include medical and diving personnel, equipment, and all other necessary supplies. The DPIC must possess instructions/procedures necessary to contact emergency services when required. These should include, but not be limited to, the following emergency contacts and telephone numbers:

- EA Operations Manager
- EA Corporate Health and Safety Manager
- U.S. Naval Medical Research Institute (Bethesda, Maryland)
- U.S. Navy Experimental Diving Unit (Panama City, Florida)
- Nearest Recompression Chamber.

4.3 EMERGENCY AID

An Emergency Management Plan (Appendix C) shall be completed prior to diving operations and kept at the dive location that includes the telephone or call numbers of the following:

- Location of the nearest operational recompression chamber
- Location of accessible hospitals
- Available means of emergency transportation
- Nearest U.S. Coast Guard Rescue Coordination Center.

4.4 FIRST AID EQUIPMENT

The following first aid supplies will be available at the dive location:

- First aid kit appropriate for the diving operation
- American Red Cross standard first aid handbook or equivalent
- Bag-type manual/mechanical resuscitator with transparent mask will be available at the dive or snorkel location
- A Stokes litter or backboard
- Automatic Emergency Defibrillator.

4.5 DIVING OPERATIONS

The following procedures shall be adhered to during all diving operations:

1. Boats or craft of any kind shall not come alongside a vessel from which diving operations are being conducted **while a diver is in the water.**
2. Whenever diving operations are conducted from a ship, precaution shall be taken to ensure the diver's safety line does not become fouled in the propellers.
3. Crane operations will not be conducted in the vicinity of diving operations unless the crane is in support of the diving operations.
4. Appropriate signals shall be prominently displayed in visible locations during diving operations.
5. Every precaution must be taken to prevent the diver or divers from becoming fouled on the bottom.
6. Care must be taken to isolate or neutralize any equipment/system at the work site that presents a potential hazard to the diver. This includes impressed current cathodic protection systems.
8. Divers shall be instructed not to cut any lines until their purpose is known.
9. The depth of water, condition of the diver, and type of work shall determine the length of the dive. The amount of work shall not be a factor.
10. No diver or diver tender who is under the influence of drugs, or who shows apparent signs of intoxication or its aftereffects, will be allowed on any diving operation.
11. Skylarking, horseplay, or carelessness will not be allowed on or near any diving operation.
12. Divers who are being treated with painkilling drugs or medications that turn the skin red shall not dive until a positive determination has been made that the diver is not suffering from decompression sickness.

13. All adjoining work activities shall be advised as to the commencement of diving operations in their area. In addition, they will be informed if explosives will be used.
14. Whenever a diving operation requires a diver to enter a pipeline, wreck, structure, tunnel, or other restricted underwater area, a standby diver shall be available at the point of entry to tend the diver who has entered the restricted area.
15. All tools passed to or recovered from the diver should be turned off.
16. Any diver who has a cold, sinus infection, inability to clear ears, or other physical or mental condition that might interfere with the ability to perform assigned tasks in a safe and healthy manner, will not be allowed to dive until the condition has passed.
17. The diver shall be properly informed of all aspects of the particular operation and will be familiar with all tools to be used on the job.
18. If a diver is not thoroughly familiar with the safety aspects of the diving operation, the diver will not be used for that particular operation until able to demonstrate a safe working knowledge.
19. Any diver that is taking medicine for any reason will inform the Diving Supervisor of the type and purpose of the medicine.

4.6 RESPONSIBILITIES

4.6.1 Designated Person-in-Charge

In addition to the responsibilities set forth in Section 1, the DPIC is responsible for the safe practices of all diving personnel and safety policies established by EA. Safety is never to be jeopardized to achieve a task. The following items are considered the minimum standards to follow:

- a. Ensure safety procedures and company policies are adhered to.
- b. Inform employees of safe practices, standards, and policies for both the protection of individuals and equipment.
- c. Ensure that all practical recommendations are carried out.
- d. Ensure accidents are fully investigated with reports submitted in a timely manner and that corrective measures, including decompression and treatment, are carried out.
- e. Ensure the proper conduct of employees on the job.
- f. Demonstrate through example that accident prevention is an essential part of diving, both on and offshore.
- g. Evaluate safety reports and implement necessary action.
- h. Assist fellow employees by instructing them in new methods of diving or new work tasks.

- i. Maintain an exchange of information between management and employees.
- j. Check time sheets and log sheets.
- k. Establish a dive plan that ensures sufficient gas and proper equipment are available for safe completion of the task.

4.6.2 Dive Crew

- a. Develop and utilize correct and safe working practices at all times.
- b. Report all injuries promptly and completely.
- c. Attend/participate in safety meetings.
- d. Make all safety suggestions known to your superior, and report any situation or condition that is dangerous or potentially hazardous.
- e. Utilize safety devices available for your protection.
- f. Correct hazards under your jurisdiction and report those outside your responsibility to your superior.
- g. Become familiar with first aid in general and as it specifically applies to your tasks.
- h. Safety helmets are to be worn where required on barges, work boats, or any place overhead work is being performed.

4.6.3 Boat Crew Personnel

The safety items expressed are not intended to replace any safety rules/regulations of a particular installation. However, they should be considered as a supplement or clarification of existing rules/regulations. They point out some, but not all, of the main problem areas in the diving operation.

4.6.3.1 Deck Crew

- a. All personnel are to stand clear of lines, hoses, diving equipment, and high-pressure cylinders.
- b. Exercise care while loading materials around diving gear and equipment. If damage to any diving gear or equipment occurs, report it to the DPIC so the proper inspections can be accomplished.
- c. Do not move any diving equipment unless a member of the dive crew is present.
- d. Do not enter any diving station unless a member of the dive crew is present.
- e. Prior to starting any engine or intake, check with the DPIC.

4.6.4 Diving Operations Commence

- a. Notify all applicable individuals: the person in charge, installation managers, boat captains, etc.
- b. Be certain to discuss the magnitude of the job beforehand with the DPIC. Be aware of the hazards involved or of any special tools or equipment that might be required. Be prepared to assign one or two people to assist the dive crew.
- c. Be prepared to provide assistance in the unlikely event of a diving emergency.
- d. Notify the standby boat and any other vessels in the vicinity that divers will be entering the water and advise them to stand clear. Notify the DPIC of any vessel attempting to approach the dive site while diving operations are in progress.
- e. Be prepared to warn other vessels by flashing light or radio that you are conducting submerged operations and their vessel is “Sailing into Danger.”
- f. Show appropriate signal flags and day shapes during dive operations.

4.6.4.1 Deck Crew (Not Assisting Divers)

- a. Stand clear of diving stations.
- b. Do not throw anything over the side while divers are in the water; objects take an erratic course to the bottom.
- c. Be especially careful working around divers’ support equipment.
- d. Be prepared to assist in an emergency.

4.6.4.2 Deck Crew (Assisting Divers)

- a. Be alert – follow instructions carefully.
- b. Follow instructions only from the DPIC.
- c. Remain at your assigned station unless properly relieved.

4.6.5 Crane Operator

- a. Never allow loads to be moved over dive support equipment. Never swing loads over the water when a dive is in progress.
- b. If it becomes necessary to move equipment around the diving gear, have the dive crew assist in positioning. This is particularly important when moving diving equipment.
- c. Should you accidentally bump into the diving equipment while moving a load, notify the DPIC immediately to assess the damages and determine repairs.
- d. Should you be called to assist during diving operations, you must have positive communications with the DPIC. (A two-way radio generally will be used for this purpose.) Under no circumstances, accept any instructions or signals from anyone other than the DPIC.

- e. Be alert and prepared to carry out urgent, immediate, and possibly contradictory instructions should the DPIC request them.
- f. Always use positive commands (e.g., “All stop – up easy”).

4.7 UNDERWATER EQUIPMENT

4.7.1 General Equipment

For most underwater work, the diver will need a variety of equipment and tools. Much of the equipment is standard; however, some are specially designed for underwater use. Whether it is a screwdriver, or special underwater gear, the diver shall be thoroughly familiar and experienced with its use. The operation and use of underwater equipment requires the following application of basic safety rules:

- a. Never use equipment that is not in good working condition. If a tool becomes dull, send it to the surface for sharpening.
- b. Do not overburden the work site with unnecessary tools and equipment.
- c. Arrange to have all required gear and tools readily available.
- d. Power-driven equipment should be sent down ahead of the diver and should be returned to the surface before the diver makes his ascent.
- e. Power tools shall be off when sent to a diver and when brought to the surface.
- f. Never use electrically-powered tools underwater.

4.7.2 Electrically-Powered Tools

All electric hand tools will have a built-in ground wire or pigtail for grounding. All electric tools must be maintained in excellent condition. Any electric tool without the necessary ground will not be used until properly equipped/repaired.

CAUTION

The use of electrically-powered tools underwater is discouraged. Electricity and water are by nature incompatible, and the use of electrically-powered tools exposes the divers to the danger of electric shock. Hydraulic or pneumatic tools, which present less of a hazard to the diver, should be used in preference to electrically-powered tools. When electrically-powered tools are required, such as when cutting, welding, or when lighting is required, the diver must be protected from electrical shock.

When using electrically-powered tools on the surface, remember they normally arc when in use. Do not use them in an atmosphere rich in flammable vapors (e.g., gasoline, paint thinner, etc.).

4.7.3 Pneumatic Power Tools

When pneumatic tools are used (above surface), eye protection must be worn. The exhaust air from the tool hurls small objects at great speed and distance.

When not in use, pneumatic tools should be disconnected from the air source. Secure air prior to disconnecting.

4.7.4 Hand Tools

- a. Hand tools are often misused because the user has never been shown the proper use of the tool.
- b. Wrenches should be inspected frequently to eliminate worn or sprung jaws, broken cages, springs, faces, and bent or cracked handles.
- c. Frequently inspect driving faces of hammers, chisels, drift pins, bars, and similar tools to eliminate mushroomed heads, broken faces, cracked handles, and other defects.
- d. Handles should be sound and securely wedged or fastened to the tool. Painting or taping of handles might cover defects or cracks that otherwise would be observed; therefore, this practice is prohibited.
- e. In applying force to a wrench, take a position so as not to lose balance when the nut or joint suddenly loosens. The way one grips a tool can be hazardous. Grip a hammer or saw tightly; a wrench or chisel should be held with the open hand.

4.8 LINE PULL AND SCUBA HAND SIGNALS

All dive personnel are required to know and understand the line pull and hand signals. In addition to voice communications, the following signals should be used regularly and are of significant value in the prompt and safe recovery of the divers.

1. Line Pull Signals (Table 4-1)
2. SCUBA Hand Signals (Table 4-2).

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TABLE 4-1 LINE PULL SIGNALS

From Tender to Diver:	From Diver to Tender:
1 Pull: “Are you all right?”	1 Pull: “I am all right” or “I am on the bottom.”
2 Pulls: “Going down.” During ascent, 2 Pulls: “You have come up too far, go back down until we stop you”	3 Pulls: “Take up my slack” 4 Pulls: “Haul me up”
3 Pulls: “Stand by to come up”	2-1 Pulls: “I understand” or “Answer the telephone”
4 Pulls: “Come up”	3-2 Pulls: “More air”
2-1 Pulls: “I understand” or “Answer the telephone”	4-3 Pulls: “Less air”
Emergency Signals:	Special Signals from the Diver:
2-2-2 Pulls: “I am fouled and need the assistance of another diver”	1-2-3 Pulls: “Send me a square mark” 5 Pulls: “Send me a line”
3-3-3 Pulls: “I am fouled but can clear myself”	2-1-2 Pulls: “Send me a slate”
4-4-4 Pulls: “Haul me up immediately”	
All signals will be answered as given — except for Emergency Signal 4-4-4	

TABLE 4-2 SCUBA HAND SIGNALS

SIGNAL	MEANING	COMMENT
1. Clenched fist.	STOP.	
2. Hand flat, fingers together, palm out, thumb down then hand rocking back and forth on axis of forearm.	SOMETHING IS WRONG.	This is opposite of Okay. The signal does not indicate an emergency.
3a/b. Thumb and forefinger making a circle with three remaining fingers extended (if possible)	I AM OKAY, ARE YOU OKAY?	Divers wearing mittens may not be able to extend three remaining fingers distinctly. Short range use.
4a. Right hand raised overhead giving Okay Signal with fingers.	OKAY ON THE SURFACE (CLOSE)	Given when diver is close to pickup boot.
4b. Both hands touching overhead with both arms bent at a 45-degree angle.	OKAY ON THE SURFACE. (DISTANT)	Given when diver is at a distance from the pickup boot.
5. Hand waving overhead. (Diver may also thrash hand in water.)	DISTRESS, HELP, PICK ME UP.	Indicates immediate aid required.
6. Diver points to either watch or depth gauge.	WHAT TIME? Or WHAT DEPTH?	When indicating time, this signal is commonly used for bottom time remaining.
7. Two fingers up, two fingers and thumb against palm.	GO DOWN. GOING DOWN.	
8. Four fingers pointing up, thumb against palm.	GO UP, GOING UP.	
9. Hand slashing or chopping at throat.	I'M OUT OF AIR.	Indicates that signaler cannot breathe.
10. Fingers pointing to mouth or regulator.	I NEED TO BUDDY BREATHE.	Signaler's regulator may be in or out of the mouth.
11. Hand to chest, repeated.	COME HERE.	
12. Finger to chest, repeated.	ME or WATCH ME.	
13. Fingers together and arm moving in an over, under, or around movement.	OVER, UNDER, or AROUND.	Diver signals intention to move over, under, or around on object.
14. Fingers and thumb spread out and hand moving back and forth in a level position.	LEVEL OFF or HOW DEEP?	
15. Fist clenched with thumb pointing up, down, right, or left.	GO THAT WAY.	Indicates which direction to swim.
16. Fingers clinched, thumb out, hand rotating right and left.	WHICH DIRECTION?	
17. Diver pointing to either ear.	EAR TROUBLE	Divers should ascend a few feet. If problem continues, both divers must surface.
18. Both arms crossed over chest.	I AM COLD.	
19. Hand extended, palm down, in short up and down motion.	TAKE IT EASY or LOW DOWN.	
20. Index fingers extended, one hand forward of the other.	YOU LEAD, I'LL FOLLOW.	

5. EQUIPMENT REQUIREMENTS

5.1 GENERAL

In order to ensure the safety and well being of the divers, the equipment used in diving operations must be designed to adequately perform the service required. It must also be properly maintained and in good working order. This chapter will provide details of the requirements equipment must meet prior to being used in diving operations conducted by EA personnel. This chapter deals with equipment used for SCUBA operations.

5.2 SYSTEM REQUIREMENTS

To be considered complete and safe for diving operations, a diving system must include the following equipment:

- a. Equipment for supplying the proper gas to the diver in sufficient quantities
- b. Lifelines
- c. Effective communications between topside and all divers (line pulls, hand signals, etc.)
- d. An accurate depth-measuring device.

5.3 DESIGNATED PERSON-IN-CHARGE

- a. Prior to beginning any diving operation, the DPIC shall ensure that:
 - All diving systems and equipment, other than mobile equipment, are secured firmly in place for the duration of the operation.
 - All diving systems and equipment required for the job are in place and ready for immediate use.
 - The decompression chamber is accessible to divers returning from underwater operations.
- b. The DPIC shall ensure, at intervals not greater than 24 hours, that:
 - All diving systems and equipment have been examined and are in good working order.
 - All compressors and cylinders used to convey breathing gas to the diver have been tested for leaks, examined, and found to be in good working order.

5.4 DIVER'S EQUIPMENT

Diver's equipment, which is worn by or attached to the diver while he is underwater, shall include all equipment required for the safety and well being of the diver. Divers will only use equipment specified and provided by EA. Except in the event of an emergency, no exceptions will be made to this rule without the permission of EA management.

5.4.1 Masks

The diver's mask is his most important piece of equipment. An inadequate or improperly maintained mask can result in a severe reduction of the diver's ability to perform underwater tasks, complications, and delays in the dive, and possible physical injury to the diver. Masks used by EA divers will be visually inspected prior to each dive for signs of damage or deterioration to the faceplate, frame, molded body, and strap.

5.4.2 Snorkel

A snorkel is a simple breathing tube which allows a diver to swim on the surface with his face in the water. This permits him to search a moderately shallow depth from the surface, conserving his SCUBA air supply. It also permits the diver to swim a long distance without having to hold his head out of the water, which can become very tiring.

Some snorkels incorporate a system of valves, intended to keep water out of the tube. Such an arrangement is basically unnecessary, since water that enters the snorkel can easily be blown out. The valves and flaps only serve to complicate what is otherwise a simple, basic, and useful piece of equipment.

When snorkels are used for skin-diving, they are often attached to the face mask with a lanyard or rubber connector on the opposite side of the regulator.

5.4.3 Thermal/Environmental Protection

The maintenance of the diver's body temperature at a safe level is extremely important. The use of inadequate thermal protection, even in relatively warm water, may result in hypothermia. Numerous environmental hazards that can cause serious burns, stings, abrasions, and lacerations are also present. Normally, a wet suit or a skin suit will provide satisfactory protection for diver.

It is the responsibility of the diver to properly utilize and maintain his suits to ensure they will provide adequate protection.

A determination, made by the DPIC, of exactly what protection is required is dependent upon the ambient water temperature and the intended duration of the dive.

5.4.4 Knife

Another of the diver's most important tools is the knife. Although it is used for a multitude of tasks, its primary function is to be available in the event of fouling or other emergency. Each diver will carry a knife of sufficient size and sharpness to cut the most commonly encountered size of line.

5.4.5 Buoyancy Control Life Jacket

The buoyancy control/personal flotation device is functionally designed as both working and safety equipment and must be treated as such by the diver. Used improperly or poorly maintained, this device can cause an uncontrolled ascent or fail to adequately inflate when needed.

A buoyancy compensator used for SCUBA diving must have an inflation source separate from the breathing-gas supply. SCUBA diving requires the use of a personal flotation device capable of maintaining the diver at the surface in a face-up position; this device also must be capable of oral inflation, have an exhaust valve, and have a manually activated inflation source independent of the breathing gas supply.

Periodic maintenance is mandatory, and the diver must ensure the approved scheduled maintenance has been performed and recorded prior to use.

5.4.6 Demand Regulator

In the single-hose, two-stage demand regulator, the first stage is mounted on the cylinder valve assembly. The second-stage assembly includes the mouthpiece and a valve to exhaust exhaled air directly into the water. The two stages are connected by a length of low pressure hose that passes over the diver's right shoulder.

5.4.7 Cylinders

SCUBA cylinders (tanks or bottles) are designed to hold compressed air at pressures of 2,250 psig for steel cylinders and 3,000 psig for aluminum cylinders. Approved SCUBA cylinders are available in several sizes, and two cylinders may be worn to provide the required quantity of air for the dive. SCUBA cylinders must be visually inspected at least once every 12 months and every time water or particulate matter is suspected in the cylinder. Cylinders containing visible accumulations of corrosion must be cleaned before being placed into service. Commercially available steel and aluminum SCUBA cylinders must be hydrostatically tested at least every 5 years in accordance with Department of Transportation regulations and the Compressed Gas Association. The following information is provided regarding the care and charging of SCUBA cylinders:

1. Each SCUBA cylinder will be gauged immediately prior to its use. Partially empty cylinders (less than 90 percent full) will be topped off prior to being used.
2. SCUBA cylinders will not be charged beyond their designed pressure.
3. SCUBA cylinders will be charged only from a source known to be free of impurities.
4. SCUBA cylinders should be cooled during charging. Water is a suitable coolant.
5. Never charge a SCUBA cylinder that:
 - Is out of hydro (5 years for steel and aluminum cylinders)
 - Shows evidence of severe rusting or damage (valve or cylinder)
 - Is dented
 - Has a frozen reserve mechanism
 - Has possible internal contamination.
6. Do not store SCUBA cylinders in direct sunlight.

5.4.8 Cylinder Valve

The cylinder valve passes the high pressure air from the cylinder to the first-stage regulator. The cylinder valve serves as an on/off valve and is sealed to the tank by a straight threaded male connection containing a neoprene O-ring on the valve's body.

The cylinder valve contains a high-pressure blowout plug or safety-disc plug in the event of excessive pressure build-up.

For all EA diving, the cylinder valve must contain an air reserve mechanism called a J-valve. The air reserve mechanism serves a two-fold purpose. It alerts the diver that the available air supply is almost exhausted, and it provides the diver with a reserve of air sufficient to reach the surface. The dive must be terminated when the diver switches to reserve air.

5.4.9 Compressed Air/Standards

Breathing air supplied to the diver must not contain more than 20 parts per million by volume of carbon monoxide, more than 1,000 parts per million by volume of carbon dioxide, 5 milligrams per cubic meter of oil mist, or a pronounced or noxious odor. The output of a compressor system must be tested for air purity every 6 months; air samples must be taken at the connection to the diver's breathing air distribution system in order to provide the most accurate indication of what the diver is breathing.

5.4.10 Harness and Backpack

The backpack must be securely fastened to the cylinder without a quick-release mechanism. During helicopter operations, backpack to cylinder quick-release mechanisms have failed, prematurely jettisoning the cylinder.

Quick-release buckles must be utilized on all waist straps and at least one shoulder strap for all backpack harnesses.

5.4.11 Weight Belt

Weight belts shall meet basic standards:

- The buckle must have a quick-release feature, easily operated by either hand.
- Weights (normally made of lead) should have smooth edges so as not to chafe the diver's skin or damage any protective clothing.
- The belt should be made of a fabric, such as nylon webbing, resistant to rot and mildew.

5.4.12 Swim Fins

Swim fins are made of a variety of materials and styles. Each feature (i.e., flexibility, blade size, and configuration) contributes to the relative power of the fin. Ultimately, selection of blade type is a matter of personal preference based upon the diver's strength and experience.

5.4.13 Diver's Watches

Analog diver's watches must be waterproof, pressure resistant, and equipped with a rotating bezel outside the dial that can be set to indicate the elapsed time of a dive.

Digital watches, with a stopwatch feature to indicate the elapsed time of a dive, are also approved for EA divers.

5.4.14 Depth Gauge

The depth gauge measures the pressure created by the water column above the diver; it is calibrated to provide a direct reading of depth in feet of sea water. It must be designed to be read under conditions of limited visibility.

The accuracy of a gauge must be checked in accordance with the planned maintenance system, or whenever a malfunction is suspected.

5.4.15 Submersible Pressure Gauge

The submersible pressure gauge allows the diver to monitor his air supply throughout the dive, indicating remaining primary and secondary air in pounds per square inch gauge.

The accuracy of the gauge must be checked in accordance with the planned maintenance system, or whenever a malfunction is suspected.

5.4.16 Optional Equipment

Depending upon the requirements of the specific diving operation, any or all of the following optional diving equipment might be necessary:

- Protective clothing
- Slate and pencil
- Witness float
- Tool bag
- Whistle
- Lines
- Tools and light
- Wrist compass
- Signal flares.

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6. AIR DIVING (SCUBA)

6.1 INTRODUCTION

Diving operations performed by EA personnel or subcontractors can be efficiently and safely conducted using air as the breathing medium. However, as water depths increase, allowable bottom times decrease and decompression requirements increase, thereby limiting the use of air. Limits for the use of air are contained in Appendix D, Table D-1. ***To safely conduct air diving operations, all diving personnel must thoroughly know and understand the procedures and special tables which apply to its use.*** As with any diving operation, these procedures must be properly and accurately followed. Equally important is the maintenance of an alert, and vigilant attitude toward the job. ***Conducting a dive using air in shallow water in no way reduces the possibility of an accident, as many serious diving accidents have occurred under these conditions.*** This section will provide information concerning emergency procedures and air diving operations, including applicable tables, rules, and the proper procedures that apply to SCUBA diving operations.

6.2 EMERGENCY PROCEDURES

The primary dangers involved with SCUBA diving are entrapment and sudden loss of breathing supply. If a diver encounters either of these situations, the following applies.

6.2.1 Fouling or Entrapment

Entrapment is particularly dangerous to a SCUBA diver because the supply of breathing gas is limited and the diver might not be able to let the surface know of the problem.

The following procedures should be followed if a SCUBA diver becomes entrapped:

- a. Don't panic.
- b. Take time to evaluate the situation and determine what actions are required to free yourself.
- c. Attempt to free yourself. This includes, if necessary, temporarily removing your tanks to free them. Do not ditch your equipment and head for the surface just because you are fouled.
- d. If unable to free yourself, obtain assistance from your buddy diver, or signal the surface using line-pull signals indicating that you require assistance.
- e. Once free, continue the dive or return to the surface, as appropriate.
- f. If your equipment cannot be freed after all reasonable efforts have been made to clear it, remove the fouled equipment, clear yourself, and execute an emergency ascent to the surface.

6.2.2 Loss of Breathing Supply

Regardless of the cause, a loss of breathing gas places the SCUBA diver in a critical situation. A rapid, proper response to this situation is required; a delayed or improper response could be fatal to the diver.

The steps required for a safe emergency ascent are outlined below:

1. Don't panic.
2. Activate reserve, terminate dive. If reserve is not functional, proceed with the next step.
3. If a “buddy” diver is available, commence buddy-breathing and make a controlled emergency ascent to the surface. If no “buddy” diver is available, proceed with the next step.
4. Drop your weight belt. Do not ditch SCUBA gear unless it is fouled.
5. If necessary, inflate your flotation device. Once the lifejacket is inflated, a controlled emergency ascent might become an uncontrolled emergency ascent due to the added buoyancy.
6. Proceed to the surface, exhaling during your ascent.

6.3 AIR DECOMPRESSION

6.3.1 Theory of Decompression

When air is breathed under pressure, nitrogen diffuses into various tissues of the body. This nitrogen uptake by the body occurs at different rates for the various tissues. It continues as long as the partial pressure of the inspired nitrogen in the circulatory and respiratory systems is higher than the partial pressure of the gas absorbed in the tissues. Nitrogen absorption increases as the partial pressure of the inspired nitrogen increases, such as with increased depth. Nitrogen absorption also increases as the duration of the exposure increases, until tissues become saturated.

As a diver ascends, the process is reversed. The partial pressure of nitrogen in the tissues comes to exceed that in the circulatory and respiratory systems. During ascent, the nitrogen diffuses from the tissues to the lungs. The rate of ascent must be carefully controlled to prevent the nitrogen pressure from exceeding the ambient pressure by too great of an amount. If the pressure gradient is uncontrolled, bubbles of nitrogen gas can form in tissues and blood, causing decompression sickness. To reduce the possibility of decompression sickness, special decompression tables and schedules were developed (Table D-1).

These schedules take into consideration the amount of nitrogen absorbed by the body at various depths and times. Other considerations are the allowable pressure gradients that can exist without excessive bubble formation and the different gas elimination rates associated with various body tissues. Because of its operational simplicity, staged decompression is used for air decompression. Staged decompression requires decompression stops in the water at various depths for specific periods of time.

Years of scientific study, calculations, animal and human experimentation, and extensive field experience all contributed to the decompression tables. While the tables contain the best information available, the tables tend to be less accurate as dive depth and time increase. To ensure maximum diver safety, the tables must be strictly followed. Deviations from established decompression procedures are not permitted except in an emergency and with the guidance and recommendations of a Diving Medical Officer with the EA Operations Manager approval.

6.4 UNLIMITED/NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR UNLIMITED/NO-DECOMPRESSION AIR DIVES

The Unlimited/No-Decompression Table (Table D-2) serves three purposes. First, the table identifies that on a dive with the depth 20 fsw and shallower, unlimited bottom time may be achieved. Second, it summarizes all the depth and bottom time combinations for which no decompression is required. Third, it provides the repetitive group designation for each unlimited/no-decompression dive. Even though decompression is not required, there is still an amount of nitrogen remaining in the diver's tissues for up to 12 hours following a dive. If they dive again within a 12-hour period, divers must consider this residual nitrogen when calculating decompression from the repetitive dive. Any dive deeper than 25 fsw that has a bottom time greater than the no-decompression limit given in this table is a decompression dive and must be conducted per the Standard Air Decompression Table.

Each depth listed in the Unlimited/No-Decompression Table has a corresponding no-decompression limit listed in minutes. This limit is the maximum bottom time that divers may spend at that depth without requiring decompression. Use the columns to the right of the no-decompression limits column to obtain the repetitive group designation. This designation must be assigned to a diver subsequent to every dive.

6.5 REPETITIVE DIVES

Upon completion of an air dive, the level of nitrogen in the diver's body, while not high enough to cause decompression sickness, is higher than normal. When the diver reaches the surface (one atmosphere of pressure) after completion of the dive and associated decompression or treatment, his body continues to off-gas nitrogen for 12 hours, until it reaches a normal level. Therefore, any dive conducted within 12 hours after completion of a previous dive is considered a repetitive dive and must take into consideration the extra nitrogen in the diver's body. The proper procedure for conducting a repetitive dive flowchart is detailed in Figure 6-1.

6.6 REPETITIVE DIVE LIMITS

During any 12-hour period, a diver is permitted to make the equivalent of two "Single 0" dives. A single 0 is the first depth/time combination on any table which results in the diver having a "0" Repetitive Group Designator. These dives are considered safe, yet will enable the diver to have enough bottom time to accomplish his tasks. After the second "0" dive is completed, or if the diver exceeds a single 0.

Repetitive Group Designator, he must take a 12-hour break prior to diving again.

Numerous repetitive dives can be made to build up to the equivalent single 0 dive.

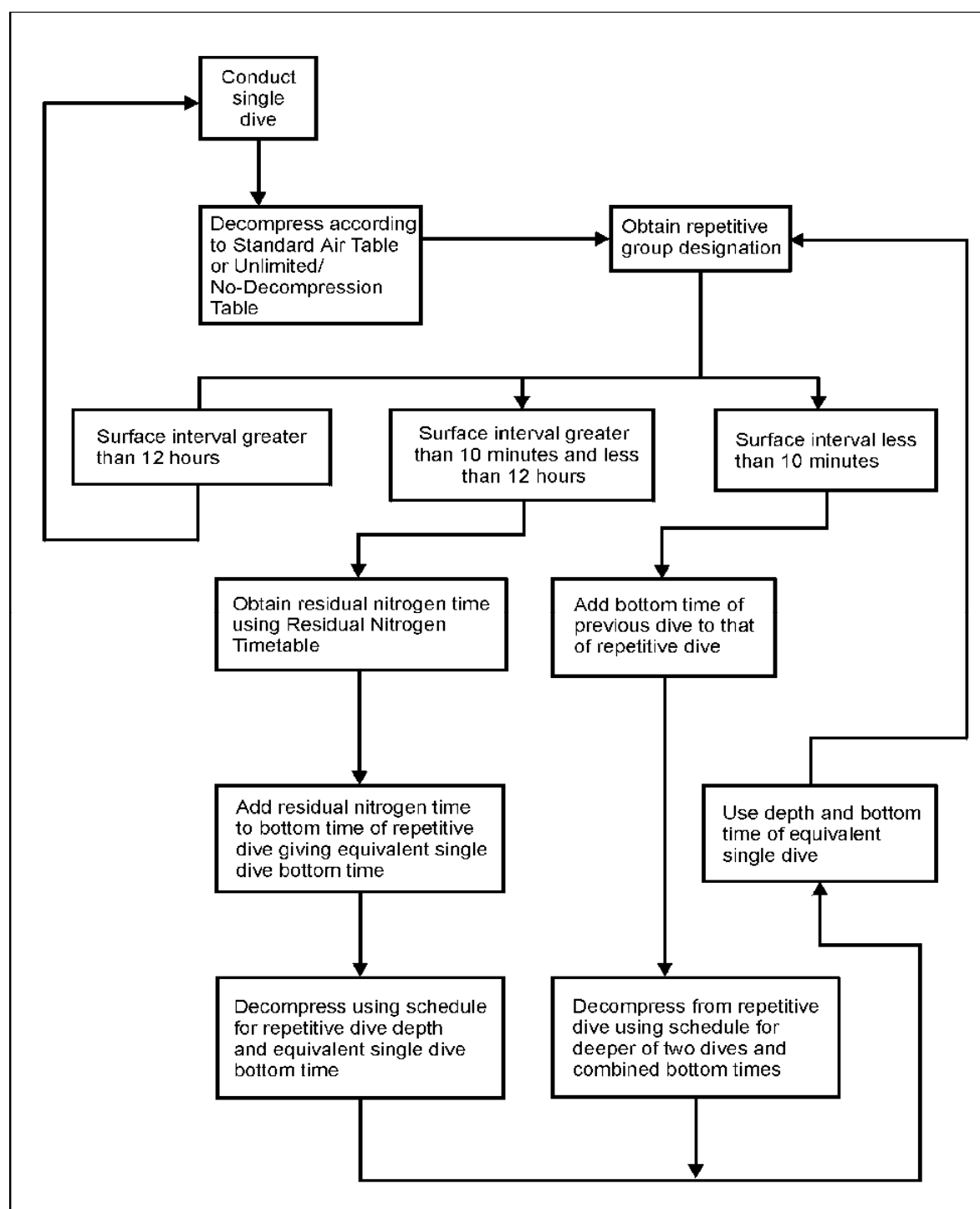


Figure 6-1. Repetitive dive flow chart.

For example:

- First dive:** 100 ft – first 25 minutes; out of water 4 hours – C Group.
- Second dive:** 100 ft – 10 minutes residual time + 15 minutes B.T. = 25 minutes or one single “0” dive. Out of water 2 hours – E Group.
- Third dive:** 100 ft – 18 minutes residual time + 7 minutes B.T. 25 minutes – out of water 4 hours – C Group
- Fourth dive:** 100 ft – 10 minutes residual time + 15 minutes B.T. = 25 minutes or second single “0” dive – diver finished for 12-hour period.

6.7 DETERMINING REPETITIVE GROUP DESIGNATOR

1. Initial Step

Immediately after completion of any air dive, determine the Repetitive Group Designator.

2. Dives Requiring Decompression

See Table D-1, U.S. Navy Standard Air Decompression Table. Enter at the schedule used for the dive. The letter listed in the “Repet. Group” column is the diver’s Repetitive Group Designator at the beginning of the surface interval.

3. Dives Not Requiring Decompression

See Table D-2, U.S. Navy No-Decompression Limits and Repetitive Group Designator for No-Decompression Dives. Enter “Depth” column at the exact or next deeper depth of the dive. Move to the right (horizontally) to the exact or next longer time. The letter at the top of this column is the diver’s Repetitive Group Designator at the beginning of the surface interval.

As the diver remains on the surface and nitrogen off-gases from his body, his Repetitive Group Designator will change.

Example No. 1: A diver conducts a dive to 145 fsw with a bottom time of 37 minutes. What is his Repetitive Group Designator?

Solution: Because this dive required decompression, proceed to the U.S. Navy Standard Air Decompression Table (Table D-1). The next greater depth is 150 fsw. The next greater time is 40 minutes. In the “Repet. Group” column of the 150/40 schedule, we find the diver’s Repetitive Group Designator is “N.”

Example No. 2 A diver conducts a dive to 98 ft for 13 minutes. What is his repetitive dive designation?

Solution: Because this is a no-decompression dive, enter the number of feet from the U.S. Navy No-Decompression Limits and Repetitive Group Designator Table (Table D-2) in the depth column to the next greater depth, or 100 ft. Move to the right to the next longer time, or 15 minutes. Looking at the top of this vertical column, we find the diver’s Repetitive Group Designator is “E.”

6.8 RESIDUAL NITROGEN TIME

The following procedure should be used in determining the residual nitrogen time (RNT) for a repetitive dive:

1. From the Residual Nitrogen Timetable for Repetitive Air Dives (Table D-3), along the diagonal slope of the upper table, locate the dive Repetitive Group Designator at the beginning of the surface interval.
2. Move to the right in this horizontal column, and locate the two times between which the diver’s surface interval falls.
3. The diver’s new Repetitive Group Designator is listed at the bottom of this vertical column.
4. Continue down to the lower table, and locate the vertical column by the diver’s new Repetitive Group Designator.
5. In the far-left vertical column, “Repetitive Dive Depth,” locate the depth which is the same or next greater than the depth of the repetitive dive.
6. Move horizontally to the right opposite this depth until you intersect the vertical column headed by the new Repetitive Group Designator, as located in Step “D.”
7. The junction of these two columns is the diver’s RNT.
8. When the diver starts his repetitive dive, his bottom time must be adjusted as if he had already spent the amount of the RNT on the bottom.

Example No. 3

The diver in Example No. 1 is required to make another dive to 145 ft. He has a surface of 4 hours and 30 minutes when he leaves the surface on his repetitive dive. What is his RNT, and how much actual time can the diver spend on the bottom to complete the job with an “N” Repetitive Group Designator?

Solution

Upon completion of the initial dive to 145 ft for 37 minutes, the diver had an “N” Repetitive Group Designator. Locating “N” along the diagonal slope of the Residual Nitrogen Timetable for Repetitive Air Dives and moving horizontally to the right, we find the surface interval time of 4:30 falls between 4:05 and 5:03. Looking at the bottom of this column, we find the diver’s new Repetitive Group Designator is “D.” Continuing down to the lower table, we locate the vertical column marked “D.” Then, in the “Repetitive Dive Depth” column, we locate 150, the next deeper depth. Moving to the right, to the vertical “D” column, we find the diver has a RNT of 9 minutes. To determine how much time the diver can actually spend on the bottom for a repetitive dive of 150 ft and finish the dive with an “N” Repetitive Group Designator, proceed to the U.S. Navy Standard Air Decompression Table (Table D-1).

From the 150-ft table, we determine that the diver can remain at 150 ft for a maximum of 40 minutes to finish the dive with an “N” Repetitive Group Designator. Since the diver already has an RNT of 9 minutes, this amount of time must be subtracted from the maximum bottom time to determine his actual permissible bottom time. $40 - 9 = 31$. The diver has a maximum actual bottom time of 31 minutes for an “N” Repetitive Group Designator upon completion of the repetitive dive.

6.9 ASCENT TO ALTITUDE AFTER DIVING/FLYING AFTER DIVING

Leaving the dive site may require temporary ascent to a higher altitude. For example, divers may drive over a mountain pass at higher altitude or leave the dive site by air. Ascent to altitude after diving increases the risk of decompression sickness because of the additional reduction in atmospheric pressure. The higher the altitude, the greater the risk. (Pressurized commercial airline flights are addressed in Note 3 of Table D-4.) Table D-4 gives the surface interval (hours:minutes) required before making a further ascent to altitude. The surface interval depends on the planned increase in altitude and the highest repetitive group designator obtained in the previous 24-hour period. Enter the table with the highest repetitive group designator obtained in the previous 24-hour period. Read the required surface interval from the column for the planned change in altitude.

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Appendix A

Glossary of Terms

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GLOSSARY OF TERMS

Acfm—Actual cubic feet per minute.

ATA—Atmosphere absolute.

Bell—An enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time—The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent (i.e., the diver “leaves the bottom”).

Bursting Pressure—The pressure at which a pressure containment device would fail structurally.

Cylinder—A pressure vessel for the storage of gases.

Decompression Chamber—A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers and to treat decompression sickness.

NOTE: As used in this standard, the term “decompression chamber” refers to any pressure vessel for human occupancy used to decompress divers and to treat decompression sickness. A closed bell, if used as a decompression chamber, shall meet the design criteria stated in 29 CFR 1910.430(f).

Decompression Sickness—A condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression Table—A profile or set of profiles of depth-time relationships for the ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Dive Location—A surface or vessel from which a diving operation is conducted.

NOTE: The term “dive location” refers to the surface location from which diving operations are conducted such as a vessel, barge, wharf, pier, riverbank, or offshore rig, and does not mean the diver’s underwater work location.

Dive Location Reserve Breathing Gas—A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.

Dive Team—Diver and support employees involved in a diving operation, including the designated person-in-charge.

Diver—An employee working in water using an underwater apparatus which supplies compressed breathing gas at the ambient pressure.

Diver-Carried Reserve Breathing Gas—A diver-carried supply of air or mixed-gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, another source of breathing gas, or to be reached by a standby diver.

Diving Mode—A type of diving requiring specific equipment, procedures and techniques (SCUBA, surface-supplied air, or mixed-gas).

Fsw—Feet of seawater (or equivalent static pressure head).

NOTE: An example of equivalent static pressure head would be the pressure of air inside a pressurized decompression chamber.

Heavy Gear—Diver-worn deep-sea dress, including helmet, breastplate, dry suit, and weighted shoes.

NOTE: Advances in diving equipment and technology have led to heavy gear that does not include a breastplate. Surface-supplied diving gear, including helmet, dry suit, and weighted shoes (i.e., with the helmet directly connected to the dry suit, forming a self-contained pressure envelope for the diver) constitutes heavy gear as well.

Hyperbaric Conditions—Pressure conditions in excess of surface pressure.

In Water Stage—A suspended underwater platform that supports a diver in the water.

Liveboating—The practice of supporting a surfaced-supplied air or mixed-gas diver from a vessel which is underway.

Mixed-Gas Diving—A diving mode in which the diver is supplied in the water with a breathing gas other than air.

NOTE: For diving operations, air is a mixture of oxygen and nitrogen with an oxygen content of 19.5-23.5 percent. Breathing gas mixtures with an oxygen content less than 19.5 percent or greater than 23.5 percent, or that use gases other than oxygen and nitrogen (excluding trace gases such as those found in compressed atmospheric air), constitute a mixed gas for the purposes of commercial diving.

No-Decompression Limits—The depth-time limits of the “no-decompression limits and repetitive dive group designation table for no-decompression air dives,” [U.S. Navy Diving Manual](#) or equivalent limits which the employer can demonstrate to be equally effective.

NOTE: The term “no-decompression limits” applies to those depth-time combinations for which decompression of the diver is not required. The no decompression tables from the U.S. Navy Diving Manual are included in Chapter 6.

Psi(g)—Pounds per square inch (gauge).

SCUBA Diving—A diving mode independent of surface supply in which the diver uses open-circuit self-contained underwater breathing apparatus.

Standby Diver—A diver at the dive location available to assist a diver in the water.

NOTE: The requirement that the standby diver be at the dive location, which is a location on the surface (such as the shore, a pier, or a dock) or on the deck of a vessel, eliminates the possibility that another diver in the water or at another dive location would be considered a standby diver. Standby divers do not necessarily have to be fully dressed, but must be available to render the necessary assistance in a timely manner. The term “available” means to be clothed and equipped, and ready to enter the water at a moment's notice. Gear such as face masks, air cylinders, and harnesses can be donned quickly, and need not be worn until the standby diver is required to enter the water.

Working Pressure—The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

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Appendix B

Activity Hazard Analysis

Appendix B – Activity Hazard Analysis

Corporate Diving Procedures and Safe Practices Manual

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Appendix B – Activity Hazard Analysis

Corporate Diving Procedures and Safe Practices Manual

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Activity: SCUBA Diving, MEC Avoidance		Date: 5 March 2008
Description of the work: Scuba diving to observe for the presence of underwater MEC and apply avoidance techniques during underwater activities.		Project:
		Prepared By: Pete Garger, CSP, CIH
		Analyzed By: Richard Hanoski
		Review for latest use: Each time before the job is performed.
PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
- Brief pre-dive operations, task assignments, and check equipment. - Locate and move to dive area and complete pre-dive checks. - Perform MEC survey and underwater avoidance services. - Recover dive team. - Perform post-dive operations and return to shore.	- MEC hazards. - Drowning hazards. - Boating hazards. - Underwater hazards from stepping on coral or other sharp underwater objects. - Biological hazards – hazardous aquatic life, e.g., jellyfish, stingrays, etc.). - Hazardous tides or currents (e.g., rip tides, high tide, etc.).	- Onsite MEC training. - Perform MEC avoidance measures using approved methods and techniques. - Review specific hazards and controls located in the Dive Plan. - Review Dive SOPs 2, 3, 4, 5, 6, 7, 8, 9, 11, and 12 as related to current task, assignment, or pre-, during, and post-dive activities. - Standby diver assigned to the team will be at the ready when divers are in the water. - All personnel trained in diving distress signals. - DPIC equipped with rescue equipment and first aid supplies and equipment. - Emergency notification communications are available and working. - Be observant while in water. NOTE: Avoid and report unsafe conditions or activities. - Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. - If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. - Determine areas where hazardous tasks, tides, or currents may be present and times of day or conditions likely to cause them from local marine or harbor police or lifeguard headquarters. Training in how to safely handle these circumstances.

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EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Manual reserve (J valve) or authorized independent system • Communication equipment • Ring buoys with rope attached • First aid kit equipped for surface and waterborne injuries with oxygen cylinder and mask	• DPIC will ensure that all controls are being followed, all equipment is being utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use. • Personal protective equipment inspected daily prior to use. • Communications equipment checked daily prior to use • First aid kits checked daily and inspected weekly.	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All personnel will demonstrate strong swimming skills. • Training in emergency procedures to include diving distress hand signals. • Site-specific hazards to include first aid. • Training in hazardous tides and currents and how to handle them. • All site personnel will have current hazardous waste operations training. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this Activity Hazard Analysis.

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Activity: Scuba Diving, MEC Intrusive Investigation		Date: 5 March 2008
Description of the work: SCUBA diving to observe for the presence of underwater MEC and apply intrusive investigation techniques during underwater activities.		Project:
		Prepared By: Pete Garger, CSP, CIH
		Analyzed By: Richard Hanoski
		Review for latest use: Each time before the job is performed.
PRINCIPAL STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
- Brief pre-dive operations, task assignments, and check equipment. - Locate and move to dive area and complete pre-dive checks. - Perform MEC survey and underwater intrusive investigation services. - Recover dive team. - Perform post-dive operations and return to shore.	- MEC hazards. - Drowning hazards. - Boating hazards. - Underwater hazards from stepping on coral or other sharp underwater objects. - Biological hazards – hazardous aquatic life E.g., jellyfish, stingrays, etc.) - Hazardous tides or currents (e.g., rip tides, high tide, etc.)	- Onsite MEC training. - Perform MEC intrusive investigation measures using approved methods and techniques. - Review specific hazards and controls located in the Dive Plan. - Review SOPs as related to current task, assignment, or pre-, during, and post-dive activities. - Standby diver assigned to the team will be at the ready when divers are in the water. - All personnel trained in diving distress signals. - DPIC equipped with rescue equipment and first aid supplies and equipment. - Emergency notification communications are available and working. - Be observant while in water; note, avoid, and report unsafe conditions or activities. - Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. - If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. - Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police or lifeguard headquarters. Training in how to safely handle these circumstances.

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EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Manual reserve (J valve) or authorized independent system • Communication equipment • Ring buoys with rope attached • First aid kit equipped for surface and waterborne injuries with oxygen cylinder and mask	DPIC will ensure that all controls are being followed; all equipment is being utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use. • Personal protective equipment inspected daily prior to use. • Communications equipment checked daily prior to use • First aid kits checked daily and inspected weekly.	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All personnel will demonstrate strong swimming skills. • Training in emergency procedures to include diving distress hand signals. • Site-specific hazards to include first aid. • Training in hazardous tides and currents and how to handle them. • All site personnel will have current hazardous waste operations training. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this Activity Hazard Analysis.

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Appendix C

Diving Standard Operating Checklists and Forms

Appendix C – Diving Standard Operating Checklists and Forms

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DIVING STANDARD OPERATING PROCEDURE

1. FOLLOW THE CHECKLIST IN DESCENDING ORDER
 - A. DIVE PREPARATION JOB ASSIGNMENTS PER DIVE SOP 2
 - B. COMPLETE DIVING NOTIFICATIONS PER DIVE SOP 3
 - C. FILL OUT DIVE BRIEF PER DIVE SOP 4
 - D. DPIC CHECKS
 - (1) DIVE BOAT CREW ASSIGNED, BOAT LAUNCHED
 - (2) BOAT FUELED (DONE PRIOR TO LOADING)
 - (3) SAFETY GEAR PRESENT
 - (4) DIVE GEAR STAGED PER DIVE SOP 8
 - (5) DIVE GEAR LOADED
 - E. CONDUCT PRE-DIVE BRIEF WITH DIVE STATION PERSONNEL TO INCLUDE BOAT CREW PER DIVE SOP 4
 - F. COMPLETE SAILING LIST PER DIVE SOP 5 (E-MAIL COPY TO CORPORATE SAFETY)
 - G. DPIC PROVIDE PRE-SAIL BRIEF TO CORPORATE PROJECT MANAGER
 - H. COMPLETE PRE-DIVE CHECKS PER DIVE SOP 6
 - I. CONDUCT POST-DIVE PMS/CLEAN UP
 - J. STOW ALL GEAR
 - K. COMPLETE PAPERWORK
 - (1) DIVE LOG DIVE SOP 7
 - (2) COMPLETE DIVE SECTION OF DAILY REPORT

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DIVE PREPARATION – JOB ASSIGNMENTS

Date of Dive	
Designated Person-in-Charge	
Point-of-Contact for Delivery of Explosives	
Date/Time/Location of Delivery	
Complete Pre-Dive Equipment Checkout	
Gear Load-Out	
Coxswain	
Boathook	
Driver(s) for boat(s) launch/time: boat(s) recovery/time	
Date, Time, and Rendezvous Posit: Complete Post-Dive	
Equipment Checkout	
Filing of Reports/Documentation of Dive Dive Log Daily Report Explosive Usage	

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DIVING NOTIFICATION

1. Diving notifications, at a minimum, will consist of contacting nearest available recompression facility, and if appropriate Harbor Master. In addition notify applicable local police and/or Port Operations/Harbor Control Office if diving within restricted waters.
2. Port Operations Ph: _____. Harbor Control, Ph: _____ will be notified prior to and following dive operations.

Location	Phone
Bends Chamber	
Local Police Department	
Ports Ops/Harbor Control	
Local EMT	
Closest Hospital	
Recompression Chambers	
NOAA Weather and Surf Conditions:	
Corporate Safety Officer	
Additional Phone Numbers	

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SCUBA DPIC PRE-DIVE BRIEF

1. Diving Supervisor	
2. Diving Medical Officer	
3. Duty Chamber	
4. Purpose/Location of Dive	
5.	
6.	
7. Job Assignments	
Primary Diver	
Secondary Diver	
Standby Diver (brief standby diver on diver on duties/dive profile)	
Tenders	
Pri	
Sec	
Standby	
Charts	
Extra(s)	
8. All Equipment Accounted for	
9. Expected Depth and Schedule	XXX ft for XXX minutes
10. Do not exceed	XXX ft for XXX minutes
11. No "D" limit	Depth: Minutes:
12. Divers	
Clear Ears	
Dives in the last 12 hours/anticipated air travel	
Contacts or false teeth	
Medications	
Aches/pains/problems	
OK to make dive	
Do not exceed ↓75 pfm/30 fpm	
Questions	
13. Emergency Assignments	
DPIC/Divers will go in boat	
Boat driver	
O2/Neuro Assist	
14. Emergency Procedures	
Requiring Recompression	
Not requiring recompression (poison/sprain/breaks/bleeding)	
Lost/separated diver	
Unconscious diver	
Blow-up	
Line pulls	
Fouled diver	

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SAILING LIST

Date			
Coxswain		Dive Platform Location	
Diving Supervisor			
Estimated Departure		Estimated Return	
Radio Call		Cellular Phone Number	
Sign		Phone Number	
Duty		Name	Company
NOTE: E-mail or fax a completed sailing list to the Corporate Safety Officer, Project Manager, and Site Manager prior to departure.			

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DIVING LOG

Date		Geographic Location									Air Temp (F)			
Equipment						Dress						Wave Height (ft)		
Breathing Medium						Platform						Water Temp (F)		
Breathing Source				Person Responsible for OPs				Person Responsible for Pre-Dives				Current (knots)		
Bottom Type							Bottom Visibility							
Diver	Depth	LS	RB	LB	RS	RNT	TBT	Single Equivalent Dive Time	TDT	TTD	Table and Schedule Used Repet. Group	Surface Interval		
Standby														

Signature of DPIC

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DIVE STATION GEAR LOADOUT

A. Recall device	
B. Dive flag (civilian and code alpha)	
C. Swimmer buoy	
D. Lost diver buoy/tending lines (minimum 200')	
E. Global Positioning System	
F. Buddy lines	
G. Regulators and Buoyancy Compensator (pre-dive complete)	
H. Air Tanks	
I. Cellular phone (on and charged)	
J. Drinking water w/cups	
K. Personal dive gear (check for minimum equipment)	
L. Medical kit (inventory in accordance with checklist)	
M. Air press: _____ (minimum 1,000 psi)	
N. Dive supervisor kit (inventory in accordance with checklist) (weigh carbon dioxide cartridges)	
O. Stretcher or backboard w/flotation device	
P. Required tools to complete mission	
ADDITIONAL LOADOUT FOR UXO TASKS	
A.	
B.	
C.	

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SCUBA EQUIPMENT PRE-/POST-DIVE PMS

	Cylinders						Regulators/Gauge Console				Buoyancy Compensators		
	Singles			Doubles									
	Pre-Dive	Post Dive		Pre-Dive	Post Dive		Pre-Dive	Post-Dive			Pre-Dive		Post-Dive
	Inspect	5921/019 R-6	5921/019 R-9	Inspect	5921/019 R-6	5921/019 R-9	5921/019 R-7	5921/019 R-2	5921/019 R-6	5921/032 R-8	5921/038 R-1	5921/038 R-3	5921/038 R-2
#													
1													
2													
3													
4													
5	NOTE: Divers complete and initial each block prior to and after each dive. Diving Supervisor's Signature and date require after completion of Post Dive Maint. Ensure all bottles have 2,500 psi minimum. If any contain less, notify DPIC.												
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													

SCUBA

Clean and Sterilize Regulator.
 Rinse Tank and Regulator.
 Inspect Regulator and Hoses.
 Leak Check Bottle during Charging.
 DPIC _____

Print

BC

Inspect Life Preserver.
 Clean Life Preserver.
 Weigh Carbon Dioxide Cartridge.

Signature

Gauges

Clean and Inspect Gauges.

Date

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EMERGENCY MANAGEMENT PLAN

NOTE: *This Emergency Management Plan is to be used in conjunction with the Site Safety and Health Plan for (site). Ensure that all personnel are familiar with the policies, procedures, and requirements outlined in both plans.*

Location	Phone
Fire Dept.	
Medical, Fire, or Explosion:	
U.S. Coast Guard Emergency Response	
Nearest Hyperbaric Chamber Facility	
The nearest hyperbaric treatment facility is:	
Normal operating times are:	
Emergency transport is available via:	
Divers Alert Network (D.A.N.), Duke University, Durham	(919) 684-4326 or (919) 684-8111
Poison Control Center	(800) 342-9293
PRIME Project Manager:	
Closest Hospital:	

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Nearest Hospital Information and Route	Nearest Recompression Chamber
Name:	Name:
Address:	Address:
Phone:	Phone:
Enclose Route Map with Directions	Enclose Route Map with Directions

In every diving operation, the possibility of an accident occurring must be considered. The need for a prompt, decisive plan of action in an emergency is essential for the safety of all diving personnel. The PUXODS will implement the following procedures for the respective situations described below.

1. Buddy Separation

- The divers will look/feel 360 degrees around for his dive partner, and
- Both divers will come to the surface with one hand above head.

2. Lost Diver

- Initiate diver recall and wait one (1) minute for response.
- Mark the last known position of the lost diver with a buoy to establish a reference point where searches can start.
- Deploy the standby diver (per DPIC direction) to swim after bubbles or to conduct a circle line search starting at the lost diver buoy.
- Notify ship/boats in the area to look out for the lost diver.
- Request emergency medical help and report situation to PRIME Project Manager.
- Ensure stricken divers recovered get immediate, effective treatment.

3. Loss of Air/Equipment Malfunction

- Signal dive partner and abort dive.
- Buddy breath/activate reserve.
- Exhale to the surface.

NOTE: No diving will proceed until the equipment is replaced/repared (with functional checks performed) and the Dive Supervisor has given the OK to proceed with the operation.

4. Mechanical Injury

- Diver will inform the DPIC of any mechanical injuries no matter how slight they may seem;
- DPIC will rule out any doubt of decompression sickness; and
- If immediate treatment is required, recall all divers and transport to recompression chamber/Emergency Room.

5. Decompression Sickness (“The Bends”) or Arterial Gas Embolism (air embolism)

- Recall all divers from the water.
- Contact (city) Fire Department Immediately to transport stricken diver(s) to chamber.
- Notify PRIME Project Manager of circumstances.
- Perform and record neurological exam
- Treat for shock.

6. Fouled Diver

- Diver will notify dive partner, if appropriate, otherwise will notify DPIC through line pull signals.
- If only one diver is in the water, then the standby diver will assist the fouled diver under the direction of the Project Diving Supervisor.
- Diver and dive boat personnel must remain calm.
- Take additional cylinders of air to the fouled diver, if needed.

7. Explosive Detonation with Diver (s) in the Water

- Attempt to establish communications with the diver via tending line.
- If communications are established with the diver immediately recall diver to the surface.
- If no communications are reestablished slowly pull the tending line to the surface to recover the diver. If the tending line is fouled deploy the standby diver.
- If the tending line has parted, mark the last location of the diver and begin a surface search of the area. If no contact is made, deploy the standby diver in the last known diver location and begin a systematic search of the area.

8. Diver Emergency Recall

- If diver is tended use standard line-pull signals to recall diver (Table 4-1).
- If diver is untended use diver audible or mechanical recall.
- Upon notification of recall by any means the diver will surface immediately.

9. Injured Diver—If a diver is injured and unable to enter the boat under his/her own power, the remaining team aboard the boat/platform (Dive Supervisor, Tender/assistant, etc.) will be used to assist or place the injured diver/snorkeler into/on the boat/platform or may hold onto the diver/snorkeler and use the boat/platform to get to the shoreline. Contact the Fire Department immediately and render emergency first aid as necessary.

10. Fire—Fire extinguishers will be maintained ready at the dive site location. Only attempt to put out small fires as necessary of prevent injury or loss of life. Contact (city) Fire Department immediately upon discovery. Also see Site Safety and Health Plan submitted as part of the Work Plan for the (site) Project.

11. Inclement Weather—All diving and snorkeling operations will be suspended if lightning is located within 10 nautical miles of the dive site. During high winds greater than 30 miles per hour, boating and platform operations will be suspended. Also see Site Safety and Health Plan submitted as part of the Work Plan for the (site) Project.

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12. ***Medical Injury or Illness***—Cease all diving operations and execute emergency procedures as per the Site Safety and Health Plan submitted as part of the Work Plan for the (site) Project. Contact Fire Department Immediately. Render first aid as necessary until an emergency medical team arrives.
13. ***Critical Equipment Failure***—In the event of an equipment failure of a critical component of the dive operations, all dive operations will be discontinued until the equipment is replaced or repaired and the UXODS has given authorization for dive operations to continue.
14. ***Injury/Illness of Surface Crew***—If a severe injury or illness occurs while a diver is in the water, the diver will be recalled immediately to the surface and the Fire Department will be notified. Diver will either enter the boat/platform to help render assistance or head to the shore and provide assistance as necessary.
15. ***Loss of Communications***—If communications are lost between a tender and diver and cannot be regained quickly, an audible recall signal will be sounded. If the diver does not surface in a reasonable amount of time after the audible re-call signal has been initiated the stand-by diver will be dispatched to the last known location of the diver. If communications are lost between the diver and the tender and cannot be regained quickly, the diver will surface immediately. The reason for the loss of communications will be investigated and remedied prior to continuation of the dive.

FIRST AID FOR DIVING RELATED INJURIES

1. FIRST AID FOR INJURIES REQUIRING IMMEDIATE TRANSPORT TO A CHAMBER FACILITY

1.1 Air Embolism

Recognition – Usually occurs during or immediately after surfacing

Symptoms (one or more of the following)

- Disorientation or fatigue
- Skin itch
- Chest pain
- Numbness, Tingling, Paralysis or Weakness
- Dizziness, Vertigo, or Ringing in the Ears
- Blurred Vision
- Personality Change

Signs (one or more of the following)

- Bloody froth from nose or mouth
- Paralysis or weakness
- Unconsciousness
- Convulsions
- Shortness of breath or cessation of breathing
- Apparent death

NOTE: Symptoms and signs usually appear within 15 minutes to 12 hours after surfacing; in severe cases, symptoms may appear immediately or even before the dive is completed. Delayed occurrence of symptoms is rare but can occur, especially if air travel follows diving. The quicker treatment begins, the better the chances of a full recovery.

Early Management

- CPR, if required.
- Open airway, prevent aspiration, and incubate if trained person available.
- Give oxygen; remove only to open airway or if convulsion ensue.
- If conscious, give nonalcoholic liquids.
- Place in horizontal, neutral position.
- Restrain convulsing person loosely and resume oxygen as soon as airway is open.
- Protect from excessive cold, heat, water, or fumes.
- Contact FIRE and RESCUE for transport, send divers profile with the diver, and send all diving equipment for examination or have it examined locally.

1.2 Decompression Sickness

Recognition – Symptoms usually appear 15 minutes to 12 hours after surfacing

Symptoms (one or more of the following)

- Tired feeling
- Itching
- Pain, arms, legs, or trunk
- Dizziness
- Numbness, tingling, or paralysis
- Chest compression or shortness of breath
- Anything unusual after the dive

Signs (one or more of the following)

- Blotchy rash
- Paralysis or weakness anywhere in the body
- Coughing Spasms
- Staggering or instability
- Unconsciousness
- Personality change

Early Management

- Stabilize patient the same way as for air embolism.
- Contact FIRE and RESCUE for transport, send divers profile with the diver, and send all diving equipment for examination or have it examined locally.

2. FIRST AID FOR INJURIES REQUIRING TRANSPORT TO A HOSPITAL FACILITY

2.1 PNEUMOTHORAX

Symptoms (one or more of the following)

- Pains in the chest
- Shortness of breath

Signs (one or more of the following)

- Willow rapid breathing
- Cyanosis (blue skin, lips, fingernails)
- Possible crackling under the skin of the neck
- Possible mediastinal shift (heart sounds not in the usual place)

Emergency Actions

- Call for help and immediate transport.

2.2 MEDIASTINAL EMPHYSEMA (LUNG OVER PRESSURE ACCIDENT)

Recognition – Always associated with pneumothorax

Symptoms (one or more of the following)

- Pain in the chest (beneath the breastbone)
- Faintness
- Shortness of breath

Signs (one or more of the following)

- Obvious difficulty breathing
- Brassy change in voice

Emergency Actions:

- Transport to medical facility for evaluation.

2.3 DROWNING-NEAR DROWNING

Recognition

- Unconsciousness
- Lack of respiration
- Cyanosis (blue skin, lips, fingernails)

Management

- Try to identify the time the victim was last seen breathing.
- Assess ABCs: airway, breathing, and circulation.
- Removal of gear.
- Transport to the boat or shore.
- Immediate call for help and transport to facility.
- Start CPR.

2.4 OXYGEN TOXICITY (WITH CONVULSIONS)

Signs (one or more of the following)

- Decreased or loss of consciousness; followed by
- Convulsions

Symptoms (one or more of the following)

- Nausea
- Dizziness
- Ringing in the ears
- Abnormal Vision
- Confusion
- Prevention
- Avoidance of gases with high oxygen concentrations (as in Nitrox at inappropriate depth)
- Avoid carbon dioxide retention that can precipitate oxygen convulsions at any depth
- If convulsions occur at depth, be prepared to treat near drowning and/or air embolism
- TREATMENT – Call for help and immediate transport.

2.5 SEVERE TRAUMA OR LARGE PREDATOR INJURY (HEAD INJURY, LIMB INJURY DUE TO FALLS, EQUIPMENT CRUSH, PROP INJURIES)

- Call for help and immediate transport
- Open Airway
- Treat for shock on site and stabilize before evacuation
- Face up neutral position
- Direct pressure over bleeding wounds
- CPR if no pulse or respiration
- Keep warm
- Be mindful of the possibility of neck injury
- Splint limb injuries
- Call for help and immediate transport.

2.6 SUSPECTED HEART ATTACK OR STROKE

- Call for help and immediate transport
- Treat for shock
- CPR if no pulse or respiration
- Keep warm
- Call for help and immediate transport.

2.7 SEVERE ALLERGIC REACTION

- Remove any remnant of allergen (i.e., jellyfish tentacles, foreign material)
- Wash out wounds of injury with alcohol, vinegar, or water
- Call for help and immediate transport
- Treat for shock
- CPR if no pulse or respiration
- Keep warm
- Pain Relief, if available
- Transport to medical facility for evaluation.

2.8 STINGING FISHES (STINGRAYS, SCORPION FISH)

- Immobilize
- Remove spine and debride (scrub the wound)
- Irrigate wound
- Soak in hot water (thermolabile toxin) 50° C, for 30-90 minutes
- Call for help and immediate transport
- Treat for shock, hydrate.

2.9 HYPOTHERMIA

- Keep core temperature above 95° F.
- Keep airway open.
- Immobilize.
- Wrap in blankets, preferably next to another person.
- Basic life support, CPR, if needed.
- Warm liquids, if alert, unless very cold – then avoid due to possibility of ventricular tachycardia (rapid, useless fluttering of the heart).
- Call for help and immediate transport.

2.10 HYPERTHERMIA (HEAT EXHAUSTION DUE TO EXCESSIVE FLUID LOSS)

- Remove from source of heat
- Lower temperature (cool compresses at arterial points and head)
- Keep calm
- Keep airway open
- Call for help and immediate transport if unstable.

2.11 HEAT STROKE

- Remove all clothing
- Cover with cool wet sheet
- Place in air-conditioned area
- Cold packs to neck, scalp, groin and armpits
- If convulsions occur ensure victim does not cause further harm to themselves
- Call for help and immediate transport.

3. AID FOR INJURIES THAT CAN BE TREATED ON BOARD

3.1 NITROGEN NARCOSIS

Signs (one or more of the following)

- Inappropriate behavior at depth
- Ignoring hand signals and instructions
- Stupor or coma

Symptoms (one or more of the following)

- Inflexible thinking and attitude
- Decrease or loss of judgment
- False sense of security
- Lack of concern for safety
- Inability to think through problems
- Panic
- Near unconsciousness or loss of consciousness at depth.

Treatment

- Ascend until free of symptoms
- Surface with controlled ascent
- Transport to medical facility for evaluation.

3.2 CARBON DIOXIDE POISONING

Symptoms (one or more of the following)

- Rapid breathing
- Feeling of suffocation or shortness of breath
- Headache, nausea, dizziness
- Rapid heartbeat
- Confusion and unclear thinking

Signs (one or more of the following)

- Slowed responses
- Muscle irritability (twitching)
- Loss of consciousness

Treatment

- Remove the cause (over-exertion, equipment failure, rebreathers, etc.)
- Stop and rest during early symptoms to avoid loss of consciousness
- Surface; transport to medical facility for evaluation.

3.3 EAR DISORDERS

Middle Ear Barotrauma

- Keep quiet and calm
- Without DCS or rupture of the round or oval windows, give Benadryl 25 mg
- Transport to medical facility for evaluation
- Discontinue diving until cleared by EMT.

Inner Ear Barotrauma

- Recognize round or oval window damage (loss balance, ataxia, tinnitus, deafness)
- Keep head up and affected ear elevated
- Discourage straining
- Transport to medical facility for evaluation
- EMT evaluation, no more diving until cleared by EMT.

3.4 SEA SICKNESS

The best medications have been found to be Meclizine, Bonine, Dramamine and Trans-derm Scope.

- Keep your eyes on the horizon
- Stay on deck
- Keep yourself well hydrated with non-alcoholic beverages
- Try antacid tablets or lemon drops
- If diving, try to be the first diver in water.

DIVING INJURY RESPONSE

1. The following procedures will be followed by the Diving Supervisor in the event of diving emergencies (if immediate treatment required, recall divers and transport):
 - a. To recover injured diver.
 - (1) Inflate Buoyancy Compensator.
 - (2) Check ABCs.
 - (3) Dump weight belt.
 - (4) Once at boat remove tank(s), but save (hook to tag line).
 - (5) Turn diver parallel to boat, one man lift by grabbing BC just under diver's chin, another man grab inside of inside leg and lift together. Set diver on rail. Reposition and lower to deck of boat.
 - b. For diving injuries **not requiring** recompression.
 - (1) Administer first aid.
 - (2) Transit to nearest medical facility.
 - (3) Notify Corporate Safety.
 - c. For diving injuries **requiring** recompression.
 - (1) Place diver(s) on oxygen.
 - (2) Administer First Aid/CPR, treat for shock as necessary.
 - (3) Perform Neuro.
 - (4) Call for Medivac, if required.
 - (5) Notify stand-by chamber.
 - (6) Transit to duty recompression chamber with affected diver, dive partner, and DPIC.
 - (7) Notify Corporate Safety.

Appendix D

U.S. Navy Diving Tables

Appendix D – U.S. Navy Diving Tables

Corporate Diving Procedures and Safe Practices Manual

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TABLE D-1 U.S. NAVY STANDARD AIR DECOMPRESSION TABLE

TABLE 1 - US NAVY STANDARD AIR DECOMPRESSION TABLE									
Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters)					Total decompression time (min:sec)	Repetitive group
			50 15.2	40 12.1	30 9.1	20 6.0	10 3.0		
40 12.1	Decompression stops (feet/meters)			Total		0	1:20	*	
	210	1:00				2	3:20	N	
	230	1:00				7	8:20	N	
	250	1:00				11	12:20	O	
	270	1:00				15	16:20	O	
	300	1:00				19	20:20	Z	
Exceptional Exposure									
50 15.2	360	1:00				23	24:20	**	
	480	1:00				41	42:20	**	
	720	1:00				69	70:20	**	
	100					0	1:40	*	
	110	1:20				3	4:40	L	
	120	1:20				5	6:40	M	
	140	1:20				10	11:40	M	
	160	1:20				21	22:40	N	
	180	1:20				29	30:40	O	
	200	1:20				35	36:40	O	
	220	1:20				40	41:40	Z	
	240	1:20				47	48:40	Z	
	60 18.2	60					0	2:00	*
70		1:40				2	4:00	K	
80		1:40				7	9:00	L	
100		1:40				14	16:00	M	
120		1:40				26	28:00	N	
140		1:40				39	41:00	O	
160		1:40				48	50:00	Z	
180		1:40				56	58:00	Z	
200		1:20			1	69	72:00	Z	
Exceptional Exposure									
70 21.3	240	1:20			2	79	83:00	**	
	360	1:20			20	119	141:00	**	
	480	1:20			44	148	194:00	**	
	720	1:20			78	187	267:00	**	
	50					0	2:20	*	
	60	2:00				8	10:20	K	
	70	2:00				14	16:20	L	
	80	2:00				18	20:20	M	
	90	2:00				23	25:20	N	
	100	2:00				33	35:20	N	
	110	1:40			2	41	45:20	O	
	120	1:40			4	47	53:20	O	
	130	1:40			6	52	60:20	O	
	140	1:40			8	56	66:20	Z	
	150	1:40			9	61	72:20	Z	
	160	1:40			13	72	87:20	Z	
	170	1:40			19	79	100:20	Z	

* See No Decompression Table for repetitive groups.

** Repetitive dives may not follow exceptional exposure dives.

Appendix D – U.S. Navy Diving Tables

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24.3

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters)					Total decompression time (min:sec)	Repetitive group
			50 15.2	40 12.1	30 9.1	20 6.0	10 3.0		
40						0	2:40	*	
50	2:20					10	12:40	K	
60	2:20					17	19:40	L	
70	2:20					23	25:40	M	
80	2:00				2	31	35:40	N	
90	2:00				7	39	48:40	N	
100	2:00				11	46	59:40	O	
110	2:00				13	53	68:40	O	
120	2:00				17	56	75:40	Z	
130	2:00				19	63	83:40	Z	
140	2:00				26	69	97:40	Z	
150	2:00				32	77	111:40	Z	

Exceptional

Exposure

180	2:00				35	85	122:40	**	
240	1:40			6	52	120	180:40	**	
360	1:40			29	90	160	281:40	**	
480	1:40			59	107	187	355:40	**	
720	1:20		17	108	142	187	456:40	**	

90
28.7

30						0	3:00	*	
40	2:40					7	10:00	J	
50	2:40					18	21:00	L	
60	2:40					25	28:00	M	
70	2:20				7	30	40:00	N	
80	2:20				13	40	56:00	N	
90	2:20				18	48	69:00	O	
100	2:20				21	54	78:00	Z	
110	2:20				24	61	88:00	Z	
120	2:20				32	68	103:00	Z	
130	2:00			5	36	74	118:00	Z	

100
30.4

25						0	3:20	*	
30	3:00					3	6:20	I	
40	3:00					15	18:20	K	
50	2:40				2	24	29:20	L	
60	2:40				9	28	40:20	N	
70	2:40				17	39	59:20	O	
80	2:40				23	48	74:20	O	
90	2:20			3	23	57	86:20	Z	
100	2:20			7	23	66	99:20	Z	
110	2:20			10	34	72	119:20	Z	
120	2:20			12	41	78	134:20	Z	

Exceptional

Exposure

180	2:00		1	29	53	118	204:20	**	
240	2:00		14	42	84	142	285:20	**	
360	1:40	2	42	73	111	187	418:20	**	
480	1:40	21	61	91	142	187	505:20	**	
720	1:40	55	106	122	142	187	615:20	**	

Appendix D – U.S. Navy Diving Tables

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Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters)					Total decompression time (min:sec)	Repetitive group
			50 15.2	40 12.1	30 9.1	20 6.0	10 3.0		
110 33.1	20						0	3:40	*
	25	3:20					3	6:40	H
	30	3:20					7	10:40	J
	40	3:00				2	21	26:40	L
	50	3:00				8	26	37:40	M
	60	3:00				18	36	57:40	N
	70	2:40			1	23	48	75:40	O
	80	2:40			7	23	57	90:40	Z
	90	2:40			12	30	64	109:40	Z
	100	2:40			15	37	72	127:40	Z

Depth feet/meters	Bottom time (min)	Time first stop (min:sec)	Decompression stops (feet/meters)							Total decompression time (min:sec)	Repetitive group
			70 21.3	60 18.2	50 15.2	40 12.1	30 9.1	20 6.0	10 3.0		
120 36.5	15								0	4:00	*
	20	3:40							2	6:00	H
	25	3:40							6	10:00	I
	30	3:40							14	18:00	J
	40	3:20						5	25	34:00	L
	50	3:20						15	31	50:00	N
	60	3:00					2	22	45	73:00	O
	70	3:00					9	23	55	91:00	O
	80	3:00					15	27	63	109:00	Z
	90	3:00					19	37	74	134:00	Z
	100	3:00					23	45	80	152:00	Z
Exceptional Exposure											

130 39.6	10								0	4:20	*
	15	4:00							1	5:20	F
	20	4:00							4	8:20	H
	25	4:00							10	14:20	J
	30	3:40						3	18	25:20	M
	40	3:40						10	25	39:20	N
	50	3:20					3	21	37	65:20	O
	60	3:20					9	23	52	88:20	Z
	70	3:20					16	24	61	105:20	Z
	80	3:00				3	19	35	72	133:20	Z
	90	3:00				8	19	45	80	156:20	Z

TABLE D-2 UNLIMITED/NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR UNLIMITED/NO DECOMPRESSION AIR DIVES

Depth (feet/meters)		No-Decompression Limits (min)	Group Designation																	NO
			A	B	C	D	E	F	G	H	I	J	K	L	M					
10	3.0	unlimited	60	120	210	300	797	*												
15	4.6	unlimited	35	70	110	160	225	350	452	*										
20	6.1	unlimited	25	50	75	100	135	180	240	325	390	917	*							
25	7.6	595	20	35	55	75	100	125	160	195	245	315	361	540	595					
30	9.1	405	15	30	45	60	75	95	120	145	170	205	250	310	344	405			310	
35	10.7	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270				
40	12.2	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200				
50	15.2	100		10	15	25	30	40	50	60	70	80	90	100						
60	18.2	60		10	15	20	25	30	40	50	55	60								
70	21.3	50		5	10	15	20	30	35	40	45	50								
80	24.4	40		5	10	15	20	25	30	35	40									
90	27.4	30		5	10	12	15	20	25	30										
100	30.5	25		5	7	10	15	20	22	25										
110	33.5	20			5	10	13	15	20											
120	36.6	15			5	10	12	15												
130	39.6	10			5	8	10													
140	42.7	10			5	7	10													
150	45.7	5			5															
160	48.8	5				5														
170	51.8	5				5														
180	54.8	5				5														
190	59.9	5				5														

* Highest repetitive group that can be achieved at this depth regardless of bottom time.

TABLE D-3 RESIDUAL NITROGEN TIMETABLE FOR AIR DIVES

Locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies.

Next read vertically downward to the new repetitive group designation. Continue downward in this same column to the row which represents the depth of the repetitive dive. The time given at the intersection is residual nitrogen time, in minutes, to be applied to the repetitive dive.

* Dives following surface intervals of more than 12 hours are not repetitive dives. Use actual bottom times in the Standard Air Decompression Tables to compute decompression for such dives.

** If no Residual Nitrogen Time is given, then the repetitive group does not change.

		Repetitive group at the beginning of the surface interval															
		A															
		B															
		C															
		D															
		E															
		F															
		G															
		H															
		I															
		J															
		K															
		L															
		M															
		N															
		O															
		Z															
		New Repetitive Group Designation															
Repetitive Dive Depth	feet/meters	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
10 3.0	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
20 6.1	**	**	**	**	**	**	**	917	399	279	208	159	120	88	62	39	18
30 9.1	†	†	†	349	279	229	190	159	132	109	88	70	54	39	25	12	7
40 12.2	257	241	213	187	161	138	116	101	87	73	61	49	37	25	17	7	6
50 15.2	169	160	142	124	111	99	87	76	66	56	47	38	29	21	13	6	5
60 18.2	122	117	107	97	88	79	70	61	52	44	36	30	24	17	11	5	4
70 21.3	100	96	87	80	72	64	57	50	43	37	31	26	20	15	9	4	3
80 24.4	84	80	73	68	61	54	48	43	38	32	28	23	18	13	8	4	3
90 27.4	73	70	64	58	53	47	43	38	33	29	24	20	16	11	7	3	3
100 30.5	64	62	57	52	48	43	38	34	30	26	22	18	14	10	7	3	3
110 33.5	57	55	51	47	42	38	34	31	27	24	20	16	13	10	6	3	3
120 36.6	52	50	46	43	39	35	32	28	25	21	18	15	12	9	6	3	3
130 39.6	46	44	40	38	35	31	28	25	22	19	16	13	11	8	6	3	3
140 42.7	42	40	38	35	32	29	26	23	20	18	15	12	10	7	5	2	2
150 45.7	40	38	35	32	30	27	24	22	19	17	14	12	9	7	5	2	2
160 48.8	37	36	33	31	28	26	23	20	18	16	13	11	9	6	4	2	2
170 51.8	35	34	31	29	26	24	22	19	17	15	12	10	8	6	4	2	2
180 54.8	32	31	29	27	25	22	20	18	16	14	11	10	8	6	4	2	2
190 59.9	31	30	28	26	24	21	19	17	15	13	10	10	8	6	4	2	2

Residual Nitrogen Times (Minutes)

**TABLE D-4 REQUIRED SURFACE INTERVAL BEFORE
ASCENT TO ALTITUDE AFTER DIVING**

Repetitive Group Designator	Increase in Altitude									
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
A	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
B	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	2:11
C	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	3:06	8:26
D	0:00	0:00	0:00	0:00	0:00	0:00	0:09	3:28	7:33	12:52
E	0:00	0:00	0:00	0:00	0:00	0:51	3:35	6:54	10:59	16:18
F	0:00	0:00	0:00	0:00	1:12	3:40	6:23	9:43	13:47	19:07
G	0:00	0:00	0:00	1:23	3:34	6:02	8:46	12:05	16:10	21:29
H	0:00	0:00	1:31	3:26	5:37	8:05	10:49	14:09	18:13	23:33
I	0:00	1:32	3:20	5:15	7:26	9:54	12:38	15:58	20:02	24:00
J	1:32	3:09	4:57	6:52	9:04	11:32	14:16	17:35	21:39	24:00
K	3:00	4:37	6:25	8:20	10:32	13:00	15:44	19:03	23:07	24:00
L	4:21	5:57	7:46	9:41	11:52	14:20	17:04	20:23	24:00	24:00
M	5:35	7:11	9:00	10:55	13:06	15:34	18:18	21:37	24:00	24:00
N	6:43	8:20	10:08	12:03	14:14	16:42	19:26	22:46	24:00	24:00
O	7:47	9:24	11:12	13:07	15:18	17:46	20:30	23:49	24:00	24:00
Z	8:17	9:54	11:42	13:37	15:49	18:17	21:01	24:00	24:00	24:00

Exceptional Exposure

Wait 48 hours before flying

- NOTE 1** When using Table 7, use the highest repetitive group designator obtained in the previous 24-hour period.
- NOTE 2** Table 7 may only be used when the maximum altitude achieved is 10,000 feet or less. For ascents above 10,000 feet, consult NAVSEA 00C for guidance.
- NOTE 3** The cabin pressure in commercial aircraft is maintained at a constant value regardless of the actual altitude of the flight. Though cabin pressure varies somewhat with aircraft type, the nominal value is 8,000 feet. For commercial flights, use a final altitude of 8000 feet to compute the required surface interval before flying.
- NOTE 4** No surface interval is required before taking a commercial flight if the dive site is at 8000 feet or higher. In this case, flying results in an increase in atmospheric pressure rather than a decrease.
- NOTE 5** No repetitive group is given for air dives with surface decompression on oxygen or air. For these surface decompression dives, enter the standard air table with the sea level equivalent depth and bottom time of the dive to obtain the appropriate repetitive group designator to be used.
- NOTE 6** For ascent to altitude following a non-saturation helium-oxygen dive, wait 12 hours if the dive was a no-decompression dive. Wait 24 hours if the dive was a decompression dive.