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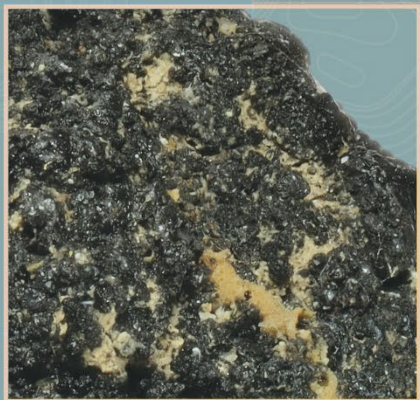
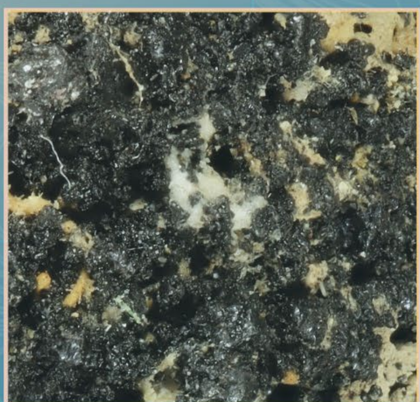
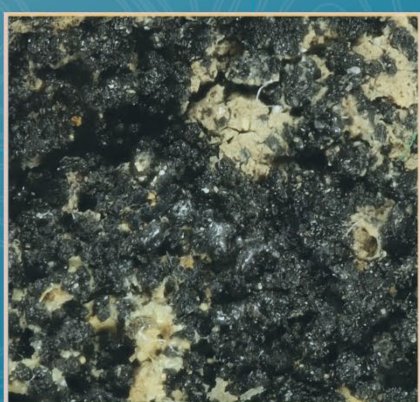
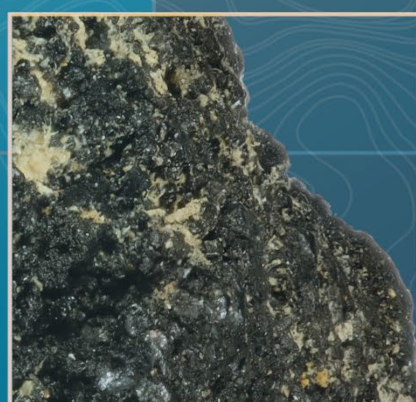
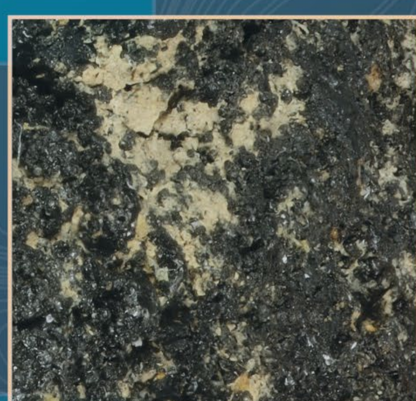


The Commonwealth of Northern Mariana Islands Critical Minerals Environmental Assessment









The Commonwealth of the Northern Mariana Islands Critical Minerals Environmental Assessment

Agency Name and Region	Bureau of Ocean Energy Management, Pacific Outer Continental Shelf Region
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Contents

List of Figures

List of Tables

List of Abbreviations and Acronyms

°C	degrees Celsius
ADCP	Acoustic Doppler Current Profiling
AIS	Automatic Identification Systems
APE	Area of Potential Effects
Area ID	Area Identification
ASV	autonomous surface vessel
AUV	autonomous underwater vehicles
BCE	Before Common Era
BMP	best management practices
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CCZ	Clarion-Clipperton Zone
CFR	Code of Federal Regulations
CH	critical habitat
CHIRP	compressed high-intensity radar pulse
cm	centimeter(s)
CNMI	Commonwealth of the Northern Mariana Islands
CO	carbon monoxide
CTD	conductivity, temperature, and depth
CZMA	Coastal Zone Management Act
dB	decibel(s)
dB re 1 μPa	decibels referenced to 1 micropascal
DOI	Department of the Interior
DP	dynamic positioning
DPS	distinct population segment
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EMF	electromagnetic field
ESA	Endangered Species Act
FAD	fish-aggregating device
FCP	Fisheries Communication Plan
FOIA	Freedom of Information Act
FPIC	free, prior, and informed consent
FR	Federal Register
ft	foot/feet
FWAT	Fisheries and Wildlife Awareness Training
gal	gallon(s)
GDP	gross domestic product
HAPC	Habitat Areas of Particular Concern
hp	horsepower

HRG	high-resolution geophysical
Hz	hertz
IHA	Incidental Harassment Authorization
ISA	International Seabed Authority
ITA	Incidental Take Authorization
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported, and unregulated
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
kn	knot(s)
lbs	pounds
L	liter(s)
LBL	long baseline
LMPA	Local Marine Protected Area
LOC	Letter of Concurrence
m	meter(s)
MACS	Mariana Archipelago Cetacean Survey
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	multibeam echosounder
mg	milligram(s)
mi	mile(s)
mm	milimeter(s)
MMPA	Marine Mammal Protection Act
μPa	micropascal(s)
MPA	Marine Protected Area
MTMNM	Mariana Trench Marine National Monument
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
nmi	nautical mile(s)
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NTL	Notice to Lessees
O_3	ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OMZ	oxygen minimum zone
ONMP	Operational National Mitigation Protocol
PATON	Private Aids to Navigation
PM	particulate matter
$PM_{2.5}$	fine particulate matter
PM_{10}	coarse particulate matter

PSO	Protected Species Observer
QMA	Qualified Marine Archaeologist
RMS	root mean square
ROV	remotely operated vehicles
SAS	Synthetic Aperture Sonar
SO_2	sulfur dioxide
U.S.	United States
U.S.C.	United States Code
UNCLOS	United Nations Convention on the Law of the Sea
USACE	U.S. Army Corps of Engineers
USBL	ultra-short baseline
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USNHHC	U.S. Naval History and Heritage Command
USV	uncrewed surface vessels
UTP	underwater transponder positioning
WPRFMC	Western Pacific Regional Fishery Management Council

1 Introduction

The United States (U.S.) Department of the Interior's (DOI's) Bureau of Ocean Energy Management (BOEM) manages the development of U.S. Outer Continental Shelf (OCS) energy, mineral, and geological resources in an environmentally and economically responsible way. The OCS is the federally managed ocean area extending across the outer boundaries of U.S. controlled waters 3 to 200 nautical miles (nmi) from shore, with some exceptions.

The Commonwealth of the Northern Mariana Islands (CNMI) has a population of approximately 47,329, according to the 2020 Census (U.S. Census Bureau 2021). The archipelago consists of 14 islands, including Saipan, Tinian, and Rota, which serve as the primary population and economic centers. Saipan is the capital and main urban center, with a size of 46.5 mi^2, and supports most of the CNMI's commercial activity, which is primarily tourism. Rota is the southernmost island of the CNMI, which is located north of Guam. The CNMI has Chamorro and Carolinian cultural heritage (Ballendorf 2026).

The Mariana Trench Marine National Monument (MTMNM), designated in 2009 by presidential proclamation, encompasses the Trench Unit, Volcanic Unit (an arch of undersea mud volcanoes and thermal vents), and Islands Unit (**Figure 1-1**). These areas include some of the deepest oceanic environments on Earth and contain unique geological and biological features. The monument has no permanent human population and is cooperatively managed by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration (FWS 2026).

BOEM initiated a Request for Information and Interest on November 12, 2025, with intent to potentially lease for seabed minerals within the OCS east of the CNMI. Subsequently, the potential lease area was expanded to include an area west of the CNMI. On March 18, 2026, BOEM's Acting Director signed the Area Identification (Area ID) Memorandum with two areas, one east and one west of the CNMI (**Appendix A**). The two areas include abyssal plains; abyssal hills; active, inactive, and extinct hydrothermal vents; seamounts; and guyots. They also partially border the MTMNM. The size, depth range, and distance of each area are shown in **Table 1-1**.

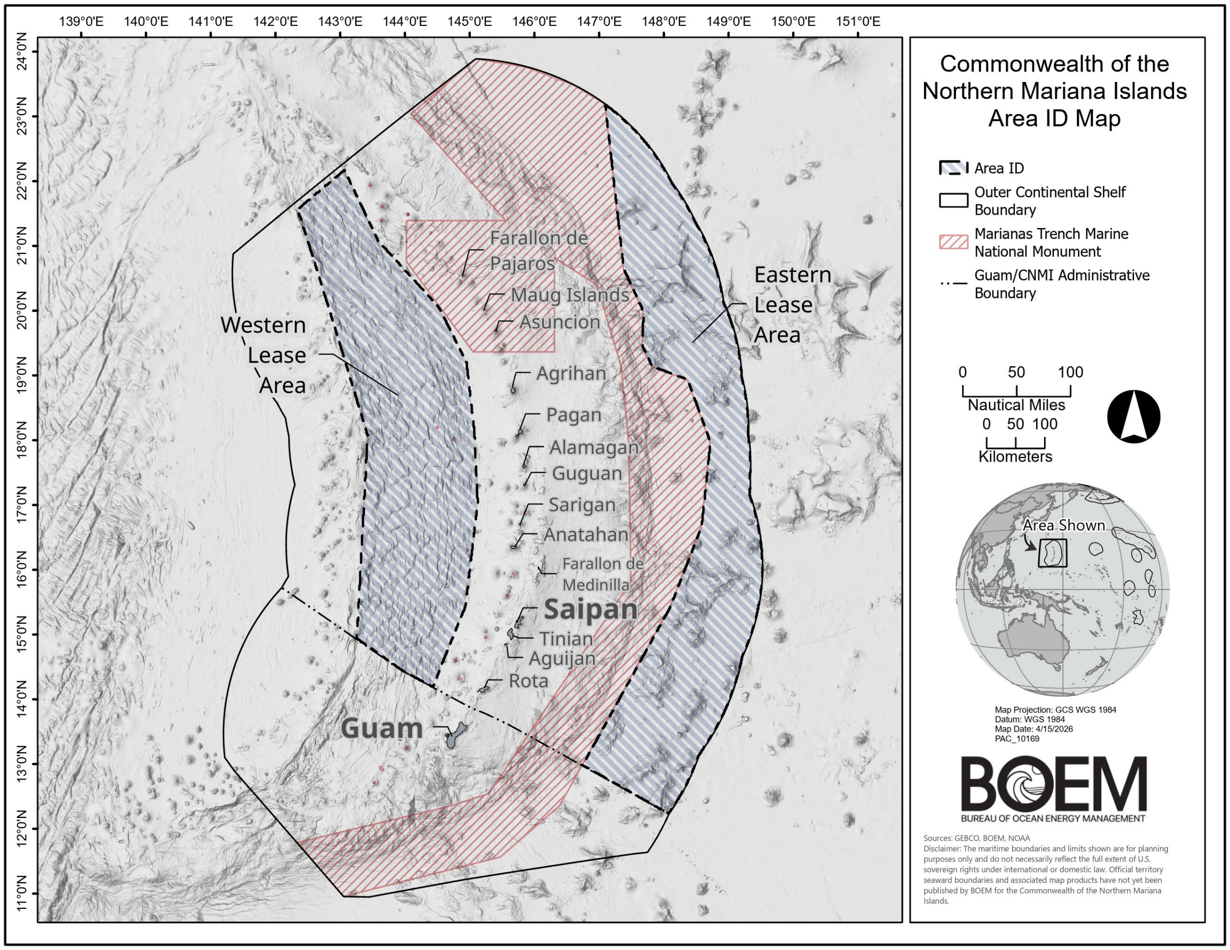

Figure 1-1. Focus area for this environmental assessment (EA) within the CNMI area of interest on OCS waters

Table 1-1. Area, depth range, and distance of the two potential lease areas

Location	Acres	Square Kilometers	Depth Range	Nearest Saipan Shore Distance	Nearest Guam Shore Distance
Leases in the Eastern Area	35,483,044	143,595	3,700–25,100 ft (1,130–7,650 m)	128 mi (206 km)	127 mi (205 km)
Leases in the Western Area	33,618,369	136,049	2,820–18,670 ft (860–5,690 m)	57 mi (91 km)	46 mi (74 km)

1.1 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action in this EA is to issue up to six commercial leases to allow the collection of survey data on the CNMI OCS. Survey data, including sample collection, are needed to determine where economically viable marine mineral resources occur, and better understand the deep-sea environment in which they occur. The issuance of a lease allows a lessee to conduct preliminary activities (e.g., high-resolution geophysical surveys, limited seabed and biological sampling, and oceanographic measurements). The issuance of these leases enables the collection of data to inform potential future delineation of areas, testing, biological assessments, and evaluation of viability for commercial mineral development. Critical minerals support key sectors such as consumer electronics, energy production, healthcare, transportation, and defense; identifying potential resources through lease issuance informs future decisions about whether delineation, testing, or commercial development may be warranted.

The need for the Proposed Action is to help meet U.S. demand for critical minerals while reducing reliance on imports. In accordance with the Outer Continental Shelf Lands Act (OCSLA) Section 11 (43 United States Code [U.S.C.] § 1340), BOEM is authorized to permit geophysical and geological exploration for marine minerals intended for commercial use. Leasing could support national security and economic resilience while managing development of the OCS mineral resources in an environmentally responsible manner. Section 3 of OCSLA (43 U.S.C. § 1332) describes the OCS as a vital national resource reserve to be developed expeditiously and orderly, while ensuring environmental protection. OCSLA Section 8 (43 U.S.C. §1337(k)) establishes a competitive leasing process for commercial mineral development. Many of the 60 critical minerals included in the U.S. Geological Survey's (USGS's) list (90 Federal Register [FR] 50494, issued November 7, 2025) occur on the OCS.

1.2 Regulatory Framework

OCSLA mandates the preparation of the OCS mineral leasing program pursuant to 30 Code of Federal Regulations (CFR) Chapter V, Subchapter B. Implementing regulations for OCSLA (30 CFR Parts 580–582) and DOI's National Environmental Policy Act (NEPA) implementing regulations (43 CFR Part 46) encourage orderly, safe, and environmentally responsible development of mineral resources on the OCS. BOEM's authority in the Pacific U.S. territories was granted by the Inflation Reduction Act of 2022, which amended OCSLA by adding a definition of "State" to include the Commonwealth of Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, and the CNMI and Pacific U.S. Minor Outlying Islands (Wake, Baker, Howland, and Jarvis Islands, Johnston Atoll, Kingman Reef, and Palmyra Atoll). BOEM is the only federal agency with the authority to issue leases for marine minerals on the OCS. BOEM’s regulatory authority is limited to the OCS. BOEM cannot approve activities in state waters, territory waters, sanctuaries, monuments, or onshore areas.

NEPA mandates that federal agencies ensure the professional and scientific integrity of environmental documents; use reliable data and resources when carrying out NEPA; and study, develop, and describe technically and economically feasible alternatives (42 U.S.C. § 4332(2)(D)–(F)). The Bureau verifies that it has complied with the requirements of NEPA, including DOI regulations and procedures implementing NEPA at 43 CFR Part 46 and the DOI NEPA Handbook (516 Department Manual 1). BOEM has proposed administrative updates to its hard-mineral regulations on the OCS to support exploration and development of critical minerals, consistent with Executive Orders 14285 and 14154 on expanding OCS critical-mineral potential.

BOEM may decide to issue leases within all, a portion, or none of the areas analyzed in the EA; BOEM’s decision regarding lease issuance will be memorialized in a Final Leasing Notice (30 CFR 581.17). The issuance of a lease by BOEM to a lessee conveys no right to proceed with mining activities and is evaluated under a separate environmental review when, and if, a lessee submits a plan.

1.2.1 Marine Mineral Status in the Pacific Ocean Beyond Federal Waters

Commercial-scale seabed mining is a new industry with a few countries testing seabed mining equipment or recovery within their waters. For the ratifiers of the United Nations Convention on the Law of the Sea (UNCLOS), the International Seabed Authority (ISA) governs the mining of mineral resources in the seabed beyond the limits of national jurisdiction, totaling approximately 60% of the ocean floor.

A region of increasing interest in the Area beyond national jurisdiction is the Northwest Pacific, extending from 1°–40°N and 132°–179°E at seamount depths of 800–3,500 m and adjacent abyssal basins exceeding 5,000 6,000 m. The region encompasses the Marcus-Wake, Magellan, and Marshall seamount groups and forms the focus of the ISA's ongoing Regional Environmental Management Plan for the Northwest Pacific. This area includes the presence of multiple ISA exploration contract areas, and the Regional Environmental Management Plan includes the identification of Areas of Particular Environmental Interest or APEIs for the protection of the marine environment. In contrast to the polymetallic nodule-rich Clarion-Clipperton Zone, the Northwest Pacific hosts the cobalt-rich ferromanganese crust resources, with additional occurrences of polymetallic nodules and polymetallic sulphides. This area shares maritime boundaries with the U.S. EEZ near the CNMI and near Wake Island.

Equipment testing and baseline environmental research within these areas, led by the ISA, gives exploration prospectors "preference and priority" when awarding seabed mining activities beyond national jurisdiction. Since the U.S. has not ratified UNCLOS, NOAA (under the Deep Seabed Hard Mineral Resources Act) regulates U.S. exploration and potential commercial recovery of critical mineral resources like manganese, cobalt, and nickel from the ocean floor beyond national jurisdiction, balancing resource access with environmental stewardship. The ISA regime is not connected with BOEM's regulations and authorities, but ISA examples and projects informed BOEM's approach and analysis throughout the OCS mineral leasing process.

2 Alternatives

NEPA requires federal agencies to rigorously explore and objectively evaluate a reasonable range of alternatives that can meet the Purpose and Need for this Proposed Action. To be considered a reasonable alternative, a proposed alternative must be technically and economically feasible, be within the jurisdiction of the Bureau, and, where applicable, meet the goals of the applicant.

BOEM identified one action alternative that meets the stated purpose of the proposed federal action and thus has been analyzed in detail. BOEM also analyzed a "No Action Alternative" that allows the reader to compare the potential impacts of the action alternatives with the effects that would occur if BOEM does not issue a lease (i.e., the status quo).

2.1 Alternative A: Proposed Action

The Proposed Action is to issue up to six leases that authorize preliminary activities only; any future action would require submission of a plan and a separate BOEM environmental review. Up to three leases would be issued on the CNMI eastern area and up to three leases on the western area. A maximum of six leases is reasonable due to the need for sufficiently large lease areas to allow for mineral exploration and to consider the number of companies that responded with interest in the Request for Information and Interest comment period. Issuing up to six leases promotes competition, accounts for the unquantified commercial value, and provides opportunities for potential commercial activity.

Each lease in the eastern area could be approximately 11.3 million acres (45,700 km^2). Each lease in the western area could be approximately 11.1 million acres (45,000 km^2). The ISA typically issues exploration leases areas of similar sizes, of approximately 18.1 million acres (75,000 km^2) for nodules and 2.5 million acres (10,000 km^2) for sulfides. Offering large lease areas also provides flexibility for exclusion areas that may be deemed necessary on an environmental or technical basis.

Issuing leases in the Proposed Area would authorize the lease holder to conduct only preliminary activities. Additional activities are not authorized and have separate environmental review processes. Geological, geophysical, and other surveys classified as preliminary may indicate the presence of mineral resources and, in the case of geological sampling, may involve collection of limited samples of the seabed. The regulatory classification of these activities as preliminary is determined in part objectively, but more by the scope and concentration of potential environmental effects of the activity. Preliminary activities are described in **Table 2-1**.

Table 2-1. Preliminary activities allowed with lease issuance and evaluated in this EA

Description from 30 CFR 582.21d	Activity	Leases in the Eastern Area	Leases in the Western Area
Bathymetric, Geophysical, Mapping, and Other Surveys	Use of survey vessels, autonomous underwater vehicles (AUVs), and remotely operated vehicles (ROVs)	Yes	Yes
Bathymetric, Geophysical, and Mapping Surveys	High-resolution geophysical (HRG) surveys using sound sources that are documented as causing little to no impact to species, Tier 4 *de minimis* sound sources[1,2] High-resolution video or acoustic cameras	Yes	Yes
Other Surveys	Sampling seabed (sediments, minerals), water, and species from an ROV	Yes	Yes
Other Surveys	Anchors on the seafloor for moorings, buoys, and physical, chemical, or biological data collection	Yes	Yes, with prior visual clearance and controlled placement
Other Surveys	Scientific physical, chemical, and biological monitoring from a ship that does not contact the seafloor, including towed equipment,	Yes	Yes
Other Surveys	Scientific physical, chemical, and biological monitoring from a ship that does contact the seafloor and use of landers	Yes	Yes
Geotechnical Survey	Box core sampling, free floating grab samples	Yes	No
Other Surveys	Expendable equipment, such as weights and underwater transponder positioning units	Yes	Yes, with prior visual clearance and controlled placement
Other Surveys	Irretrievable equipment meant for one-time use, such as expendable bathy thermographs	Yes	Yes
Other Surveys	Focused biological surveys from the air, from the ship, or in water can utilize aerial digital imaging, visual observation, radar, and thermal or acoustic monitoring	Yes	Yes

Note: [1]Sound sources are described in NMFS (2025a) [2]Center for Marine Acoustics (2023)

Preliminary activities are similar for both the eastern and western sides, except no box cores will be collected from the western area, and more ROV sampling may take place in the west. The eastern and western sides of the CNMI differ due to the seafloor conditions associated with distinct types of the critical mineral deposits. In the eastern CNMI waters, mineral deposits are associated with abyssal, soft sediments, and relatively flat bathymetry, which may allow for box coring without risk of notable impacts. In western CNMI waters, mineral deposits are generally associated with hard or consolidated sediments and/or hydrothermal systems that are not amenable to tools like box cores. More selective sampling from an ROV would be more feasible to minimize habitat disruption and collect the targeted information. Tools like rock drills and piston cores are not considered within the scope of preliminary activities.

2.1.1 Bathymetric, Geophysical, and Mapping Surveys

Bathymetric, geophysical, and mapping surveys are an important first step for planning subsequent activities. Bathymetric surveys measure depth and elevation of the seafloor, while geophysical surveys are focused on the composition of sediments on and below the seafloor. The scientific community, several U.S. agencies, and the ISA have standard methodologies for exploring and sampling the ocean seafloor; these methodologies have become less destructive as technology improved. For the leases in both the eastern and western areas, an initial HRG survey to map an area of interest would likely use a hull-mounted multibeam echosounder (MBES). An MBES is a category of HRG equipment that collects bathymetry and reflectivity at roughly 100-m resolution of the seafloor; subsequent finer resolution surveys then would be conducted within smaller areas.

HRG surveys utilize many types of equipment to map the seafloor or subsurface. Most HRG survey equipment generates sound, which is transmitted toward the seafloor, where it is reflected and received by the AUV or vessel. Different equipment types generate sound with different frequencies and sound levels, which could cause harm to some species if the sound emitted from the equipment is too powerful or overlaps with frequencies to which some species are sensitive. The scientific and regulatory communities categorized the sound profiles of HRG equipment into categories, or tiers, of impact. BOEM uses the standardized tiering system based on Ruppel et al. (2022); Tier 4 activities are considered *de minimis*—defined as sources considered unlikely to result in the incidental take of protected species—and further considered in **Chapter 3**. Equipment types are described below in **Table 2-2**.

Table 2-2. HRG survey equipment considered during preliminary activities

Equipment Type	Data Collection and/or Seafloor Survey Types	Description of the Equipment
Bathymetry (depth) sounder; multibeam echosounder (MBES)	Shallow hazards, archaeological resources, and seafloor habitats	A depth sounder is a microprocessor-controlled, high-resolution, survey-grade system that measures precise water depths in both digital and graphic formats. The system records with a sweep appropriate to the range of water depths expected in the survey area. This EA assumes the use of multibeam bathymetry systems to characterize complex bathymetric. Units can be hull-mounted, mounted in an AUV, or towed.
Side-scan sonar	Shallow hazards, hard (rock) bottoms, and archaeological resources	Side-scan sonar evaluates surface sediments, seafloor morphology, and potential surface objects (MMS 2007). Systems typically consist of a top-side processor, tow cable, and towfish with transducers (or "pingers") that generate and record the returning sound traveling through the water column at a known speed. This EA assumes the use of a digital dual-frequency side-scan sonar system with 300–500 kHz frequency ranges or greater to record continuous planimetric images of the seafloor. Synthetic Aperture Sonar (SAS) may also be used, are similar to side-scan sonars, and operate in the 70–100 kHz frequency ranges. Side-scan sonars and SAS can be mounted in an AUV or towed.

Equipment Type	Data Collection and/or Seafloor Survey Types	Description of the Equipment
Magnetometers; gradiometer	Archaeological resources and shallow hazards	These types of equipment detect and aid in the identification of ferrous or other objects having a distinct magnetic signature. The gradiometer sensor is typically towed approximately 6 m above the seafloor. This methodology is not anticipated as it is not commonly used in depths greater than 500 m. Magnetometers can be installed inside AUVs and may be present during surveys. They are passive and make no noise.

Key: kHz = kilohertz

Several survey methods can be used to collect HRG data. Typically, these methods are based on the water depth of the survey area. However, restrictions on available equipment may affect which survey methods are chosen. Additional information about AUVs, shallow multi-instrument tow, deep-tow, and uncrewed surface vessel surveys is provided in **Appendix A**. The instruments listed below are generally considered *de minimis* according to the standardized tiering system (Ruppel et al. 2022):

- Fathometers for navigation
- Sub-bottom profilers that are hull-mounted, towed, and parametric sub-bottom profilers
- MBES systems—hull-mounted EM120, EM122, EM 124 (12kHz); EM 302–304 (30kHz)
- MBES systems (towed/AUV) EM 2040 (200–700 kHz)
- EK60 and EK80 split-beam echosounders
- Pingers (acoustic locators) for locating over the side wireline instrumentation in the water column
- Acoustic releases (brief duration pinging), e.g., for moorings and landers
- Ultra-short baseline (USBL) and long baseline (LBL) positioning equipment, e.g., for navigation of submersibles, ROVs
- Acoustic Doppler Current Profiling (ADCP) equipment
- Instrumentation on HOVs, AUVs, and ROVs
- Pressure-equipped inverted echo sounders and Pressure Monitoring Transducers
- Electromagnetic sources

Sub-bottom profilers are used to survey geological features, hazards, and archaeological resources present below the seafloor (in subsurface sediments). Sub-bottom profilers (also known as pingers) can penetrate sediment depth ranges of 3 m to greater than 100 m, depending on frequency and bottom composition. High-resolution compressed high-intensity radar pulse (CHIRP) system sub-bottom profilers generate a profile view under the seabed to develop a geologic cross-section of subsurface sediment conditions. Potential impacts and best management practices (BMPs) associated with the use of some MBES systems and sub-bottom profilers are further outlined in **Chapter 3**.

The HRG surveys associated with the Proposed Action are not going to use medium-penetration sub-bottom profiler systems, which are also known as boomers, sparkers, bubble pulsers, or impulse-type systems. Low-frequency sources, such as the Wolfspar listed in Ruppel et al. (2022), also will not be used and are not evaluated here.

2.1.2 Other Surveys

Part of preliminary activities are other surveys to characterize the seabed condition and surrounding environment. Geological, oceanographic, and biological surveys that collect seabed, physical, and species information are necessary for describing deep-sea, open-ocean environments. These data are commonly collected nationally and internationally in ways determined to not notably alter the environment or natural resources by domestic and international agencies.

As listed in **Table 2-1**, other surveys in the eastern area include sampling sediments and species by ROV, anchoring buoys and scientific equipment to the seafloor, deploying equipment (such as box core sampling) from a ship, and using landers. Some equipment can remain on the seafloor, such as weights and underwater transponder positioning (UTP) units. Focused biological surveys from the air, from the ship, or in water can utilize aerial digital imaging, visual observation, radar, and thermal or acoustic monitoring. Species collection techniques and impacts are location and species-specific (and further defined in **Chapter 3** with focused descriptions of endangered species).

Other surveys in the western area are similar, except that they do not include deploying equipment that contacts the seafloor due to more variable seafloor characteristics. In the western CNMI waters, any preliminary activity that touches the seafloor, except for box cores, requires prior visual clearance and controlled placement to ensure that sampling methods are appropriate for the targeted habitat and do not inadvertently impact the seafloor.

2.1.2.1 Geological, Geotechnical, and Biological Sampling

The purpose of geological sampling during preliminary activities is multifold: to validate (ground truth) HRG surveys; to conduct environmental characterization; to better identify site-specific exploration targets; and to collect information for developing Delineation, Testing, and/or Mining Plans. Geological and geotechnical surveys include a variety of seabed sampling equipment that cause a range of impacts to the seafloor.

Within the scope of preliminary activities, ROVs provide the most precise method for data and sample collection. ROVs can collect samples with a manipulator within centimeters and provide real-time visual control. Instruments that measure CTD, USBL pingers, cameras, and other equipment also can be mounted on an ROV for additional environmental observations.

Box core and free-fall sampling are preliminary activities considered only for the eastern area. A box core is lowered from a surface vessel to the seabed by winch and penetrates the seabed; when tension is applied, the box core jaws close, sealing the sample inside. Once on deck, various sub-sampling (e.g., grab or scoop) and tests can be performed. A free-fall grab is similar, except that it is released unconnected to the vessel, descends to the seafloor, samples the seabed, releases ballast weights, and comes back to the surface via a float. A box core or free-fall grab retrieves a greater sample volume of sediment than an ROV, but preclearance is typically not possible. Additional sensors can also be mounted on a box core or free-fall sampler for additional environmental observations. Box core sampling also can provide information to characterize the biological environment, such as identifying species and contributing to genetic libraries. The intent would be to further scientific understanding and not for commercial purposes. **Chapter 3** further defines the density, frequency, and types of biological sampling.

On the eastern side of the CNMI areas, BOEM assumes up to three seafloor sampling efforts per lease using box cores or free-fall grabs. The initial effort would include sampling and mapping at a coarse scale covering a larger area, and then two subsequent sampling surveys would focus on increasingly smaller areas of interest. This assumed approach maximizes the number of surveys and samples; therefore, the document analyses the maximum anticipated environmental impact. The number of surveys and samples, and area are estimated from research-based activities, U.S. agency research, and 2023 ISA guidance with details available in **Appendices A and E**. The ISA's deep data website (International Seabed Authority 2025a) shows that sampling grids sometimes are not constant throughout a lease. However, the values in **Table 2-3** assume a consistent survey density and a greater-than-average number of samples for ISA exploration contracts. Under the Proposed Action, multiple sampling surveys would be completed on the eastern area, collecting approximately 2,550 samples (**Table 2-3**). Each sample could disturb an area of 0.5 to 1.5 m^2 of the seafloor. Together, multiple surveys could disturb 2,265 m^2 of the seafloor and represent less than 0.0000016% of the total lease in the eastern area (**Table 2-4**).

For the leases in the eastern area, BOEM expects four main surveys: one mapping HRG survey from a ship, and three subsequent surveys (increasingly fine-scale) utilizing AUVs, box cores, and/or free-fall samplers. Several oceanography cruises also may be conducted. For the leases in the western area, BOEM expects three main types of surveys: mapping and chemical oceanography, AUV, and ROV. For mapping, HRG survey activities would be similar to leases in the eastern area, with the addition of instruments that measure conductivity, temperature, and depth (CTDs) to detect active hydrothermal vents. Subsequently, a dense AUV survey would be used to identify inactive and extinct vents, either along exposed fault lines or off axis of the spreading center. After a deposit is found, an ROV would be deployed to collect additional information, including physical samples such as via push core and/or grab. HRG, ROV, and AUV equipment are described in more details below and in **Appendix A**.

Table 2-3. Estimated range seabed box core and free-fall grab sample stations on the eastern area

Survey	Total Number of Stations in Eastern Area
Coarse survey using free-fall grab (15-km grid)	567.9 (257.5 to 1,038.2)
Coarse survey using box core (50-km grid)	62.1 (32.1 to 116.2)
Lease area box core survey (10-km grid)	1,353.5 (419 to 3,237.2)
Area of interest box core survey (7-km grid)	565.9 (279.1 to 982.1)
Total	2,549.4 (987.7 to 5,373.7)

Note: Counts of samples or stations contacting the seafloor are mean values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in **Appendix A**.

Table 2-4. Estimated area of disturbance to the seafloor caused by box core and free-fall grab surveys on the eastern area

Survey	Total Disturbance in Eastern Area (m^2)
Coarse survey using free-fall grab (15-km grid)	283.9 (117.4 to 544.5)
Coarse survey using box core (50-km grid)	62.1 (28.4 to 121.3)
Lease area box core survey (10-km grid)	1,353 (390.2 to 3,305.7)
Area of interest box core survey (7-km grid)	565.9 (279.1 to 982.1)
Total	2,264.9 (815.1 to 4,953.6)

Note: Area of disturbance to the seafloor are the mean values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in **Appendix A.**

On the western area, BOEM assumes multiple seafloor sampling efforts by ROV. This assumed approach maximizes the number of sampling sites (i.e., potential deposits) and samples; therefore, the maximum anticipated environmental impact. The number of sites and samples are estimated from research-based activities, U.S. agency research, and the 2023 ISA guidance, with details available in **Appendices A and E**. BOEM estimates there may be up to 241 deposits in the western area. One ROV survey per lease would be completed under the Proposed Action, collecting approximately 30 samples per deposit (**Table 2-5**). Together, these surveys could disturb 13,586 m^2 of the seafloor and represent approximately 0.000010% of the total western area (**Table 2-5**).

Table 2-5. Estimated range of number of seabed ROV samples and area of seafloor disturbance on the western area

ROV Sampling Method	Number of Samples per Deposit	Total Disturbance in Western Area (m^2)
Push core	10 (5 to 15)	4,529.4 (13,89.1 to 11,135.5)
Grab	20 (10 to 30)	9,056.6 (2,771.8 to 22,129.1)
Total	30 (15 to 45)	13,586 (4,160.9 to 33,264.6)

2.1.2.2 Moorings and Equipment Placement

Ocean environmental characterization surveys utilize anchors, clump or ballast weights, and placement of scientific equipment on the seafloor. Weights and some equipment are considered expendable and left on the seafloor, while the connected equipment is released and retrieved. Sediment plumes are a known concern from commercial-scale mining, and a common way to understand ocean sedimentation and currents is to anchor sampling devices on or near the seafloor. AUVs may also require the use of multiple navigation devices positioned on the seafloor. During preliminary activities, a lessee would likely include placement of sampling devices and associated anchors to position those devices on the seafloor.

For leases in the western area, preliminary activities that contact the seafloor, such as placing anchors, require prior visual clearance and controlled placement of equipment. Sediments and substrates on the leases in the western area are expected to be more variable and contain hard-bottom or consolidated sediments, which may be sensitive to disturbance. Therefore, any equipment on the seafloor must be placed precisely where imagery, or other clearance methods, have confirmed that placement would have no notable adverse impact. Due to expansive soft sediments expected in the leases in the eastern area, the same procedures are recommended where feasible but not required.

Surface buoys are anchored at fixed locations for monitoring and evaluating water column and air conditions. In deeper waters, lessees are more likely to set moorings for collecting oceanographic data without a surface buoy (AMC Consultants Pty Ltd et al. 2021). However, BOEM estimates two large surface ocean buoys would be placed per lease; the Proposed Action could have a maximum of 12 buoys. Likely buoy types for deep water include discus-shaped, boat-shaped, and spar buoys; a large discus-shaped hull buoy has a circular hull of 10–12 m in diameter. Meteorological buoys are the most common type of larger ocean buoy deployed. Meteorological buoy anchors deployed create a buoy watch circle (i.e., excursion radius) of approximately 1,250 m and almost 3,000 m of line (Pacific Northwest National Laboratory 2019). Onboard power supply sources for buoys could include solar arrays, lithium or lead-acid batteries, and diesel generators, which require an onboard fuel storage container with appropriate spill protection and environmentally sound methods for refueling activities. Buoys will be lit in accordance with the U.S. Coast Guard (USCG) private aid to navigation (PATON) requirement. Decommissioning to remove the approved equipment is essentially the reverse of the installation process. Installation and decommissioning of buoys are expected to be completed within one day per buoy, and decommissioning likely would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation.

A buoy would be anchored to the seafloor at two or three locations by equipment made from materials such as solid cast iron, cement, or chain. The line connecting the buoy to the anchor consists of chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats, which keep the mooring line taut to semi-taut, reduce slack, and eliminate looping (National Data Buoy Center 2025). The chain at bottom of the mooring line could sweep and disturb the seafloor. A meteorological buoy anchor deployed a solid cast iron anchor weighing approximately 11,000 lbs and had a footprint of approximately 2.3 m^2 (Pacific Northwest National Laboratory 2019). Anchors range from 3,700–6,800 lbs, with similar types of mooring lines extending approximately 500 m below the surface to avoid interference with other marine activities (Sharma and Nath 2020; AMC Consultants Pty Ltd et al. 2021; China Minmetals Corporation 2024; National Data Buoy Center 2025). BOEM estimates that mooring installation could disturb approximately 28 m^2 of seafloor per mooring (**Appendix A**). After installation, the transport vessel likely would remain in the area for several hours while technicians configure systems.

The speed and direction of ocean currents would likely be assessed with ADCPs. An ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures their reflection as the waves ricochet off fine particles or zooplankton suspended in the water column. A typical ADCP has three to four acoustic transducers that emit and receive acoustical pulses from different directions, with frequencies ranging from 300–600 kHz and a sampling rate of every 1 to 60 minutes. ADCPs could be mounted independently on the seafloor, attached to a buoy, or have multiple instruments deployed as a subsea current mooring. A seafloor ADCP likely would be mounted in a tripod or a trawl resistant mount. One subsea current mooring might have 8–10 ADCPs vertically suspended from an anchor, combined with several floats made of syntactic foam. These moorings do not breach the surface. A typical ADCP is about 1–2 ft tall and 1–2 ft wide. Its mooring, base, or cage (surrounding frame) would be several feet wider. BOEM estimates that eight moorings per lease could be installed across all lease areas, with seafloor disturbance likely around 28 (12.6 to 78.5) m² per mooring

Preliminary activities in the eastern CNMI waters may include a seafloor lander. This stationary scientific monitoring device "lands" on the seafloor and ranges in size. BOEM assumes approximately 22 landers could be deployed across the total area but not at the same time. Most landers would displace about 2 m^2 of seafloor, though the footprint of a newer device rated to ocean depths of 6,000 m is approximately 4 m^2 (Guo et al. 2023).

As a part of the Proposed Action, the EA also assumes AUV-based surveys would use multiple AUVs and require placement of UTP units on the seafloor. Each UTP could displace 1 m^2 of area, with up to 405 UTPs placed across the eastern area (**Table 2-6**) and 1,472 UTPs in the western area (**Table 2-7**). Leases in the eastern area likely would have one HRG AUV survey. Leases in the western area would likely have an additional denser AUV survey.

Table 2-6. Estimated area of disturbance to the seafloor caused by deploying equipment and moorings for data collections within leases in the eastern area

Survey	Disturbance per Lease Alternative A (m^2)	Total Disturbance for Eastern Lease Areas (m^2)
UTP deployment for AUV survey	134.9 (67.4 to 239.4)	404.7 (202.2 to 718.2)
Moorings for equipment	186.7 (95 to 303.8))	560 (285 to 911.3)
Landers	7.3 (5 to 9.6)	21.9 (15.1 to 28.8)
Total seafloor disturbance	328.9 (167.4 to 552.8)	986.6 (502.3 to 1,658.3)

Note: Any value that has a range is described as the mean value (5% to 95%) value. Totals are derived from running simulations, and not additive, from the three efforts and explained further in **Appendix A**.

Table 2-7. Estimated area of disturbance to the seafloor caused by deploying equipment and moorings and landers for data collections within leases in the western area

Survey	Disturbance per Lease Alternative A (m^2)	Total Disturbance for Western Lease Areas (m^2)
UTP deployment for AUV survey	498.8 (269.8 to 757.8)	1,471.6 (794.9 to 2,229.9)
Moorings for equipment	183 (93.1 to 297.8)	549 (279.4 to 893.3)
Landers	7.2 (4.9 to 9.4)	21.5 (14.8 to 28.2)
Total seafloor disturbance	689 (367.8 to 1,065)	2,041.5 (1,044.1 to 3,151.4)

Note: Any value that has a range is described as the mean value (5% to 95%) value. Totals are derived from running simulations, and not additive, from the three efforts and explained further in **Appendix A**.

2.1.2.3 Vessel Trips and Number of Survey Days

The survey duration in days and number of vessel trips anticipated for Proposed Action (Preliminary Activity) surveys and equipment deployments are estimated on **Tables 2-8 and 2-9**. The number of survey vessels at any one time is estimated to be two, with a maximal statistical potential of five per lease (**Appendix A**). A vessel trip is a two-way voyage of a ship moving from a port or harbor to the survey area and then returning. BOEM assumes vessels will utilize the Port at Saipan, but vessels could use ports from the CNMI region. Transit to the CNMI would likely be from U.S. mainland ports but could be from other energy hubs in the Pacific Ocean (e.g., Malaysia, Australia). Available ships that can access deep waters and stay in the open ocean are limited in the global market. BOEM projected vessel trips information from the initial assessment of the CCZ's Nauru Ocean Resources property and from the Tonga Offshore Mining Limited CCZ Project Exploration Area.

For leases in the eastern area, there is a range for the survey duration estimates listed (**Table 2-8**) due to varying densities reported from related assessments. The sum of these factors approximates the survey duration: (1) expected duration of the survey work using the calculated line miles and expected velocity; (2) number and duration of line turns; (3) expected daily time for deck work, such as AUV or device deployments, retrievals, or sampling operations; and (4) amount of time when no work is conducted because of either mechanical or weather delays. See **Appendix A** for more explanations and assumptions.

For the three potential leases in the western area, there is also a range of survey duration estimates (**Table 2-9**). These estimates are based on factors listed above, as well as assumptions about the expected magnitude and duration of AUV and ROV surveys, including amount of time to sample and move among deposit sites. See **Appendix A** for more explanations and assumptions.

Table 2-8. Estimated number of vessel trips for surveys and for equipment or mooring deployments on the leases in the eastern area

Survey	Duration of Survey in Days[1] and Number of Vessel Trips[2]
Mapping survey: initial or coarse survey with low or medium frequency (one survey)	56.9 (45.9 to 70.2) days across 5 trips (low frequency) 112.7 (91.7 to 137.8) days across 8 trips (medium frequency)
Geological, geotechnical, and biological sampling:[3] initial or coarse, lease area, and fine (total of three) surveys	946.5 (388.6 to 1,969.9) days across 55 trips
Oceanographic/biological surveys: include deployment and retrievals of equipment, water, chemical, avian, fishes, marine mammal, and sea turtle (total of four) surveys[4]	328.8 (279.3 to 382.6) days
Total estimated number of days at sea with vessel trips (Alternative A)	1,668 (1,174.5 to 2,504.7) days across 156.2 (117.1 to 220.6) trips

Notes: 1. Survey days and vessel trip numbers and ranges were calculated using methodology in **Appendix A**. Values are intended to be conservative estimates of survey requirements accounting for weather and maintenance.
2. A vessel trip is a two-way voyage of a ship moving from a port/harbor to the survey area and then returning.
3. Geotechnical and biological sampling assume 24-hour survey days.
4. Avian, fish, marine mammal, and sea turtle surveys are typically conducted during daylight hours (10 hours).

Table 2-9. Estimated number of vessel trips for surveys and for equipment or mooring deployments on the leases in the western area

Survey	Duration of Survey in Days[1] and Number of Vessel Trips[2]
Mapping and chemical oceanography survey: MBES and CTD tow-yos	46.3 (38.2 to 56) days across 6 trips mapping with an EM122 109.8 (89.4 to 134.4) days across 10 trips mapping with an EM304 146.6 (89.6 to 230) days across 13 days to conduct CTDs
AUV survey with six AUVs: identify inactive and extinct vents along exposed faults or “off axis”	395 (298.1 to 502.7) days over 31 trips
ROV survey: targeted collection of water, sediment, rocks, and animals	1,381.3 (465.9 to 3,299.3.) days over 104 trips
Total estimated number of days at sea with vessel trips (Alternative A)	2,214.5 (1,226.7 to 4,201) days across 191 (116.2 to 340.1) trips

Notes: 1. Survey days and vessel trip numbers and ranges were calculated using methodology explained in **Appendix A**. Values are intended to be conservative estimates of survey requirements accounting for weather and maintenance, with actual numbers likely to be lower.
2. A vessel trip is a two-way voyage of a ship moving from a port/harbor to the survey area and then returning.

Vessels that install moorings and conduct surveys are typically 90 to 122 m in length (German Federal Institute for Geosciences and Natural Resources 2018; China Minmetals Corporation 2024). Crew boats used for buoy operations and maintenance are typically 16 to 17 m in length, with 100- to 400-hp engines and 1,800-gal fuel capacity. The remote location is a large cost for data collection. BOEM anticipates larger survey vessels would attempt to collect as much data as possible while on the water. While a cruise may have a particular category or priority, survey vessels could function as platforms for collecting HRG, geotechnical, biological, and oceanographic information. Vessels performing surveys or towing equipment are relatively slow moving at approximately 4–6 knots. Specific surveys and data collection are further explained in **Chapter 3** and **Appendix A**.

Under Alternative A, up to three leases would be issued in each leasing area, making each lease approximately 44,977 to 45,699 km^2 in size (**Table 2-10**), with three located on the eastern and three located on the western area.

Table 2-10. Areas of individual leases

Survey Area	Eastern Area (km^2)	Western Area (km^2)
Total Area	137,007	134,930
Proposed Action (Alternative A) – Up to Three Leases	45,669 each	44,977 each

Leasing six areas, three in the eastern area and three in the western area, would allow for more, smaller leases, which may increase competition and may reduce financial barriers to participating in the auction by lowering costs based on acreage, such as the bidding amount and rent. Smaller sized leases are more comparable in scale, but still larger in size compared to the size of subdivided exploration contract areas managed by the ISA. The ISA gives a total of 75,000 km^2 to each country; each portion is then divided into areas of approximately 15,000 km^2. For comparison, the NORID (Nauru Ocean Resources Inc.) exploration area in the CCZ is 25,000 km^2.

2.2 Alternative B: No Action

Under Alternative B, the No Action Alternative, the proposed commercial leasing would not be authorized in the CNMI OCS. As a result, no preliminary activities or BOEM-directed data collection would occur within the designated Proposed Action Area. The marine environment (including benthic habitats, water column ecosystems, and associated biological communities) would remain undisturbed by entities holding leases in the OCS offshore CNMI. The No Action Alternative serves as a baseline for evaluating the environmental impacts of the Proposed Action and other alternatives. It allows decision-makers and the public to compare the consequences of proceeding with commercial leasing for marine minerals against maintaining the status quo.

This alternative represents the continuation of current conditions and trends of the natural environment.

NOAA and USGS ocean research and box cores would continue under the No Action Alternative. NOAA conducts ocean research through its Office of Ocean Exploration and Research, Office of Coast Survey, and others. Examples of actions include seafloor mapping, biological surveys, and water column studies using sonar and ROVs. Additional efforts include technology development, such as AUV deployment and environmental DNA (eDNA) collection. USGS conducts non-invasive studies via its Coastal and Marine Hazards and Resources Program, including seafloor mapping, sediment transport studies, and submarine landslide analysis. USGS also has a mission to survey deep-sea minerals and biology without extraction. These serve as examples and other activities may take place in the area.

2.3 Alternatives Considered but Eliminated from Further Analysis

2.3.1 Preliminary Activities Omission

Another alternative, conducting a lease sale without preliminary activities, was not carried forward for detailed consideration because this alternative does not align with applicable regulatory requirements.

2.3.2 Other Leasing Configurations

Phased development, pilot scale approaches, and additional spatial exclusions were not carried forward at this decision point because they do not meet the Purpose and Need as effectively as preliminary activities that should be authorized under the Proposed Action. Preliminary review indicated that these configurations would not provide meaningful environmental advantages compared to the alternatives already under consideration given the early stage and novel nature of this Proposed Action.

2.3.3 Non-Routine Events

Non-routine and low-probability events and hazards that could occur in all alternatives include the following: (1) allisions and collisions between vessels and other vessels or marine life; (2) spills from collisions or fuel spills resulting from generator refueling; and (3) recovery of lost survey equipment. Non-routine and low-probability events and hazards are incorporated by reference from Section 2.6 of the Commercial Leasing for Minerals Offshore American Samoa Environmental Assessment (BOEM 2026b) as the actions considered are similar for this analysis and the documentation is recent and reliable.

3 Affected Environment and Environmental Considerations

This EA considers the potential effects of activities associated with lease issuance. This section briefly describes aspects of the natural and human environment that could be impacted by the Proposed Action. Conclusions for resources including marine habitats, fish, seabirds, marine mammals, and sea turtles involve varying degrees of uncertainty because baseline data are limited. **Appendix A** describes assumptions and activities that should be used in the Proposed Action Area.

Impact analysis of each resource focuses on duration and concentration of the action to that resource. Duration refers to whether an impact is short term, occurring only during a limited operational period, or long term, persisting throughout the life of the Proposed Action activities or beyond.

The Proposed Action includes BMPs for some resources to reduce or eliminate potential risks to or conflicts with specific environmental resources (**Appendix C**). If leases are issued, BOEM would require the lessee to comply with BMPs as part of conducting preliminary activities associated with a lease.

3.1 Air Quality

3.1.1 Affected Environment

Air Quality can be degraded by non-anthropogenic sources (e.g., dust or sea salt); however, human activity is responsible for most ambient air pollution, which includes emissions from industrial and transportation sources, such as power plants, manufacturing, resource extraction, automobiles, vessels, and aircraft. Air quality tends to be the most degraded in metropolitan areas and near other large sources of air pollutants. Additionally, dry climates and rugged terrain can capture pollutants, degrading local air quality. As an archipelago with a population of 51,000, the CNMI has low levels of air pollution.

The Clean Air Act requires the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards for criteria pollutants to provide protection from adverse effects of certain pollutants. There are two sets of standards. Primary standards protect public health, including the health of sensitive populations, such as people with asthma, children, and older populations. Secondary standards protect public welfare (including visibility), the health of animals and plants, and infrastructure. The criteria pollutants are nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3), fine ($PM_{2.5}$) and coarse (PM_{10}) particulate matter (PM), and lead (Pb). The criteria pollutants released by OCS activity associated with the Proposed Action include NO_2, CO, SO_2, $PM_{2.5}$, and PM_{10}. Nitrogen oxides (NO_X) and volatile organic compounds, known as precursor pollutants, are released by the same activity, and may form O_3 through photochemical reactions. Deposition of NO_2 and SO_2 may harm plants, including agriculture, as well as degrading infrastructure and water quality.

When these standards are exceeded, the USEPA designates the area as nonattainment. The CNMI is in attainment with the National Ambient Air Quality Standards. Guam has three SO_2

nonattainment areas: Piti Power Plant and Tanguisson Power Plant above the 3-hour 0.5 ppm standard, and Piti-Cabras above the 1-hour 75 ppb standard (USEPA 2026). The primary cause of the three nonattainment areas are the emissions of SO_2 from onshore oil power plants. Secondary causes include mobile sources, such as vessels, due to the close proximity of the power plants to port facilities (TRC Environmental Consultants and Guam Power Authority 2023). However, long-term trends have seen large reductions in SO_2 concentrations in some of these locations (90 Federal Register [FR] 26235).

Note that the air above the OCS is undesignated.

3.1.2 Impact Analysis

3.1.2.1 Alternative A: Proposed Action

Emissions from vessels and other equipment may impact air quality in onshore areas near ports and when vessels pass close to shore. When vessels are further away from shore, emissions will dissipate before reaching shore. This dissipation will help limit the volume of emissions likely to impact people. These emissions could have been notable if they were to be released in areas with high concentrations of ambient pollution. However, the CNMI is within attainment, with no notable sources of emissions over the OCS; therefore, no notable impacts are expected.

Because of Guam's nonattainment areas, and the potential for vessels to make use of the port facilities close to the existing SO_2 nonattainment areas, there is the potential for a small increase in concentrations from these vessels while they are moving in and out of the port facilities. These contributions to the nonattainment areas would likely be brief. Further, since all three nonattainment areas were not established primarily due to vessel and port emissions, it is unlikely additional vessel and port activity would delay the timing of the nonattainment areas being brought into compliance with the NAAQS.

3.1.2.2 Alternative B: No Action

If no leasing were to take place, then none of the proposed activities would take place. No changes in impacts to air resources would occur.

3.1.3 Conclusion

The impact of emissions on air quality is not expected to be notable for any of the action alternatives for the CNMI nor for the reasonably foreseeable planned activities for up to six leases. However, there is the potential for short-term, slight impacts to the three existing nonattainment areas on Guam if vessels use those port facilities.

3.2 Oceanography and Water Quality

3.2.1 Affected Environment

The affected environment for oceanography and water quality spans the Proposed Action Area and the navigation routes between the Proposed Action Area and the ports where survey vessels would stage, such as the Port of Saipan or the Port of Tinian. The CNMI Bureau of Environmental and Coastal Quality protects and preserves the CNMI's natural resources and bodies of water, including monitoring, and when necessary, remediating both marine and freshwater systems.

The most common threats to coastal water quality are stormwater runoff from onshore infrastructure, sewage discharge from failing infrastructure, fecal contamination from feral and domesticated animals, and heavy metal contamination from legacy WWII sites (Yuknavage et al. 2022). Several of these sources can lead to fecal indicator bacteria (Enterococci) levels exceeding the CNMI water quality standards (Yuknavage et al. 2022). The wet season (July to October) tends to correlate with a higher number of exceedances (Paradigm Environmental 2017).

Waters near the Port of Saipan are designated Class A; the objective of this class of waters is that their use for recreational purposes and aesthetic enjoyment be protected (Paradigm Environmental 2017). However, port waters are considered use-impaired due to levels of Enterococci, phosphate, nitrate, and lead in bivalves (Denton et al. 2009; Yuknavage et al. 2022). In addition to port and marina activities, there is a closed municipal dump and wastewater treatment plant that may contribute to frequent exceedances of water quality standards and trace element enrichment of surface sediments (Denton et al. 2009; Paradigm Environmental 2017).

The Port of Tinian is also designated as Class A and considered use-impaired due to levels of Enterococci, phosphate, and dissolved oxygen (Yuknavage et al. 2022). Sources of depleted dissolved oxygen are marina activities, groundwater seeps, and on-site septic system treatment (Yuknavage et al. 2022). Vessel traffic in Tinian is low, however construction for new development adjacent to the harbor began in 2019 (Yuknavage et al. 2022).

A summary of archipelago climate and oceanography can be found in Geo-Marine Inc. (2005) and Lowe et al. (2024). The CNMI climate is considered somewhat tropical, getting more humid, hot, and wet from north to south. During the wet, monsoon season between June and December, the archipelago gets approximately 65–70% of its precipitation. During El Niño years, the islands may experience less rainfall; the Pacific Decadal Oscillation can also influence the CNMI climate. The northeast trade winds dominate for most of the year, except during summer, when the easterlies are strongest (NOAA 2025). The archipelago averages 1–2 typhoons per year and one super typhoon approximately every 10 years (Eldredge et al. 1977).

Surface currents predominantly flow from east to west and strengthen from north to south as a result of five main currents: Kuroshio, North Equatorial, North Equatorial Counter, North Pacific Subtropical Counter, and South Pacific Subtropical Counter (Spalding et al. 2012). Islands of the archipelago may produce eddies that transport eggs and larvae to nearby reefs (Wolanski et al. 2003). Seasonality in currents and winds also help shape marine and coastal habitats (e.g., Harmelin-Vivien 1994; Kawakami and Aoyama 2010). At the seafloor, the Mariana back-arc hosts submarine volcanoes that emit hydrothermal fluids and carbon dioxide, which can lead to extreme thermal and chemical local conditions offshore (McMullin et al. 2000; Butterfield et al. 2011).

3.2.2 Impact Analysis

3.2.2.1 Alternative A: Proposed Action

Routine activities associated with the Proposed Action that could impact oceanography and water quality are vessel traffic and discharges (e.g., bilge and ballast water), geotechnical and benthic sampling, mooring anchoring and decommissioning, and lander deployment. Oil and hydrocarbon spills are non-routine events that have the potential to impact water quality.

Vessel traffic and discharges are not expected to have lasting impacts on water quality. Under Section 402 of the Clean Water Act, the USEPA regulates discharges of any point source pollution into navigable waters (33 U.S.C. § 1342). Any non-recreational, non-Armed Forces vessels greater than 79 ft in length must comply with vessel discharge requirements established by the USEPA's 2013 Vessel General Permit and the USCG discharge regulations (33 CFR 151.10). Permitted vessel discharges would be treated to meet water quality standards, such as technology-based effluent limits, and diffuse rapidly in the water column.

Geotechnical and benthic sampling, mooring anchoring and decommissioning, and lander deployment are expected to temporarily decrease water quality. See **Chapter 2** and **Appendix A** for a description of equipment and activities. These activities would resuspend sediments where equipment physically disturbs the seafloor. Upon cessation of these activities, resuspended sediment would resettle onto the seafloor, but there is uncertainty about when and where redeposition would occur.

Sediment properties (such as particle size, shape, and behavior) that influence resettlement are largely unknown in the Proposed Action Area. On the east, abyssal nodule fields can be associated with fine-grained clays and biogenic oozes (Dutkiewicz et al. 2020; Zawadzki et al. 2020). On the west, sediments likely consist of volcanic muds and calcareous ooze (Eldredge 1983). Fine and non-circular particles settle more slowly than coarse and circular particles (Komar and Reimers 1978; Dietrich 1982). Flocculation, in which particles aggregate to become larger, can reduce settlement time (Gillard et al. 2019; Elerian et al. 2023).

Local physical conditions influence resuspended sediment behavior but are uncharacterized. Background vertical turbulent diffusion can maintain sediment in suspension (Peacock and Ouillon 2023). Bathymetric slope and bottom currents play a role in particle propagation and transport (Gazis et al. 2025). Sample operations, such as descent speed and tilt, also factor into turbidity changes (Blomqvist et al. 2015). These site- and operation-specifics would need to be resolved to more accurately model sediment dynamics.

Given data scarcity on these key factors, this analysis relies on standards established by previous deep-ocean research (**Table 2-3**) and assumptions that sediment behavior in the Proposed Action Area is similar to other marine systems. During modified box core field trials in the Baltic Sea (3–150 m water depth), Blomqvist et al. (2015) recorded turbidity inside the sampling chamber up to 60 times the background turbidity at a descent speed of 24 m per min. When the box core was left open on the seafloor for observation, turbidity returned to ambient levels within 1 min (Blomqvist et al. 2015). Box core removal would suspend additional sediment. Preliminary activities are anticipated to result in suspended sediment that rapidly resettles onto the seafloor in the same area as the physical disturbance, and water quality would return to ambient conditions within minutes. However, additional data collection is required to confirm, or revise, this expectation. This could be done by measuring turbidity before (background) and after sampling events to determine how long it takes to return to ambient conditions, whether resuspended sediment can be detected, and how far it is transported.

Large-scale abyssal disturbance experiments range in measured suspended sediment concentrations, settlement time, and transport. During the Global Sea Mineral Resources pre-prototype collector trial, maximum suspended sediment concentrations were recorded up to four orders of magnitude higher than background conditions and seafloor within 100 m of the disturbance area was blanketed with at least 3 cm of sediment (Gazis et al. 2025). The resulting plume could be detected over an area of 9 km^2, and 4.5 km away from the impact site within 35 hours of the disturbance (Gazis et al. 2025). Within 50 m of the disturbance site, ambient conditions returned after 14 hours (Gazis et al. 2025). Spearman et al. (2020) conducted an abyssal sediment release experiment in which suspended sediment concentrations returned to background conditions at a distance of around 1 km from the release site; sediment redeposition was limited to 100 m due to flocculation and rotational currents caused by internal tides. Analysis of the historical Ocean Minerals Company collector vehicle test estimated that plume deposition thickness was approximately 0–10 mm over a distance of tens of meters with detectable impacts after 44 years (Jones et al. 2025).

There have been some sulfide test drilling and extraction (e.g., Crowhurst and Lowe 2011; Matsui et al. 2018). During excavation and ore-lifting tests in the Okinawa Trough, the amount of excavated sediment and the lifting and lowering of the excavator contributed to sediment resuspension (Matsui et al. 2018). The spatial extent of sediment redeposition was influenced by prevailing currents (Matsui et al. 2018). The sediments also contained elevated concentrations of Fe, Hg, Cd, Pb, Cr, Cu, and Zn (Matsui et al. 2018).

An accidental release of oil and hydrocarbon products (e.g., diesel, lubricates) may result in short-term impacts on water quality in the immediate vicinity of the release before it dissipates and evaporates (**Section 3.2**).

3.2.2.2 Alternative B: No Action

Under the No Action Alternative, commercial leases would not be issued in the Proposed Action Area. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on oceanography and water quality for the timeframe considered in this EA. Oceanography and water quality in the Proposed Action Area are subject to a variety of ongoing impacts that overlap with the Proposed Action, including development, point and non-point pollution, shipping, and dynamic ocean conditions. Implementing the No Action Alternative would not meaningfully reduce ongoing impacts on oceanography and water quality when compared to the Proposed Action.

3.2.3 Conclusion

Oceanography and water quality impacts are expected to be resolved within minutes at the disturbance site under the Proposed Action, assuming the sediment behaves similarly to other regions. Vessel discharges must comply with USEPA, USCG, and local regulations and requirements. Based on limited existing knowledge, sediment resuspension would settle quickly after disturbance and in the immediate footprint. Data on sediment properties (e.g., particle size, shape, and behavior) and local physical conditions (e.g., vertical turbulent diffusion, bathymetric slope, bottom currents) would reduce uncertainty by supporting site-specific modeling to accurately predict resuspended sediment behavior.

3.3 Geology

3.3.1 Affected Environment

The area impacted by the Proposed Action is in the eastern and western CNMI Exclusive Economic Zone (EEZ). The eastern side of the CNMI EEZ extends from the eastern MTMNM eastward to the limits of the CNMI EEZ. Leases in the western area are inside the Mariana back arch basin, beginning just to the east of the Mariana Trough (an active spreading center) and extending west to the West Mariana Ridge. The two areas will be discussed separately.

3.3.1.1 Eastern Area

Leases in the eastern area are dominated by the presence of an intra-ocean convergent margin. In this margin, the Pacific plate is subducting below the approaching Philippine Sea plate. The Marianas Trench is the result of this subduction zone (Stern 2002; Artemieva 2023).

The seabed minerals area is largely in the abyssalpelagic zone of the western Pacific plate. Seamounts, seamounds, guyots, and abyssal plain are present in the seabed minerals area (Bell et al. 2017). The effects of the Mariana subduction zone are apparent throughout the seabed minerals area, with the slope of the seabed increasing from east to west across the area down-dip towards the trench. Large linear fissures, parallel to the trench, exist across the seafloor on the western portion of the leases (Emry et al. 2014). Large guyots spread throughout the area, rise to a depth of 1,200 m, and are the flat-topped remnants of volcanic islands (Figure 3-1).

In this area, BOEM expects interest from potential lessees would be restricted to the abyssal plain. The abyssal plain is generally defined as a flat, featureless area below 2,000-m water depth with a nearly level (1:1,000) slope. Abyssal plains are the area where polymetallic nodules are most likely to exist in mineable quantities. Seabed morphology (Harris et al. 2014) indicates that of the eastern area only 82,458 km^2 would be considered abyssal plain, while 69,963 km^2 would be made up of guyots, seamounts, ridges, or escarpments.

In the abyssal plain, east of the Marianas Trench, the seafloor sediment is likely to consist of oozes and very soft abyssal clays (Sidlauskas Jr and Mills 1996). Near the guyots, seamounts, and seamounds, the sediment is likely coarser due to sedimentation from the seabed features. The sides of guyots may have outcropping basalt, and the tops of the guyots are likely carbonate reef material, sediment, and polymetallic crusts.

3.3.1.2 Western Area

Leases in the western area are dominated by the Mariana Trough, an active spreading center in the Mariana back-arc basin (Hilbert et al. 2024). The Mariana Trough is formed as tectonic forces pull the seafloor apart. Extension in the overriding plate causes the seafloor to spread, forming new oceanic crust. In the center of the spreading center, repeated magma intrusions form sheeted dykes, and volcanic eruptions on the seafloor form pillow basalts. The seafloor, under tension, forms ridges and valleys as it is pulled from the spreading center. The resulting seafloor is very rugous. The difference of depth between the ridges and valleys can exceed 1,000 m and have slopes in excess of 50° (indicated on sea surface MBES data). ROV video of the seabed indicates it can be very rough, and slopes can be vertical in some areas.

Sediment in the western area thickens east of the spreading center towards the Mariana Arc, and west towards the Western Mariana Ridge (Oakley et al. 2009). Sediments collect in the valleys and can be several hundred meters thick. The sediment is mostly volcanoclastic. Elsewhere, the sediment is likely very soft to soft thinly covering the underlying basalt.

3.3.2 Impact Analysis

3.3.2.1 Alternative A: Proposed Action

Anticipated impacts on the local geological resources by the preliminary activities include geotechnical sampling, deploying of sensors on the seafloor, and various types of geophysical and bathymetric survey. Geotechnical sampling in the eastern seabed mineral area will result in the disturbance of the seafloor. For leases in the eastern area, box cores and free-fall grab samplers will be used to collect information of the abundance and type of nodules, along with samples of the sediment for use in environmental and pore water studies. In the western area seabed samples will likely be taken by ROV using various implements, including scoops and the ROVs manipulator arm. Oceanographic moorings will likely be deployed in both eastern and western areas, with anchors securing the instruments to the seabed. Navigation transponders also will likely be deployed to assist navigation of AUVs and ROVs in both areas. Geophysical and bathymetric surveys will likely consist of several survey missions, with increasing resolution, over several years.

BOEM calculated the expected amount of seabed disturbance from the preliminary activities in both areas separately, due to the difference in survey methods. For each lease in the eastern area, BOEM calculated that 3,619 m^2 of seabed would likely be removed for sampling or disturbed for oceanographic moorings and landers. Compared to the size of the eastern seabed minerals areas, 138,000 km^2, the expected disturbance area (3,619 m^2) is roughly 0.0000026% of the total area.

For leases in the western area, 15,654 m^2 of seabed was calculated as likely to be disturbed for sampling or disturbed via oceanographic moorings and landers. Compared to the size of the leases in the western lease area, 135,200 km^2, the expected disturbance area (15,654 m^2) is roughly 0.0000115% of the total area.

3.3.2.2 Alternative B: No Action

If no leasing were to occur, then none of the proposed activities would take place. The slight disturbances to local geological resources would not occur.

3.3.3 Conclusion

Geotechnical sampling would result in 0.0000064% bottom disturbance for both seabed minerals areas. For the leases in the eastern area, samples would be taken, at a maximum density, of a 5-km grid over a very limited area. For leases in the western area, sampling would be denser over sulfide deposits. However, the distance between deposits has been shown to have an average of 60 km. Geophysical surveys, part of the preliminary activities, would not impact the geological resources of either area. The impacts are expected to be minimal for the Proposed Action.

3.4 Offshore Habitats

3.4.1 Affected Environment

The Proposed Action Area spans two areas, eastern and western, in the western Pacific Ocean and includes diverse bathymetric features such as abyssal plains, abyssal hills, ridges, guyots, seamounts/knolls, and hydrothermal vents (**Section 3.3**). Oceanographic conditions are shaped by five main currents (Kuroshio, North Equatorial, North Equatorial Counter, North Pacific Subtropical Counter, and South Pacific Subtropical Counter), mesoscale eddies, and atmospheric drivers (**Section 3.2**). Vertical ecological zones structure the water column, each with specialized biological communities adapted to depth, pressure, temperature, and light availability. This analysis considers the potential effects from the Proposed Action on these distinct zones below. Due to limited scientific data on many of these habitats, our discussion emphasizes the typical species that inhabit or use these environments.

BOEM recognizes that microbes and viruses are abundant biological entities in the ocean that often drive biogeochemical processes and recycle nutrients (Cotner and Biddanda 2002; Vincent and Vardi 2023), but a lack of geographic- and habitat-specific information prevents discussion at finer resolutions. This analysis does not consider marine mammals, sea turtles, and marine and coastal birds, as they are addressed in subsequent sections. Threatened and endangered species are discussed in **Section 3.9**. Some of the species that inhabit offshore environments support important fisheries and are described in **Section 3.10**.

3.4.1.1 Epipelagic (0–200 m)

The epipelagic zone, extending from the ocean surface to approximately 200-m depth, is the sunlit layer of the ocean and supports comparatively high biological productivity. The Proposed Action Area lies within the Tropical Northwestern Pacific marine province, which is part of the broader Central Indo-Pacific (Spalding et al. 2007; Sutton et al. 2017). Primary producers in this zone are phytoplankton, including diatoms and dinoflagellates, which sustain a diverse community of zooplankton. Common zooplankton groups include calanoid and cyclopoid copepods, euphausiids, chaetognaths, and gelatinous organisms such as larvaceans. These organisms form the base of the food web and serve as prey for larger pelagic species. The epipelagic zone also generates most marine snow (organic particles that sink into deeper waters), which plays an important role in regulating atmospheric CO_2 and supplying energy to deep-sea ecosystems that rely on this continuous flux of material (Middelburg 2019).

Characteristic epipelagic fish species in the region include skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), albacore (*Thunnus alalunga*), mahi-mahi (*Coryphaena hippurus*), and flying fishes (*Exocoetidae*) (Western Pacific Regional Fishery Management Council 2009b). These species are both ecologically and economically important, supporting local and regional fisheries (Chan 2023). Larvae and juveniles of nearshore, mesopelagic, and bathypelagic organisms often inhabit the epipelagic zone before migrating to their adult habitats (Carassou et al. 2009; Bandara et al. 2021). Potential stressors from proposed activities include a fish-aggregating device (FAD) effect, marine debris, anthropogenic noise, artificial light, and oil spills. Entanglement, vessel strike, and displacement of fishing activities are also concerns for large epipelagic fishes and are discussed in **Section 3.9**.

3.4.1.2 Mesopelagic (200–1,000 m)

The mesopelagic zone, also known as the “twilight zone,” spans depths from 200 to 1,000 m and is characterized by low light levels, decreasing temperatures, and a sharp decline in primary productivity. This zone plays a critical role in oceanic food webs and biogeochemical cycling, particularly through diel vertical migration and the biological carbon pump (Steinberg and Landry 2017).

In the waters surrounding the CNMI and Guam, the mesopelagic zone is influenced by regional oceanographic features, such as the five major currents and mesoscale eddies, which affect nutrient transport and biological distributions (Bertrand et al. 1999; Domokos et al. 2007). An oxygen minimum zone (OMZ) may be present in the Proposed Action Area, likely between 300- to 800-m depths, consistent with patterns observed elsewhere in the tropical Pacific (Fiedler and Talley 2006; Wishner et al. 2020). OMZs are zones of hypoxia that can strongly structure community composition and vertical distribution of organisms in the mesopelagic.

In general, the mesopelagic zone supports a diverse assemblage of zooplankton and micronekton, including myctophid fishes, bristlemouths (*Cyclothone* spp.), cephalopods, gelatinous zooplankton (e.g., ctenophores, medusae), and crustaceans such as euphausiids and amphipods (Choy et al. 2017; Drazen and Sutton 2017). Many of these taxa exhibit diel vertical migration, ascending into the epipelagic zone at night to feed and descending during the day to avoid predation, and this behavior contributes considerably to carbon sequestration. Piscine predators in this zone include deep-diving tunas, snake mackerels, lancetfishes, moonfishes, and cutlassfishes (Haddock and Choy 2024). The mesopelagic zone also may serve as an important habitat for the early life stages of many deep-sea species (Bandara et al. 2021). Very little is known about this habitat within the Proposed Action Area, and baseline data collection is needed to assess biodiversity, connectivity, and potential sensitivity to anthropogenic stressors.

3.4.1.3 Bathypelagic (1,000–4,000 m)

The bathypelagic zone, extending from 1,000 to 4,000 m depth, is a cold, dark, and high-pressure environment that supports a unique assemblage of deep-sea organisms. This zone lies below the reach of sunlight and is characterized by stable temperatures (typically 1–4°C), low food availability, and slow biological processes (Seibel and Drazen 2007; Black et al. 2021). In the CNMI EEZ, this zone includes both open-ocean water column habitats and prominent bathymetric features, such as seamounts, which contribute to regional biodiversity and ecological complexity.

Bathypelagic fauna are adapted to extreme conditions and include gelatinous zooplankton (e.g., medusae, siphonophores), deep-living cephalopods, amphipods, and fishes such as grenadiers (*Coryphaenoides* spp.), slickheads (Alepocephalidae), and deep-sea eels. Many species exhibit low metabolic rates, slow growth, and long lifespans (Roark et al. 2009; Drazen et al. 2021). Ontogenetic vertical migration is common, with juveniles occupying shallower depths and adults residing in the bathypelagic zone (Bandara et al. 2021).

Seamounts (defined as features that rise > 1,000 m above the seabed) within this depth range are ecologically important. They alter local hydrodynamics, enhancing vertical mixing and productivity, and serve as biodiversity hotspots and aggregation sites for pelagic species such as tuna and cetaceans (Clark et al. 2010; Morato et al. 2010; Nagai et al. 2021). Seamounts support distinct benthic communities, including deep-sea corals, sponges, and echinoderms, many of which are vulnerable to disturbance and exhibit limited dispersal (Vanreusel et al. 2016; Kennedy et al. 2019). There are a number seamounts within the Proposed Action Area (**Section 3.4**).

Despite their importance, seamount ecosystems in the Proposed Action Area remain poorly characterized. Limited ROV and AUV surveys have reached these depths (e.g., Kennedy et al. 2019; National Centers for Environmental Information 2020; Selig et al. 2023), and baseline data collection is needed to assess biodiversity, habitats, connectivity, and potential sensitivity to anthropogenic stressors.

3.4.1.4 Abyssalpelagic (4,000–6,000 m)

The abyssalpelagic zone, ranging from 4,000- to 6,000-m depth, represents one of the most remote and least explored regions of the ocean. It is characterized by perpetual darkness, near-freezing temperatures (~1–2°C), high hydrostatic pressure, and extremely low food availability. These conditions result in a unique biological community adapted to extreme environmental constraints (Seibel and Drazen 2007; Black et al. 2021).

Organisms in this zone include gelatinous zooplankton, deep-living amphipods, polychaetes, and fishes such as cusk eels (*Abyssobrotula* spp.) and grenadiers. Many species exhibit slow growth, low metabolic rates, and long lifespans, with some deep-sea corals and fish living for centuries (Roark et al. 2009; Drazen et al. 2021). Biomass is generally low, but diversity can be high, particularly among meiofauna and microbial communities (Rex et al. 2006; Rabone et al. 2023).

The abyssalpelagic zone above the seafloor is tightly coupled to the benthic environment through vertical fluxes of particulate organic matter and the activities of vertically migrating species. Recent studies suggest that even small increases in turbidity or sedimentation can disrupt feeding and respiration in abyssal organisms (van der Grient and Drazen 2022). The presence of a deep scattering layer near the seafloor, composed of micronekton and zooplankton, has been observed in similar regions and also may occur in the CNMI OCS (Ellis et al. 2025).

Despite its ecological importance, the abyssalpelagic zone remains poorly characterized in the Proposed Action Area, and physical factors that may drive biodiversity and productivity have not yet been described. For example, the importance of the carbonate compensation process, which occurs at the ocean depth below which calcium carbonate dissolves faster than it accumulates, thus limiting sedimentation and reducing habitat complexity, may be an important constraint (Simon-Lledó et al. 2023). Only a handful of AUV dives have reached these depths, and BOEM is not aware of any quantitative biological surveys that have been conducted within the Proposed Action Area, or water column samples from this depth range that have been analyzed for biodiversity or ecosystem function. Baseline data collection is needed to assess biodiversity, connectivity, and potential sensitivity to anthropogenic stressors.

3.4.1.5 Abyssal Plain (4,000–6,000 m and ~3 m Above Substrate)

The abyssal plain (defined here as the seabed and the water column immediately above the substrate) within the Proposed Action Area spans depths of 4,000 to 6,000 m and is part of one of the most extensive deep-sea habitats on Earth. This environment is characterized by soft sediments, potential polymetallic nodule fields, and potentially complex terrain including abyssal hills and other bathymetric features. Despite its remoteness and low productivity, abyssal plain habitat can support a diverse and highly specialized biological community that is adapted to extreme environmental conditions.

In general, abyssal plain sediments are primarily composed of fine-grained clays and siliceous or calcareous biogenic material. These sediments accumulate at extremely slow rates, typically less than 0.5 cm per thousand years (Dutkiewicz et al. 2020) and are associated with low organic carbon fluxes (0.4–6 g C m^2/yr) (Smith and Rabouille 2002). Abyssal plains typically host high species richness and low biomass, dominated by smaller size-fractions (Rex et al. 2006). In the CCZ, which may share similar environmental conditions, 88–92% of species remain undescribed, and many are known from only one or two specimens (Rabone et al. 2023). Similar patterns could be expected in the Proposed Action Area. Abyssal soft sediment habitats and species in the CNMI are undescribed; most deep-sea scientific exploration has been on high-relief features (e.g., Glickson et al. 2017; Kennedy et al. 2019; Lowe et al. 2024).

If present, polymetallic nodules would be a defining feature of this habitat. Nodules create habitat heterogeneity and structural complexity, which can drive local ecological patterns (Simon-Lledó et al. 2019b; Durden et al. 2020; Fleming et al. 2025). Sessile fauna such as sponges, bryozoans, xenophyophores, and cnidarians colonize nodule surfaces, while meiofauna and macrofauna inhabit the interstitial spaces and crevices (Vanreusel et al. 2016; Drennan et al. 2021; Pape et al. 2021). Nodules have been shown to contribute to distinct ecosystem functions and services (Thurber et al. 2014; Purser et al. 2016; Orcutt et al. 2020; Stratmann et al. 2021). Microbial communities may be of special importance in this habitat as they play essential roles in nutrient cycling and metal oxidation on nodule surfaces and within sediments (He et al. 2025).

The abyssal plain is not uniformly flat. Abyssal hills, ridges, and other features may introduce topographic heterogeneity that influences current flow, sediment deposition, and biological community structure (**Figure 3-1**). Within the CNMI EEZ, seamounts may occur at abyssal depths, although none have been surveyed. Research in other regions demonstrates limited taxonomic overlap between seamounts and abyssal plains (Laroche et al. 2020), but they may contribute limited source populations and overall biodiversity to the latter (Leitner et al. 2021). Seamount flanks that extend into the abyssal depth range also may serve as refugia or source populations for recolonization following disturbance (Leitner et al. 2021).

In summary, abyssal benthic habitats in the Proposed Action Area remain poorly studied. Few AUV or ROV dives have reached these depths, no comprehensive biological surveys have been conducted, and no sediment samples have been analyzed for biological characterization.

Mariana Trough. The Mariana Trough is a back-arc basin that hosts complex bathymetry and hydrothermal systems (**Figure 3-1**) (Karig et al. 1978; Baker et al. 2005). These hydrothermal systems, which produce sulfide deposits (Jamieson and Gartman 2020), fuel highly productive ecosystems based on chemoautotrophic microbes that generate energy using reduced chemical species, such as H_2, H_2S, CH_4, CO_2, and Fe^{2+} (Tunnicliffe 1992a; Takai et al. 2006; Fisher et al. 2007). In the southern Mariana Trough, active vents are dominated by *Betaproteobacteria*, *Epsilonproteobacteria* and hyperthermophillic archaea (*Thermoprotei*, *Thermococci*, and *Archaeoglobi)* (Kato et al. 2010; Yanagawa et al. 2015). These microbes can be free-living within fluids and seawater, exist as mats or biofilms, and act as symbionts within larger organisms (Takai et al. 2006). While there are heterotrophic vent species (e.g., brachyuran crabs), many have symbiotic microbes that provide trophic support and detoxification (e.g., vestimentiferan tube worms, *Calyptogena* clams, *Bathymodiolus* mussels); in return, the host provides habitat for the microbes to grow (Childress and Fisher 1992). Vent species are quick to colonize new vent systems (Shank et al. 1998), exhibit high endemism (Tunnicliffe 1992b; Alfaro-Lucas et al. 2024), and can survive extreme and rapid changes in temperature, highly sulfidic waters, metal toxicity, and low oxygen concentrations (Childress and Fisher 1992; McMullin et al. 2000). Active vents can also influence adjacent non-hydrothermal systems (Levin et al. 2016).

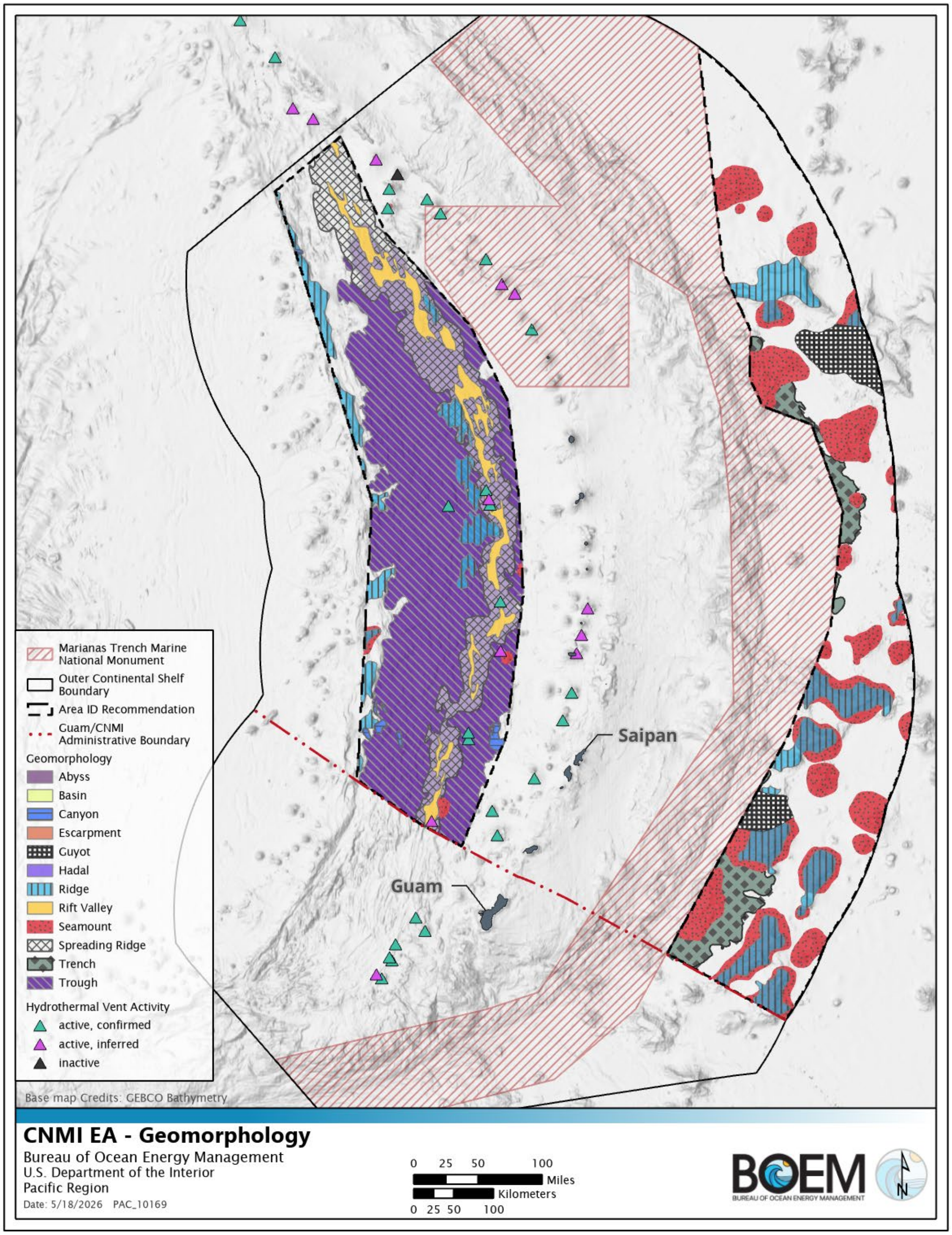

Figure 3-1. Map of geomorphology within the Proposed Action Area

Data from GRID Arendal (2026).

Kojima and Watanabe (2015) provide a summary of vent fauna that have been observed in the southern Mariana Trough, which are distinct from the volcanic arc. Back-arc vent fields are dominated by the large provannid *Alviniconcha hessleri.* Other common organisms include *Lepetodrilus* limpets, bythograeid crabs, alvinocarid shrimp, and *Paralvinella* polychaetes. Vestimentiferan tube worms tend to be rare in this area. Giguère and Tunnicliffe (2021) report that meiofauna are also relatively rare in back-arc vent habitats, the majority of which are nematodes and copepods. The NOAA VENTS program completed several expeditions to the Mariana Archipelago during its tenure (Hammond et al. 2015). Although most were focused on geological and chemical oceanography, they also contributed to biological observations of the area (e.g., Huber et al. 2010; Giguère and Tunnicliffe 2021).

As active chimneys move away from the spreading center, vent fluid flow eventually stops, and the chimney becomes inactive and ultimately extinct (Jamieson and Gartman 2020). This change in fluid flow results in succession of the biological community (Van Dover 2019). As the source of primary productivity ceases, inactive vents begin to look like other deep-sea, hard-bottom communities (Collins et al. 2012; Sen et al. 2014). However, there is evidence that traces of active vent communities can persist for many months after abrupt environmental changes (Mullineaux et al. 2003). Microbial communities may persist even longer, potentially cycling sulfur, nitrogen, iron, and methane, as well as fixing carbon, (Sylvan et al. 2012; Achberger et al. 2024). However, some inactive vent microbial communities may be more comparable to non-hydrothermal sediments (Kato et al. 2010; Yanagawa et al. 2015). Most efforts have focused on active systems, so there are many unknowns and uncertainties associated with inactive and extinct vents in the CNMI.

3.4.2 Impact Analysis

3.4.2.1 Alternative A: Proposed Action

BOEM proposes to issue up to six leases for preliminary seabed mineral exploration activities in the Proposed Action Area. These activities include marine vessel traffic; HRG surveys; sediment sampling; buoy and mooring deployment, operation, and retrieval; AUV and ROV surveys; and other low-impact technologies. Although these activities would not result in commercial-scale disturbance, they may introduce a suite of potential stressors into offshore habitats from the surface to the abyssal seabed, including habitat disturbance, sediment resuspension and turbidity, FAD effect, marine debris, anthropogenic noise, artificial light, electromagnetic field (EMF) alteration, and oil spills. Entanglement, vessel strike, and displacement of fishing activities also are concerns for large epipelagic fishes (**Section 3.9**).

Habitat Disturbance. Habitat disturbance would be most relevant where sampling devices, moorings, and landers make contact with the seabed. While the areal footprint is very small, the local consequences are likely to persist due to the extreme longevity and slow recovery of deep benthic communities. Experimental mining studies in and near the CCZ have shown that microbial, infaunal, and megafaunal communities may not recover to pre-disturbance levels, even after 26–44 years (Jones et al. 2017; Simon-Lledó et al. 2019a; Vonnahme et al. 2020; Jones et al. 2025). Nodules themselves take millions of years to form (Hein et al. 2020), and their removal or disturbance could result in permanent habitat loss on human timescales. However, preliminary activities are expected to be individually much smaller than these disturbance experiments and dispersed throughout a large area. Remaining large patches of undisturbed habitat are expected to retain ecosystem structure and functioning within the Proposed Action Area.

During test drilling at active vents in the Okinawa Trough, fluid flow began out of the new “artificial” vents and microbial mats began to develop around the disturbed area within 11 months of the disturbance (Nakajima et al. 2015). Within 16 months, galatheid crabs, alvinacarid shrimp, and *Paralvinella* polychaetes were found in the area (Nakajima et al. 2015). Inactive and extinct vents may not recover from disturbances as rapidly due to the lack of primary productivity. However, impacts from the Proposed Action are still expected to be minimal and temporary due to limited and controlled bottom disturbance. Test drilling is not a preliminary activity and is thus excluded from this analysis.

Seamount flanks may be affected by benthic-disturbing activities. These features often host vulnerable communities such as deep-sea corals and sponges, which are highly sensitive to physical disturbance and exhibit limited dispersal (Shank 2010). Even minor contact could damage these long-lived organisms. Avoidance of seamount habitats could minimize this risk.

Sediment Resuspension and Turbidity. Sediment sampling, buoy and mooring activities, and placement of other benthic-oriented equipment may resuspend sediments and increase turbidity. Although these are expected to be short-lived and spatially limited, even minor increases in turbidity can affect filter feeders and visual predators in the abyssal plain and abyssalpelagic zone (van der Grient and Drazen 2022). Abyssal organisms are adapted to extremely clear waters, and small changes in suspended sediment concentrations (e.g., 0.04–0.08 mg/L) may impair feeding and respiration. Given only a very small part of the Proposed Action Area will be sampled and low organism densities, no population-level effects are expected from proposed activities.

Preliminary activities on the western seafloor of the CNMI are expected to result in sediment resuspension and increased turbidity that are short term and spatially limited due to controlled placement of equipment. Hydrothermal sediments can contain elevated concentrations of Fe, Hg, Cd, Pb, Cr, Cu, and Zn (Matsui et al. 2018), which can travel and deposit over 100s of meters through naturally occurring plumes (Lou et al. 2020). While inactive and extinct vents may not experience active fluid flow, they may be influenced by particles from nearby venting (Levin et al. 2016), which may provide some tolerance for increased turbidity.

FAD Effect. For the duration of their emplacement, surface buoys and moored structures may act as FADs, altering the behavior and distribution of pelagic species such as tuna, mahi-mahi, and billfish (Kramer et al. 2015). These effects are most relevant in the epipelagic and upper mesopelagic zones. FADs can increase local fish densities, potentially enhancing predation risk, altering trophic interactions, and increasing fishing pressure, including bycatch (Seto et al. 2024). While the Proposed Action limits the number of buoys to 12, their presence in a remote and relatively undisturbed region could have disproportionate ecological effects. The FAD effect will be eliminated with the removal of surface structures and is not expected to cause population-level changes within the region.

Marine Debris. While the Proposed Action does not intentionally introduce debris, the deployment of expendable gear and potential loss of equipment (e.g., UTPs, mooring components) could contribute to long-term accumulation of marine litter. Lost gear may persist for decades or longer in the deep sea, where degradation is extremely slow, and may pose entanglement risks or alter benthic habitat structure. Recovery operations for lost equipment, if required, could also cause additional seafloor disturbance. To mitigate these risks, all activities associated with the Proposed Action will be conducted in compliance with applicable U.S. regulations, including the Marine Debris Act (33 U.S.C. § 1951 et seq.) and relevant provisions of International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V, which prohibits the discharge of plastics and other persistent solid wastes into the ocean.

Anthropogenic Noise. Noise from survey vessels, AUVs, ROVs, and acoustic equipment (e.g., MBESs, ADCPs, USBL systems) may affect species across all depth zones. Noise stressors are addressed in more detail in **Appendix D**. Preliminary activities primarily include Tier 4 *de minimis* sound sources, which are unlikely to cause take; however, short-term behavioral responses may occur for sensitive species near the sound source during sound exposure. In abyssal habitats where light is absent and visual cues are limited, acoustic and mechanosensory systems may offer a key sensory modality for organisms to perceive their environment. For example, deep-sea fishes such as macrourids may be sensitive to low-frequency noise, though data are limited (Marshall 1965; Hendricks et al. 2025). Active venting can radiate acoustic energy that may provide organisms with behavioral cues (Crone et al. 2006; Chen et al. 2021).

Artificial Light. Artificial lighting from surface vessels, AUVs, and ROVs may temporarily disrupt diel vertical migration patterns in the epipelagic and mesopelagic zones. Many zooplankton and micronekton migrate nightly to feed in surface waters and return to depth during the day. Artificial light can suppress this behavior, altering predator-prey dynamics and carbon flux (Berge et al. 2020; Marangoni et al. 2022).

As depth increases, the role of vision transitions from dominant (epipelagic) to highly specialized (mesopelagic and bathypelagic) to largely diminished (abyssal and hadal habitats) (Haddock and Choy 2024). In the mesopelagic zone, visual interactions are particularly important and have driven the evolution of sensitive eyes and bioluminescent signaling. In deeper zones, the scarcity of light leads to a shift toward other sensory modalities, although bioluminescence remains a key adaptation in many midwater species. Artificial light from AUVs or ROVs may disturb visually sensitive species, such as gelatinous zooplankton and deep-sea fishes, but the spatial extent and temporal duration of artificial light from Proposed Action activities would be limited.

EMF Alteration. Some survey equipment (e.g., ADCPs, USBL systems) and mooring components may generate or alter local EMFs. Though the concentration and spatial extent are expected to be minimal, EMF-sensitive species in all habitats may be affected during migration or foraging. However, given the limited deployment of EMF-generating gear, impacts are expected to be minimal.

Oil Spills. The risk of a petroleum spill is expected to be low but not minimal (**Chapter 2**). Nevertheless, even small spills could affect many species, especially larvae in the surface waters of the epipelagic zone. Compliance with 33 CFR Parts 151, 154, and 155 is expected to minimize this risk.

3.4.2.2 Environmental Protection Measures

BOEM regulates "preliminary activities" on OCS mineral leases to ensure environmental protection and operational oversight. These activities are described in **Chapter 2**. Lessees are required to notify BOEM at least 30 days prior to initiating any preliminary activities and provide a detailed description and schedule of the proposed operations (30 CFR 582.21d). This advance notice allows BOEM to evaluate potential environmental impacts and determine whether additional environmental review or action is necessary. Environmental protection measures a lessee should consider are outlined below; some are included as BMPs in **Appendix C**.

Two BMPs are proposed to safeguard marine ecosystems, consistent with OCSLA and NEPA (**Appendix C**), and are intended for planning and analytical purposes only. Their inclusion in this EA does not constitute final agency action and could be subject to further interagency consultation, public review, and formal adoption through the lease issuance process in accordance with 30 CFR 581.17.

BMPs (1) protect known habitats and species vulnerable to human activities, and (2) given the much of the Proposed Action Area is unexplored, establish an adaptive management framework that enhances environmental protection. Although the Proposed Action is limited to preliminary activities, it may establish conditions that facilitate scientific research, delineation actions, etc.

BMPs would minimize the collective impacts of repeated surveys, habitat disturbance, and potential future extraction on ecological communities that may have slow recovery rates and high endemism. Public access to environmental data also would promote transparency, facilitate independent scientific review, and support regional ecosystem assessments that can reduce duplicative surveys and improve the efficiency and environmental performance of future leasing decisions. By enabling shared access to baseline and monitoring data, the lessee could reduce costs for industry by minimizing redundant data collection and streamlining environmental review for subsequent activities.

3.4.2.3 Alternative B: No Action

Under the No Action Alternative, commercial leases would not be issued in the Proposed Action Area. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on offshore environments for the timeframe considered in this EA. Offshore environments in the Proposed Action Area are subject to a variety of ongoing impacts that overlap with the Proposed Action, including shipping, fishing, and dynamic ocean conditions. Implementing the No Action Alternative would not meaningfully reduce ongoing impacts on offshore environments when compared to the Proposed Action.

3.4.3 Conclusion

The analysis considered the potential for habitat disturbance, sediment resuspension and turbidity, FAD effect, marine debris, anthropogenic noise, artificial light, EMF alteration, and oil spills associated with preliminary activities described in the Proposed Action. While the spatial footprint of these activities is minimal relative to the total Proposed Action Area, the persistence and sensitivity of deep-sea communities warrant careful consideration. The Proposed Action is not expected to result in substantial adverse impacts to offshore habitats. However, the analysis also highlights data gaps, particularly in the deeper zones of the Proposed Action Area, where biodiversity, ecological function, and baseline conditions remain poorly characterized. To address these uncertainties and support adaptive management, BOEM recommends continued baseline data collection, habitat mapping, and monitoring of potential collective impacts.

3.5 Nearshore Habitats

3.5.1 Affected Environment

In this document, nearshore environments are defined as intertidal, benthic, and water column habitats and species out to 3 nm. The nearshore geomorphology and biological cover of the CNMI are described in National Centers for Coastal Ocean Science (2005). Notable nearshore habitat types include coral reefs, seagrasses, and mangroves. Substrates around the port consist of mostly sand and pavement, which hosts seagrasses, macroalgae, and a fringe reef (National Centers for Coastal Ocean Science 2005; Brainard et al. 2012); there is also a small mangrove patch near the port facility (Paradigm Environmental 2017).

3.5.1.1 Coral Reefs

Coral reefs are highly diverse and productive systems that provide numerous functions and services. They are considered biodiversity hotspots (Roberts et al. 2002), providing habitat for many marine species. Reef fish can be a source of local livelihoods and diets (Cinner 2014). Coral reefs provide recreational opportunities to snorkel and dive (Brander et al. 2006). They protect shorelines by buffering current and wave energy and reducing coastal flooding (Beck et al. 2018; Burke and Spalding 2022).

The Mariana Archipelago hosts more than 375 species of hard corals and 130 soft corals (Paulay et al. 2003; Brainard et al. 2012). The region’s corals are monitored and managed by several programs, such as the Marine Monitoring Team, Coral Reef Initiative, NOAA U.S. Pacific Islands National Coral Reef Monitoring Program, and the Western Pacific Regional Fishery Management Council. Common genera include *Astreopora, Cyphastrea, Favia, Leptastrea, Montastrea, Montipora, Pocillopora, Porites, and Psammocora* (Brainard et al. 2012). One ESA-listed coral species, *Acropora globiceps*, occurs in the CNMI (**Section 3.9**). In general, coral cover and reef fish biomass in the northern archipelago are higher than in the southern islands (Brainard et al. 2012). Surveys of southern islands (Saipan, Tinian, Rota, and Aguijan) observed coral and coralline-algal diseases that disproportionately affect reef-building species on those islands (Brainard et al. 2012). A status report in 2018 indicated that the coral reefs were in fair condition, although widespread coral bleaching may have happened since (NOAA 2018). There are two native species of giant clam that reside on the reefs (*Tridacna maxima* and *T. squamosa*), although several additional species have been introduced through mariculture (*T. derasa, T. gigas*, *Hippopus hippopus*) (Lowe et al. 2024). They tend to appear in higher densities in the northern islands (Brainard et al. 2012).

3.5.1.2 Seagrass Beds

Seagrasses are aquatic, flowering plants that can form submerged meadows along the coast. They play key biological and physical roles in nearshore environments (Larkum et al. 2006; Duarte et al. 2008; McKenzie et al. 2021). Seagrass meadows provide habitat for fish and invertebrate communities, including nursery and recruitment grounds for adjacent habitats (Beck et al. 2001; Dorenbosch et al. 2005), and can also contribute to local fisheries (Gillanders 2006). Seagrasses stabilize sediments and dampen current and wave energy to protect shorelines (Koch et al. 2006). They also increase sedimentation rates (Gacia and Duarte 2001) and act as a biological filter for coastal waters (Marbà et al. 2006). Seagrass meadows are highly productive and contribute to carbon services (Duarte and Chiscano 1999; Mateo et al. 2006), as well as nutrient cycling, such as for nitrogen and phosphorous (Marbà et al. 2006; Romero et al. 2006). There are five species of seagrass in the CNMI: *Enhalus acoroides*, *Halophila minor, H. ovalis, Halodule uninervis*, and *H. pinifolia* (Ellison 2009). On Saipan, seagrasses mainly occur on the western side of the island (National Centers for Coastal Ocean Science 2005). The majority of the CNMI wetlands occur on Saipan, Tinian, Rota, and Pagan, but there is presently less than 1% of wetland cover within the archipelago (Yuknavage et al. 2022), due to historical infill for agriculture and recent urban development (Brainard et al. 2012).

3.5.1.3 Mangroves

Mangroves are an important nearshore habitat that is found in the CNMI. Mangrove forests are highly productive, serving as habitat and nursery grounds for some species (Robertson and Duke 1987; Paillon et al. 2014). They have high carbon densities and support global carbon cycling (Alongi 2012; Adame et al. 2021), as well as cycling of nutrients and organic matter (Singh et al. 2005). Mangroves provide protection against storms and coastal flooding through their ability to buffer waves and winds (Alongi 2008; Zhang et al. 2012; Das and Crépin 2013), which is especially important due to frequent wind and storm activity in the region (Lowe et al. 2024). The CNMI has three species of mangrove: spotted mangrove (*Rhizophora stylosa*), blind-your-eye mangrove (*Excoecaria agallocha*), and oriental mangrove (*Bruguiera gymnorhiza*), which is the only species of any abundance as of 2018 (Ellison 2009; Lowe et al. 2024).

3.5.2 Impact Analysis

3.5.2.1 Alternative A: Proposed Action

Impacts on nearshore habitats are not expected for preliminary activities. Any benthic impacts that could occur would be from accidental events, such as vessel grounding or collision during transit to and from the Proposed Action Area. Impacts on fishes and essential fish habitat (EFH) could occur from noise generated by project vessels and accidental introduction of non-native or invasive species from non-local project vessels, which would be minimized by BMPs within the USEPA 2013 Vessel General Permit. These potential effects are not expected to affect viability of regional populations or cause long-lasting damage to habitats.

3.5.2.2 Alternative B: No Action

Under this alternative, commercial leases and grants would not be issued in the Proposed Action Area. However, BOEM expects ongoing activities and planned actions (e.g., development, fishing, and shipping) to have continuing regional impacts on nearshore habitats over the timeframe considered in this EA. In comparison to the Proposed Action, the No Action Alternative would not meaningfully affect ongoing impacts to nearshore habitats.

3.5.3 Conclusion

Based on the limited scope of preliminary activities and the lack of direct spatial overlap between the Proposed Action Area and nearshore environments, there are no expected impacts to nearshore environments from the Proposed Action.

3.6 Protected Habitats

3.6.1 Affected Environment

3.6.1.1 EFH

EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. § 1802(10)). Habitat Areas of Particular Concern (HAPCs) are defined as “discrete subsets of EFH that provide extremely important ecological functions, are especially vulnerable to degradation, are particularly rare, or are already subject to substantial stress from development or fishing activities” (50 CFR 600.815(a)(8)).

Through Fishery Ecosystem Plans and related documents, the Western Pacific Regional Management Council (WPRFMC) has identified and described EFH and HAPCs for the Mariana Archipelago and for the pelagic fisheries of the Western Pacific; these documents are incorporated by reference (Western Pacific Regional Fishery Management Council 2005; 2009a). Broadly, EFH in the Mariana Archipelago includes the water column down to 1,000-m depth from the shoreline out to the 200-mi EEZ boundary. The WPRFMC designated as HAPCs for managed pelagic species the upper 1,000 m of the water column above all seamounts and banks that are less than 2,000 m in the OCS. These areas are also designated as HAPCs for archipelago-managed species: coral reefs, all escarpments and slopes between 40–280 m, all banks with summits less than 30 m, and all no-take MPAs. Additionally, specific one coral reef ecosystem HAPC has been designated in the CNMI (Saipan Lagoon) and five in Guam (Cocos Lagoon, Orote Point Ecological Reserve Area, Haputo Point Ecological Reserve Area, Ritidian Point, and Jade Shoals).

More detailed information on EFH can be found in BOEM’s *2026 CNMI Biological and Essential Fish Habitat Assessment* (BOEM 2026a).

3.6.1.2 Marine National Monument and National Wildlife Refuges

The purpose of the MTMNM is to conserve the unique geological, biological, and ecological features of the region, including coral reefs, seamounts, mud volcanoes, hydrothermal vent communities, and the trench itself. The Proposed Action Area is adjacent to the monument's boundary (**Figure 1-1**). The MTMNM was established in 2009 and is jointly managed by the Secretary of Commerce (NOAA) and the Secretary of the Interior (U.S. Fish and Wildlife Service). The monument includes submerged lands and waters totaling over 95,000 mi^2 and overlaps with the **Mariana Trench National Wildlife Refuge** and the **Mariana Arc National Wildlife Refuge**. The MTMNM Management Plan and related scientific literature provide detailed descriptions of habitats and species and are incorporated here by reference (FWS 2026). The monument's deep-sea environments are distinct from shallower reef systems in the region, with communities dominated by specialized organisms adapted to high pressure, low temperature, and absence of sunlight. These include microbial mats, vent-endemic invertebrates, and deepwater fish species. The monument's management emphasizes the protection of these unique geological and biological resources, as well as the preservation of scientific, cultural, and ecological values.

3.6.1.3 Local Marine Protected Areas (LMPAs)

A variety of LMPAs are located within the Mariana Archipelago (ProtectedSeas 2026a; 2026b). The CNMI LMPAs include Bird Island Marine Sanctuary, Bird Island Sea Cucumber Reserve, Bird Island Wildlife Conservation Area, Forbidden Island Marine Sanctuary, Laulau Bay Sea Cucumber Reserve, Lighthouse Reef Trochus Reserve, Managaha Marine Conservation Area, Sasanhaya Fish Reserve, Tank Beach Trochus Reserve, and the Tinian Marine Reserve. Guam LMPAs include Achang Reef Flat, Anao Conservation Area, Haputo Ecological Reserve Area, Pati Point, Piti Bomb Holes Marine Preserve, Orote Ecological Reserve Area, Sasa Bay, Tumon Bay, and the War in the Pacific National Historical Park. These areas are located within 3 nm from the shore and offer various levels of protection to natural and cultural resources. They often support a high diversity of reef fish, invertebrates, and marine plants.

3.6.2 Impact Analysis

3.6.2.1 Alternative A: Proposed Action

EFH. Potential impacts from the Proposed Action are discussed under Offshore Habitats (**Section 3.4**) and Nearshore Habitats (**Section 3.5**). The impact analysis and conclusions from these sections that have habitats that correspond to EFH and HAPCs would be the same. No substantial adverse impacts are expected.

LMPAs. Potential impacts from the Proposed Action are discussed under Nearshore Habitats (**Section 3.5**), where all LMPAs are located. There is no spatial overlap with the Proposed Action Area. The impact analysis and conclusions from this section for habitats that correspond to LMPAs would be the same. No substantial adverse impacts are expected.

MTMNM. There are few data on deepwater habitats and species within the monument, so potential impacts are uncertain. More accurate analysis would require identification of sensitive habitats and species, and threshold concentrations at which they would be impacted. Other useful data would be high-resolution information about oceanographic regimes within the Proposed Action Area to assess any unintended effects, such as sediment transport into

MTMNM. Given what is known, impacts to MTMNM are not expected from preliminary activities. Any potential impacts would be from accidental events, such as vessel grounding or oil spill.

3.6.2.2 Environmental Protection Measures

Two potential BMPs are proposed: Protection of Biological Resources and Public Disclosure of Environmental Data, which are described under Offshore Habitats (**Section 3.4 and Appendix C**)

3.6.2.3 Alternative B: No Action

Under the No Action Alternative, commercial leases would not be issued in the Proposed Action Area. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts to EFH, LMPAs, and MTMNM for the timeframe considered in this EA. Offshore environments in the Proposed Action Area are subject to a variety of ongoing impacts that overlap with the Proposed Action, including shipping, fishing, and dynamic ocean conditions. Implementing the No Action Alternative is not expected to meaningfully reduce ongoing impacts on offshore environments when compared to the Proposed Action.

3.6.3 Conclusion

This analysis considered potential impacts to protected areas such as EFH, MTMNM, and LMPAs. Based on the limited scope preliminary activities and the lack of direct spatial overlap between the Proposed Action Area and protected areas, no substantial adverse impacts to these habitats are anticipated. While some uncertainty remains regarding the potential for unintended or accidental impacts, particularly in deepwater and pelagic zones near MTMNM, the Proposed Action includes environmental protection measures, such as avoidance and adaptive management protocols that would provide further protection.

3.7 Marine Mammals and Sea Turtles

3.7.1 Affected Environment

There are numerous marine mammal species in the Pacific, including baleen whales, toothed whales, dolphins, seals, and sea lions, some of which are listed under the ESA of 1973, as amended (**Appendix B**) and/or considered depleted under the Marine Mammal Protection Act (MMPA) (Carretta et al. 2024). Hill et al. (2020) documented the Mariana Archipelago as a breeding area for humpback whales. Five ESA-listed species of sea turtles (green, hawksbill, leatherback, loggerhead, and olive ridley) (**Appendix B**) also inhabit the Pacific region. Historical baseline nesting information in general is not widely available, but 22 and 57 nesting turtles of the Central West Pacific green turtle DPS have been observed in Guam and the CNMI, respectively (Seminoff et al. 2015). Detailed species descriptions, including habitat ranges, population trends, predator-prey interactions, and species-specific threats, are described in the U.S. Pacific Marine Mammal Stock Assessments (Carretta et al. 2024), sea turtle status reviews (Conant et al. 2009; NMFS and FWS 2014; Seminoff et al. 2015; NMFS and FWS 2020a; 2020b), and BOEM's *2026 CNMI Biological and Essential Fish Habitat Assessment* (BOEM 2026a). Critical habitats (CHs) also are present in the Pacific Ocean, but none overlap with the Proposed Action Area; thus, as described below, no effects are anticipated. NOAA Fisheries has proposed CH for the Central West Pacific DPS of Green Sea Turtles, but the designation has not yet been finalized.

3.7.2 Impact Analysis

Risks from Noise-Associated Activities.

HRG Surveys: A peer-reviewed paper by Ruppel et al. (2022), "Categorizing Active Marine Acoustic Sources Based on Their Potential to Affect Marine Animals," uses physical criteria about various HRG sources, such as source level, transmission frequency, directionality, beamwidth, and pulse repetition rate, to evaluate the potential impacts to protected species. Ruppel et al. (2022) divided marine acoustic sources into four tiers that could inform regulatory evaluation. Tier 4 includes most HRG, oceanographic, and communication/tracking sources, which are considered unlikely to result in incidental take of marine mammals and are therefore termed *de minimis*. The Operational National Mitigation Protocol (ONMP) and its adoption within the 2025 Biological Opinion formalizes this tiered system for categorizing geophysical sound sources based on their relative potential to affect marine mammals (NMFS 2025b). All acoustic sources under this Proposed Action fall into this *de minimis* category. Use of these equipment types does not injure or disturb marine mammals, turtles, or fishes, and mitigations are therefore not required. Some types of MBES systems and sub-bottom profiler systems can potentially cause acoustic injury and/or disturbance to marine mammals when operated at certain source levels, transmission frequencies, directionalities, beamwidths, tow depths, and pulse repetition rates. Therefore, the precise equipment types, equipment settings and uses for planned surveys will be submitted to BOEM 30 days or more prior to use for review to confirm that the sources comply with the *de minimis* criteria described in Ruppel et al. (2022) and the ONMP. If the proposed survey equipment is determined to have a potential risk of disturbing or harming ESA-listed species, BOEM will not approve the activity or use of equipment without initiating consultation with the National Marine Fisheries Service (NMFS).

Only a subset of HRG sources (e.g., boomers, sparkers) are likely to be audible by sea turtles given the frequency range of the sounds and the hearing range of turtles, and that subset may have some effects. However, injury is highly unlikely given the short duration of signals generated by this equipment (Crocker and Fratantonio 2016). As described in Ruppel et al. (2022), the nature of the proposed sound sources makes it very unlikely that these sources would result in behavioral disturbance of sea turtles, even without mitigation. Therefore, although temporary displacement or behavioral responses may occur, these disruptions would be limited in extent and short term in duration.

Therefore, BOEM believes that the risk of auditory or behavioral impacts to any protected marine mammal or sea turtle species from HRG surveys within the Proposed Action Area would be small.

Vessel Noise: Vessel trips associated with the Proposed Action activities are described in **Table 2-8**. The vessels used for the Proposed Action would produce low-frequency, broadband, underwater sound below 1 kHz (for larger vessels) and higher-frequency sound between 1 kHz to 50 kHz (for smaller vessels), though the exact level of sound produced varies by vessel type. The general frequency range for vessel noise (10 to 1,000 Hz; Richardson et al. 1995) overlaps with the generalized hearing range for blue, fin, sei, humpback (7 Hz to 35 kHz) and sperm whales (150 Hz to 160 kHz) and therefore would be audible. Vessels without ducted propeller thrusters would produce levels of noise of 150 to 170 dB re 1 μPa-1 m at frequencies below 1,000 Hz, while the expected sound-source level for vessels with ducted propeller thrusters level is 177 dB (root mean square) at 1 m (BOEM 2015; Rudd et al. 2015). For ROVs, source levels may be as high as 160 dB (NMFS 2021). Given that the noise associated with the operation of project vessels is below the thresholds that could result in injury, no injury is expected. However, vessel noise has the potential to disturb marine mammals and elicit an alerting, avoidance, or other behavioral reaction. These reactions are anticipated to be short term, likely lasting the amount of time the vessel and the whale are in close proximity (Watkins 1981; Richardson et al. 1995; Magalhães et al. 2002), and not consequential to the animals (Holt et al. 2015).

Depending on ambient sound levels, short-term masking of vocalizations and other biologically important sounds (e.g., sounds of prey or predators) could occur. Masking by passing ships or other sound sources transiting the Proposed Action Area would be short term and intermittent, and therefore unlikely to result in any substantial costs or consequences to individual animals or populations. Areas with increased levels of ambient noise from anthropogenic noise sources, such as areas around busy shipping lanes and near harbors and ports, may cause sustained levels of masking for marine mammals, which could reduce an animal's ability to find prey, find mates, socialize, avoid predators, or navigate (NMFS 2021). Protected species and vessels in these areas are continually moving, and these masking effects are expected to be short term. Impacts to marine mammals from vessel noise are expected to be marginal.

Per NMFS (2021), ESA-listed sea turtles could be exposed to a range of vessel noises within their hearing range. Their response from vessel noise exposure include avoidance, startle responses, altered submergence patterns, masking of biologically relevant sounds, and physiological stress (Samuel et al. 2005; National Science Foundation 2011). These responses may disrupt essential activities like feeding, migration and breeding behavior. However, these responses are only evident from vessels 10 m or closer, suggesting their detection of approaching vessels relies more on visual than on acoustic cues (Hazel et al. 2007). Similarly, Lester et al. (2013) showed that the diamondback terrapin did not alter its behavior in response to recorded boat noise. Díaz et al. (2024) found that traveling green sea turtles increased vigilance with increasing vessel noise. However, those resting on the seabed did not exhibit increased vigilance, suggesting that sea turtles may also respond differently when in different behavioral states.

Current evidence indicates that sea turtles respond to vessel noise at very close ranges, making population-level impacts unlikely. Therefore, the noise from vessels is not likely to affect sea turtles at further distances, and if a sea turtle hears a vessel nearby or sees it as it approaches, they would likely avoid it or result in limited to temporary non-injurious changes in behavior. Therefore, impacts to sea turtles from vessel noise exposure are expected to be marginal.

Aircraft Noise: Other than vessels, aircraft are an alternative means of crew transport. Aircraft noise has the potential to propagate underwater at levels that could be detected by marine mammals, sea turtles, and fish. Air-to-water transmission depends on (1) the receiver depth, and (2) the altitude, aspect, and strength of the source (Richardson et al. 1995). The angle of incidence at the water surface, water depth, and bottom conditions also strongly influence the propagation and levels of underwater sound from passing aircraft; propagation is attenuated in shallow water, especially when the bottom is reflective (Richardson et al. 1995).

The effects of underwater transmission of airborne noise from helicopters or fixed-wing aircraft are minimal and unlikely to affect marine species. van Polanen Petel et al. (2006) determined that in-water transmission of sound was greatest when aircraft landings and takeoffs took place on surface ice. Underwater transmission was otherwise inaudible or barely audible. Above the water's surface, airborne sound was more substantial and could be heard from aircraft traveling at altitudes up to 3,000 ft.

Sound produced from aircraft may impact protected species. However, because of the relatively low numbers of aerial surveys expected and the temporary duration of the aerial survey activity, BOEM expects sound effects from aerial surveys, if any, would be temporary and minimal.

Geotechnical Survey Noise: Geotechnical surveys (vibracores, piston cores, gravity cores) related to the Proposed Action are typically numerous, but very brief, sampling activities that introduce relatively low levels of sound into the environment. General vessel noise is produced from vessel engines and Dynamic Positioning (DP) systems. DP systems produce continuous noise, but unlike transiting vessels, this source is usually stationary. DP systems use propellers and thrusters for station-keeping (e.g., holding station over a specific seafloor location), docking, and other precise maneuvering during operations. Recent analyses of the potential impacts to protected species exposed to noise generated during geotechnical survey activities determined that effects to protected species from exposure to this noise source are extremely unlikely to occur (NMFS 2021). Hence, we expect impacts associated with geotechnical survey noise as part of the Proposed Action to be discountable.

More detailed information on noise impacts to protected species can be found in BOEM's *2026 CNMI Biological and Essential Fish Habitat Assessment* (BOEM 2026a).

Vessel Strike Risks from Project-related Vessel Traffic. Vessel strikes pose a threat to the populations of green, hawksbill, loggerhead, olive ridley, and leatherback sea turtles that are known to be around the Proposed Action Area (U.S. Navy 2026). Of leatherback strandings documented in central California between 1981 and 2016, 11 were determined to be the result of vessel strikes (7.3% of total) (NMFS and FWS 2020a). However, information on leatherback vessel strikes for other locations is not available (NMFS and FWS 2020a). Green turtles have been documented as being hit by boats in Guam (Seminoff et al. 2015). For example, in May 2012, one stranded green turtle with evidence of being hit by a vessel washed ashore east of Kil Wharf on Naval Base Guam. Another green turtle that stranded dead at Uniform Wharf at Naval Base Guam in September 2011 had a gash on the carapace suggesting a vessel strike (Seminoff et al. 2015). Additionally, Summers et al. (2018) documented stranding of sea turtles between 2005 through 2016 on Saipan and Tinian, the CNMI; of the 89 strandings, two green turtles were documented to be involved in boat strike injuries. These green sea turtle incidents may have occurred from high-speed vessel traffic because they are known to flee less frequently and at shorter distances from vessels approaching at higher speeds than at lower speeds (Hazel et al. 2007). Although vessel strikes are a well-documented risk to large whales in the Pacific (Rockwood et al. 2017), there is a lack of vessel strike data for the CNMI (Carretta et al. 2024).

The number of vessel trips for surveys within the Proposed Action Area is a conservative estimate (**Tables 2-7 and 2-8**), meaning that BOEM included a higher number of trips than is likely. BMPs for Vessel Strike Avoidance and Protected Species Reporting (**Appendix C**) are expected to minimize the risk of vessel strikes. Additionally, wherever available, lessees would be required to ensure all vessel operators check for daily information regarding protected species sighting locations. These media could include, but are not limited to, Channel 16 broadcasts, whalesafe.com, and Whale Alert.

BOEM expects that impacts on protected species from vessel interactions would be minimal because of vessel strike avoidance BMPs as provided in the *2026 CNMI Biological and Essential Fish Habitat Assessment* (BOEM 2026a).

Entanglement or Entrapment Risks. Observed and confirmed entanglements underestimate the true number of entangled whales, as many entangled whales go undetected (e.g., not observed while entangled and die at sea) (NMFS 2024b). However, there are reports of large whales (including humpback, right, and fin whales) interacting with commercial or recreational fishing gear (e.g., buoys with identifiable marks, traps, nets, and monofilament line) and anchor moorings of yachts and other vessels; towing small yachts from their moorings; or becoming entangled in anchor chains, sometimes with lethal consequences (Blue Water Sailing 2012; Love 2013; Saez and DeAngelis 2021; NMFS 2024b). Additionally, a humpback mother (with a calf) was reported entangled in a longline in 2007 in the Cook Islands (NMFS 2009). Sea turtles have been documented entangled in a variety of man-made items (Duncan et al. 2017; Dodge et al. 2022). Since the Sea Turtle Disentanglement Network was formed in 2002 and through 2014, there have been 275 entanglements in vertical lines (NMFS 2015). Turtles are usually entangled around the neck and/or front flippers. Sightings of leatherback sea turtles in the eastern North Pacific are most frequently encountered off the coast of central California (Benson et al. 2007). This species faces substantial threats from bycatch in fisheries (entanglement and hooking) (Benson et al. 2007; Dodge et al. 2022).

Ocean buoys with surface expression and anchoring could be used as part of the Proposed Action. A line connects the buoy to the anchor and is made of materials such as chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats (used to keep the mooring line taut to semi-taut, reduce slack, and eliminate looping). The Proposed Action also includes the use of HRG survey equipment, which includes lines that pose an entanglement risk such as deep-tow lines. BOEM will require lessees to follow established protocol for minimizing potential entanglement of marine mammals and sea turtles (**Appendix C**). BOEM will review all survey plans to ensure that reasonable low risk designs are used. Potential impacts from entanglement related to buoys and lines associated with HRG survey equipment are thus expected to be discountable.

Lost or derelict fishing gear could become entangled in the meteorological buoy lines and present an entanglement risk to protected species. At least two ocean buoys with surface float per lease area could be deployed as part of the Proposed Action. From 1982 to 2017, direct entanglements in fishing gear were most attributed to unidentifiable gear, netting, and pot/traps (Saez and DeAngelis 2021). Changes in gill-net fishing regulations helped address an increase in the 1980s, when primarily gray whales entangled with gillnets (Saez and DeAngelis 2021). With BMPs in place (**Appendix C**), effects from secondary entanglement related to buoy deployment and operations are expected to be discountable.

Moon pools may be used in the Proposed Action Area to deploy or retrieve equipment (e.g., ROVs, AUVs). Moon pool usage presents potential for marine mammals and sea turtles to become entrapped. However, there is no known record of entrapment of protected species in the moon pools in the Pacific region. Due to the extreme unlikelihood of entrapment and reduction of impact with the use of BMPs (**Appendix C**), impacts from moon pool usage is expected to be discountable.

Impacts of Accidental Fuel Spills. Marine mammals and sea turtles are susceptible to oiling impacts because (1) they breathe at the surface of the water, and, if oil is present, they can inhale oil and its vapors into their lungs; (2) they can also be exposed to oil and its components by ingesting oiled prey; (3) breeding can be disturbed if sea turtle nests or breeding ground(s) for marine mammals are oiled; and (4) sufficient exposure to oil can lead to mortality events (Frasier et al. 2020). Although spills are not anticipated and are not part of the Proposed Action, if an accidental fuel spill occurred, it would be an acute event in a small area. The potential of an accidental spill is low, especially with the USCG spill prevention requirements in place. Additionally, since diesel fuel is lighter than water and may float on the water's surface or be dispersed into the water column by waves, diesel would be expected to dissipate very rapidly, evaporate, and biodegrade within a few days (MMS 2007; Tetra Tech Inc. 2015). As such, impacts to protect species from accidental fuel spill are anticipated to be minimal.

Trash and Debris. Plastic is found throughout the world's oceans and could potentially pose a risk to marine mammals and sea turtles through entanglement or ingestion. Preliminary activities may generate trash comprising paper, plastic, wood, glass, and metal. IMO MARPOL Annex V is the globally recognized regulations for discharge from vessels at sea (International Maritime Organization 2026). Vessels follow MARPOL Annex V regulations for implementing trash and debris reduction and improved handling practices to reduce the amount of offshore trash that could potentially be lost into the marine environment. In addition, all authorizations for shipboard surveys would include guidance for marine debris awareness. The guidance would be similar to Bureau of Safety and Environmental Enforcement's (BSEE's) Notice to Lessees (NTL) No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any superseding NTL. Therefore, the amount of trash and debris dumped offshore would be expected to be minimal, as only accidental loss is anticipated. Moreover, with the use of BMPs (**Appendix C**), risks to marine mammals and sea turtles would decrease. Addition of trash and debris from the Proposed Action is extremely unlikely, and, with BMPs and BSEE's guidance, effects to marine mammals and sea turtles are expected to be discountable.

Impacts on CH. There are several CHs (NOAA 2026) of ESA-listed species (and one delisted ESA species) within the Pacific region: Central America distinct population segment (DPS), Mexico DPS and Western DPS of humpback whales (86 FR 21082), eastern and western U.S. stocks of Steller sea lions (50 FR 226.202, 50 FR 30715), North Pacific right whale (74 FR 190000; 2008), killer whale (86 FR 14668), False killer whale (83 FR 35062), Hawaiian monk seals (50 CFR 226.201), and leatherback sea turtles (77 FR 4169). Although these CHs are within the Pacific, they do not overlap with the Proposed Action Area; thus, no effects to these CHs are expected from the Proposed Action.

NMFS and the U.S. Fish and Wildlife Service (USFWS) are proposing to designate CH for five DPS of green turtles (88 FR 46572, 7/19/2023), and one of the proposed CH areas for the Central West Pacific DPS of green sea turtles is near the Proposed Action Area. Although this CH has been proposed, it has not been finalized. Thus, no analysis will be conducted for this proposed CH.

3.7.2.1 Alternative A: Proposed Action

The potential stressors and impacts associated with the Proposed Action to marine mammals and sea turtles include (1) noise from HRG and geotechnical surveys, aircraft, and vessels; (2) potential collisions with project-related vessels; (3) potential entanglement in mooring systems associated with the installation of buoys and with the deep-tow survey systems; (4) accidental fuel spills; and 5) trash and debris.

3.7.2.2 Environmental Protection Measures

BMPs, which lessees would be required to comply with as part of the stipulations if leases are issued, protect wildlife and the environment during the proposed activities (**Appendix C**). These BMPs have been developed through years of conventional energy operations and consultations with NMFS and include vessel strike avoidance, visual monitoring, and reporting BMPs. As a result of these BMPs and the nature of the Proposed Action, the impacts on protected marine mammal and sea turtle species from preliminary activities (e.g., noise from vessels, aircraft, and HRG and geotechnical surveys; collisions with project-related vessels; entanglement in survey equipment, moon pools, and buoy moorings; and accidental fuel spills) are anticipated to be slight.

3.7.2.3 Alternative B: No Action

Under this alternative, commercial leases would not be issued offshore the CNMI. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine mammals and sea turtles over the timeframe considered. Impacts from urban development and increasing air, vessel, and onshore traffic would have commensurate negative impacts. The ongoing contributors to impacts stem from habitat disturbance and destruction, as well as commercial and recreational fishing activities that could lead to vessel collision and entanglement. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to marine mammals and sea turtles from existing actions.

3.7.3 Conclusion

Although several CHs are within the Pacific region, none of them overlap with the Proposed Action Area, and no effects to the CHs are expected from the Proposed Action. The Proposed Action includes environmental protection measures as stated above that would provide further protection.

3.8 Marine and Coastal Birds

3.8.1 Affected Environment

The marine bird population in the region encompassing the Northern Mariana Islands and its surrounding OCS waters is composed of over 50 species (**Appendix B**) (Yano et al. 2022; eBird 2026; U.S. Navy 2026). Of the different types of birds that are expected to be in this area, marine birds are expected to be the most sensitive to the potential impacts of the Proposed Action. Marine birds in this region include species of jaegers, terns, tropicbirds, albatrosses, storm-petrels, gadfly petrels, shearwaters, frigatebirds, and boobies. While some of these species breed in the area, others may spend their nonbreeding period there or may simply pass through during migration. This analysis considers the area covered by the Area ID recommendation.

There is a variety of marine birds that occur seasonally on the Northern Mariana Islands. Species known to breed on the islands include Brown Noddy (*Anous stolidus*), Black Noddy (*Anous minutus*), Blue-billed White Tern (*Gygis candida*), Sooty Tern (*Onychoprion fuscatus*), White-tailed Tropicbird (*Phaethon lepturus*), Red-tailed Tropicbird (*Phaethon rubricauda*), Wedge-tailed Shearwater (*Ardenna pacifica*), Great Frigatebird (*Fregata minor*), Masked booby (*Sula dactylatra*), Brown Booby (*Sula leucogaster*), and Red-footed Booby (*Sula sula*) (U.S. Navy 2015; Raine et al. 2022). A list of marine birds that have occurred in the area is included in **Appendix B**.

These species are expected to forage near the islands, but some species may move extensive distances from the islands to forage and are likely to overlap with waters included in the Proposed Action Area. There is little information available on the at-sea spatial patterns of birds in this region, but the species breeding on the islands near the Proposed Action Area could provide some context of the species that are likely utilizing this area for foraging or otherwise passing through the area. As potential projects may move forward in this region, it would be valuable to collect baseline data on the at-sea distribution of birds in this region.

In addition to the local breeding species, marine birds from islands much farther away may be utilizing the Proposed Action Area as well. Many of these are highly pelagic species that generally occupy deeper waters farther from shore and predominantly comprise species that are dispersing through the South Pacific from distant breeding areas that can be hundreds or thousands of miles away. These species spend much of their time on the water surface or diving for food. In the Proposed Action Area, highly pelagic species are expected to include a variety of Procellariiformes, including albatrosses, storm-petrels, gadfly petrels, and shearwaters. These presence of the species is expected to be seasonal and primarily when they are dispersing away from distant breeding locations. However, local breeding species such as the Wedge-tailed Shearwater may be more regular in the Proposed Action Area. Two marine birds that have the potential to occur in the Proposed Action Area are listed under the ESA: the endangered Short-tailed Albatross (*Phoebastria albatrus*) and threatened Newell's Shearwater (*Puffinus newelli*). However, the Mariana Archipelago is considered peripheral or extralimital to the primary foraging ranges of these species, and their occurrence in the region is very rare.

3.8.2 Impact Analysis

3.8.2.1 Alternative A: Proposed Action

This section discusses the potential impacts of routine events associated with the Proposed Action on marine birds. Potential sources of impacts for marine birds include (1) vessel attraction, (2) larger ocean buoys, (3) trash and debris, and (4) accidental fuel spills. Since all Proposed Action activities are performed using vessels, all activities have the potential to impact marine birds. Noise-related potential impacts for marine birds are expected to be minimal and are listed in **Appendix D**.

Vessel Attraction. A single vessel is typically involved in a site assessment-related survey. This level of vessel traffic is not expected to be a notable increase when compared to existing vessel traffic in nearshore or offshore waters. In addition, vessels performing surveys are relatively slow moving (approximately 4–6 kn), which allows for marine birds to easily move out of the way of survey vessels.

The potential for bird strikes on a vessel is not expected to be notable to individual birds or their populations. However, a number of marine bird species—including members of the jaegers, terns, gulls, tropicbirds, albatrosses, storm-petrels, gadfly petrels, shearwaters, frigatebirds, and boobies—are generally attracted to offshore rigs and vessels. The attraction of some of these bird species is due to light attraction at night (Montevecchi et al. 1999; Wiese et al. 2001b; Black 2005; Montevecchi 2006).

Artificial lighting from Proposed Action activities may affect marine birds. Any lights used to aid marine navigation by the lessee during lease activities must meet USCG requirements in 33 CFR Part 66 for PATON. The holding or trapping effect of bright, artificial lighting can deplete the energy reserves of migrating birds, resulting in diminished survival and reproduction. Marine birds have been observed to continuously circle offshore oil and gas platforms until exhausted, whereupon they fall to the ocean or land on the platforms (Montevecchi 2006; Center for Biological Diversity 2007). Similarly, light entrapment may negatively affect breeding marine birds by increasing their time away from their nests, leaving the nests vulnerable to predation for longer periods of time and increasing parent-chick separation.

Artificial lighting may attract bird species that are susceptible to artificial light attraction during night operations. In some cases, a bird may strike a work vessel, leading to injury or death. Federally endangered or threatened birds are not expected to occur in the Proposed Action Area, and it is highly unlikely that any would be affected by the Proposed Action activities. However, several special-status species—including albatrosses, gadfly petrels, and shearwaters identified in **Table B-1** may occur in the vicinity of the Proposed Action and could be attracted by vessel lighting. Fledgling albatrosses, gadfly petrels, and shearwaters are more attracted to artificial lights than adults and are particularly vulnerable when they are dispersing away from their natal areas.

Some birds engage in ship following as a foraging strategy, especially with commercial or recreational fishing vessels. In addition, in an open environment like the ocean, objects are easy to detect, and birds locate vessels easily from long distances and approach to investigate. Bird mortality has been documented as a result of light-induced attraction and subsequent collision with vessels. Birds exhibiting this behavior are typically petrels, with bird strikes typically occurring at night and occasionally resulting in mortality (Black 2005). Vessels also are required to have down-shielded lighting to minimize the potential attraction of birds. However, even if petrels or other birds were attracted to the survey vessels or dove near a survey vessel, there is a low potential for either vessel collision or entanglement since the vessels are moving relatively slowly (4–6 kn) and the gear is towed from 1 to 3.5 m below the surface. There is no empirical evidence indicating that these types of marine birds could become entangled in HRG survey gear in spite of the potential for attraction to this gear. Given the low potential for collision or gear entanglement, the impacts are not expected to result in mortality or serious injury to individual birds, resulting in the determination that there would be minimal impact to these types of seabirds from vessel attraction.

Metocean Buoys. Potential impacts to marine birds from metocean buoys may be caused by noise disturbance, lighting, collisions, loss of habitat, and decommissioning. Noise and other disturbance generated by the installation or decommissioning of buoys are expected to be short term and localized, resulting in minimal impacts on birds. Because buoy height is anticipated to be up to approximately 12 m above the ocean surface, collisions with buoys are unlikely. Although seabirds (including terns, frigatebirds, and boobies) may roost on buoys, this behavior does not pose a threat to these birds. Thus, overall impacts to birds from buoys is expected to be minimal. Although it is possible that predatory birds could use a tower as a perch to opportunistically prey on seabirds, this predation would be expected to have a minimal impact on birds overall.

Due to their excellent vision, birds flying during daytime hours are unlikely to collide with metocean buoys. However, flying at night or under other conditions that impair their vision, birds could potentially collide with buoys, leading to injury or death. Managing the type of lighting present on the buoys could minimize collisions.[1] Because the metocean buoys would be more than 46 mi from shore, the chances of birds colliding with the buoys would be rare, and these buoys are not expected to impact marine bird populations.

Trash and Debris. Plastic is found in the surface waters of all the world's oceans and poses a potential hazard to marine birds through entanglement or ingestion (Laist 1987). The ingestion of plastic by marine birds can cause obstruction of the gastrointestinal tract and potentially result in mortality. Plastic ingestion also could cause blockage of the intestines and ulceration of the stomach. In addition, plastic accumulation in seabirds has also been shown to be correlated with the body burden of polychlorinated biphenyls, which can cause lowered steroid hormone levels and result in delayed ovulation and other reproductive problems (Pierce et al. 2004).

Preliminary activities may generate trash comprising paper, plastic, wood, glass, and metal. Most trash is associated with galley and offshore food service operations. IMO MARPOL Annex V is the globally recognized regulations for discharge from vessels at sea, including the types of trash listed above (International Maritime Organization 2026). Vessels operating offshore follow

[1] Lighting on buoys are strictly for vessel navigation. This falls within USCG judication. Private Aids to navigation will be lit according to USCG PATON requirement.

MARPOL Annex Regulations to reduce the amount of offshore trash that could potentially be lost into the marine environment. In addition, all authorizations for shipboard surveys would include guidance for marine debris awareness like BSEE's NTL No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination") or any superseding NTL. Therefore, the amount of trash and debris dumped offshore would be expected to be minimal, as only accidental loss of trash and debris is anticipated, some of which could float on the water surface. Therefore, impacts from trash and debris on marine birds, as generated by preliminary activities, are anticipated to be minimal.

Impacts of Accidental Fuel Spills. An accidental event could result in release of fuel or diesel by a survey vessel. Spills occurring at the ocean surface would disperse and weather. Volatile components of the fuel would evaporate. Fuel and diesel used for operation of survey vessels is light and would float on the water surface. There is the potential for a small proportion of the heavier fuel components to adhere to PM in the upper portion of the water column and sink. This accidental spill could occur either offshore or nearshore, and the marine bird species affected, and the type of effect, would differ depending on the location of the spill (Wiese et al. 2001a; Castege et al. 2007).

If the accident occurred in nearshore waters close to any of the islands during transit, coastal seabirds near their breeding colonies could be impacted. Impacts could include physical oiling of individuals. The effects of oil spills on marine birds include the potential for tissue and organ damage from oil ingested during feeding or inhaled during grooming, and stress that could result in interference with food detection, predator avoidance, homing of migratory species, and respiration issues. Other effects could include oiling of nesting and foraging habitats and displacement to secondary locations. An accidental event could result in release of fuel or diesel by a survey vessel, but such an event has a remote probability of occurring. Therefore, an accidental fuel spill within nearshore waters would not be expected to result in notable impacts to these types of marine birds. Impacts on marine bird species would depend on timing and location.

If an accident occurred in offshore waters, fuel and diesel would float on the water surface. There is potential for seabirds to be affected by spilled diesel fuel. Impacts would include oiling of plumage and ingestion. Indirect impacts could include oiling of foraging habitats and displacement to secondary locations. The potential of a vessel collision occurring is quite low, with the potential for a resultant spill even lower. Dispersal, weathering, and evaporation would reduce the amount of fuel remaining on the sea surface. The level of impacts on marine birds from a spill incident involving survey vessels within offshore waters would depend on the timing and duration of the incident.

3.8.2.2 Environmental Protection Measures

Additionally, the Proposed Action includes BMPs for birds to reduce the potential for the Proposed Action to adversely impact marine birds. During leasing-related vessel activities, PSOs or trained crew members would document the presence and behavior of seabirds and avoid or minimize potential disturbance to protected avian species.

3.8.2.3 Alternative B: No Action

Under this alternative, commercial leases would not be issued offshore of the Northern Mariana Islands. However, BOEM expects ongoing activities and planned actions to have continuing regional impacts on marine birds over the timeframe considered in this EA. Impacts from urban development and increasing air, vessel, and onshore traffic would continue to have commensurate negative impacts on marine birds. Implementation of the No Action Alternative would not meaningfully reduce ongoing impacts to marine birds from existing and potential future actions. The largest ongoing contributions to impacts on marine birds stem from habitat destruction, disturbance of marine and nearshore environments, and commercial and recreational fishing activities, primarily through bycatch.

3.8.3 Conclusion

The Proposed Action could pose minimal threats to birds. Loss of water column habitat, benthic habitat, and associated prey abundance are expected to have minimal impacts. Impacts on birds in nearshore waters from vessel traffic are expected to be minimal due to the amount of existing vessel traffic. Impacts on birds from preliminary activities, including attraction to vessels, are expected to be minimal. Impacts on birds from trash or debris releases and from accidental fuel spills are expected to be minimal. Potential noise impacts from the Proposed Action could have localized, short-term impacts on birds foraging near or migrating through the lease areas, and noise impacts are expected to be minimal. The risk of collision with metocean buoys is expected to be minimal because of buoy height and their distance from shore.

All these conclusions contain varying degrees of uncertainty due to the lack of data on the at-sea distribution and abundance of marine birds in the Proposed Action Area. This uncertainty can be reduced by filling data gaps through marine bird surveys in the Proposed Action Area.

3.9 Threatened and Endangered Species

3.9.1 Affected Environment

Blue whale *(Balaenoptera musculus).* The blue whale was listed as endangered in 1970 (35 FR 8491) and has no designated CH. Blue whales are found in all oceans except the Arctic Ocean. Primary threats to blue whales are vessel strikes and entanglements in fishing gear.

Fin Whale *(Balaenoptera physalus).* The fin whale was listed as endangered in 1970 (35 FR 8491) and has no designated CH. They are found throughout the ocean. The main threat to fin whales is vessel strikes.

Sei Whale *(Balaenoptera borealis).* The sei whale was listed as endangered in 1970 (35 FR 12222) and has no designated CH. They have a wide distribution and are found in subtropical, temperate, and subpolar waters around the world. Vessel strikes and entanglement pose the biggest threats to sei whales.

Sperm Whale *(Physeter macrocephalus).* The sperm whale was listed as endangered in 1970 (35 FR 18319) and has no designated CH. They have one of the widest global distribution and are found in all deep oceans. Threats to sperm whales include vessel strikes, entanglement in fishing gear, ocean noise, marine debris, changing environmental conditions, oil spill and contaminants.

Humpback Whale (*Megaptera novaeangliae).* The humpback whale was listed as endangered in 2016 (81 FR 62260). The Western North Pacific DPS could occur in and around the Proposed Action Area. Western North Pacific Stock of humpbacks, listed as endangered under ESA, are known to be in the waters off Marianas Archipelago and Ogasawara (Young et al. 2023). CH was designated in 2021 (86 FR 21082), but it is located in Alaska waters; thus, the designated CH does not overlap with the Proposed Action Area. Threats to humpbacks include vessel strikes, entanglement in fishing gear, and vessel-based harassment.

Other Listed Marine Mammal Species*.* Other marine mammal species in the Pacific region listed as endangered include gray whales, North Pacific right whales, killer whales, false killer whales, Steller sea lions, and Hawaiian monk seals. Guadalupe fur seals are listed as threatened. However, the likelihood of these endangered and threatened species being within the Proposed Action Area is low, and they are unlikely to be affected by the Proposed Action. Therefore, they are excluded from further analysis.

Green Turtle *(Chelonia mydas).* Green turtles nest in over 80 countries and were listed as threatened in 1978 (43 FR 32800) throughout their Pacific range. The Central South Pacific DPS and the Central West Pacific DPS of green turtles were classified as endangered in 2016 (81 FR 20057). Bycatch in commercial and recreational fishing gear, loss of nesting habitat from coastal development, changing environmental conditions, and vessel strikes are their biggest threats. The designated CH for green turtles does not overlap with the Proposed Action Area.

Hawksbill Turtle *(Eretmochelys imbricata).* Hawksbill turtles were listed as endangered in 1970 (35 FR 8491), and they inhabit the tropical and subtropical waters of all major oceans. CH was designated in 1998 (63 FR 46693) but is not in the Pacific. Threats include bycatch in fishing gear, harvesting eggs, loss and degradation of nesting and foraging habitat, predation of eggs and hatchings, vessel strikes, and ocean pollution.

Leatherback Turtle *(Dermochelys coriacea).* Leatherback turtles were listed as endangered in 1970 (35 FR 8491). CH was designated in 2012 (77 FR 4169) but does not overlap with the Proposed Action Area. The leatherbacks are observed in the Atlantic, Pacific, and Indian waters and nest primarily in tropical latitudes around the world. Threats to leatherbacks include bycatch in fishing gear, harvesting of eggs, loss and degradation of nesting habitat, vessel strikes, ocean pollution, and changing environmental conditions.

Loggerhead Turtle (South Pacific DPS) *(Caretta caretta).* Loggerhead turtles were listed as threatened in 1978 (43 FR 32800). The South Pacific DPS was listed as endangered in 2011 (76 FR 58868) and has no designated CH. Loggerhead turtles are found worldwide primarily in subtropical and temperate regions. Threats include bycatch in fishing gear, harvesting of eggs, loss and degradation of nesting habitat, vessel strikes, ocean pollution, and changing environmental conditions.

Olive Ridley Turtle *(Lepidochelys olivacea)*. Olive ridley turtles were listed as threatened in 1978 (43 FR 32800) and have no designated CH. They are mainly a pelagic (open-ocean) turtle that have been observed by trans-Pacific ships over 2,400 mi from shore but are also known to inhabit nearshore areas. Threats include bycatch in fishing gear, harvesting of eggs, loss and degradation of nesting habitat, vessel strikes, ocean pollution, and changing environmental conditions.

Oceanic Whitetip Shark *(Carcharhinus longimanus)*. The oceanic whitetip shark was listed as globally threatened on January 30, 2018 (83 FR 4153). On March 5, 2020, NMFS determined designation of CH was not prudent at this time (85 FR 12898). Oceanic whitetip sharks are widely distributed in tropical and subtropical oceanic waters, primarily between 10°N and 10°S, with abundance decreasing farther from the equator and continental shelves (Bonfil et al. 2008). They inhabit the epipelagic zone above 20°C but may dive to depths exceeding 1,000 m (Howey-Jordan et al. 2013). Some individuals show regional site fidelity (Schultz 2025). As apex predators, oceanic whitetip sharks feed mainly on bony fishes and cephalopods but also consume invertebrates, stingrays, seabirds, sea turtles, marine mammal carrion, and garbage (Compagno 1984). Populations have declined due to commercial fishing (NMFS 2024a).

Giant Manta Ray *(Mobula birostris).* The giant manta ray was listed as globally threatened on January 22, 2018 (83 FR 2916). On December 5, 2019, NMFS determined designation of CH was not prudent at this time (84 FR 66652). Found worldwide in tropical, subtropical, and temperate waters, giant manta rays can exhibit diel patterns in habitat use, moving inshore during the day to clean and socialize in shallow waters, and then moving offshore at night to feed to depths of 1,000 m or so (NOAA Fisheries 2024). Giant manta rays are obligate ram-ventilators (needing to swim to breathe), and movements track the distribution of their planktonic prey (such as euphausiids, copepods, mysids, decapod larvae, and shrimp) and occasionally small fish (NOAA Fisheries 2024). After deep dives, these large rays may display basking behavior to thermoregulate (NOAA Fisheries 2024). The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch (NOAA Fisheries 2024).

Scalloped Hammerhead Shark *(Sphyrna lewini).* Indo-West Pacific DPS. The scalloped hammerhead shark, Indo-West Pacific DPS, was listed as threatened on July 3, 2014 (79 FR 38213). On November 17, 2015, NMFS determined that designating CH was not prudent (80 FR 71774). These sharks are highly mobile and partially migratory, occurring in warm temperate and tropical seas worldwide. They inhabit continental and insular shelves, and adjacent deep waters; they also often enter bays and estuaries (Compagno 1984). Scalloped hammerhead sharks frequently form aggregations, particularly around seamounts (Miller et al. 2014) and occupy depths from the surface to over 800 m (Hutchinson et al. 2023). Their diet includes a wide range of fishes and invertebrates, especially cephalopods. This DPS is threatened by fishing pressure and shark removal programs (Miller et al. 2014; NMFS 2020).

Invertebrate Species. One coral species, *Acropora globiceps*, is listed as threatened, and five clam species (*Hippopus hippopus, Tridacna squamosa, T. derasa, T. gigas, T. maxima*) are proposed for listing (NOAA Fisheries 2025). These species limit their distribution to nearshore coral reefs, and they are unlikely to be affected by the Proposed Action. Therefore, they are excluded from further analysis. See **Section 3.5** (Nearshore Habitats) for more details.

Marine Birds. No listed species of marine birds likely overlap with any of the proposed activities; thus, no further analyses were conducted.

3.9.2 Impact Analysis

3.9.2.1 Alternative A: Proposed Action

Fishes and Invertebrates. Potential stressors analyzed here include FAD effects, noise, vessel strike, and entanglement. Other stressors are discussed in **Section 3.4**. Preliminary activities under the Proposed Action may affect listed species as they use epipelagic to mesopelagic zones and exhibit diel vertical migrations or foraging behaviors that may overlap with proposed activities. Surface buoys may act as FADs and alter the behavior of sharks. Increased local densities could elevate predation risk, disrupt trophic interactions, or attract fishing effort. However, the limited number and temporary nature of buoys reduce the likelihood of effects. Acoustic sources are Tier 4 *de minimis* levels and therefore are unlikely to cause injury, but behavioral responses may occur. Exposure is expected to be brief and spatially limited. Risk from vessel strike is low due to the remote location, which can act as a deterrent to vessels due to time and fuel costs, slow vessel speeds, and low density of large-bodied species. However, surface-oriented species (such as oceanic whitetip sharks and manta rays) may be vulnerable during basking or feeding. Mooring lines, expendable gear, and marine debris pose minimal entanglement risk due to their limited number, taut configuration, and deep deployment. No entanglement-prone gear (e.g., nets, longlines) would be used. With adherence to BMPs (**Section 3.4** [Offshore Habitats] and **Section 3.10** [Commercial and Non-commercial Fisheries]), the Proposed Action is not expected to result in adverse effects to listed fishes and invertebrates. Introduction of trash and debris, and other man-made substances foreign to the terrestrial or marine environment from the Proposed Action is extremely unlikely and, with BMPs and BSEE’s guidance, are expected to be discountable.

Marine Mammals and Sea Turtles. Chapter 4 and **Section 3.7** provide additional marine mammal and sea turtle information.

3.9.2.2 Alternative B: No Action

Under the No Action Alternative, no commercial leases would be issued. However, ongoing and planned activities, such as shipping, fishing, and natural ocean dynamics, would continue to affect offshore environments. These impacts overlap with those of the Proposed Action, so the No Action Alternative would not substantially reduce overall environmental impacts in the region.

3.9.3 Conclusion

With requirement of lessees to comply with BMPs through BOEM’s authority under 30 CFR 582.20–582.29 (specifically 582.22, 23, and 24, and 43 U.S.C. § 1334(a)(1)), the preliminary activities are not expected to cause adverse impacts to listed marine mammals, sea turtles, fishes, or invertebrates.

3.10 Commercial and Non-Commercial Fisheries

3.10.1 Affected Environment

Both the CNMI and Guam are categorized as “fishing communities” by the Western Pacific Regional Fishery Management Council. This designation is based on the portion of the population that is dependent upon fishing for subsistence; economic importance of fishery resources to the islands; and geographic, demographic, and cultural attributes of the communities (Western Pacific Regional Fishery Management Council 2009a; 2009b; 2024). Archaeological and historical records show a long tradition of pelagic and reef fishing, ranging from trolling mahi-mahi, marlins, and tunas to shore-based netting and reef gleaning, that persists today in modified forms (Amesbury 2013). Thus, fishing is deeply embedded in the social fabric and food systems of the Chamorro and other resident communities of the CNMI and Guam, where catch is frequently shared through customary exchange networks alongside cash sales, blurring boundaries between “commercial,” “subsistence,” and “recreational” activities (Hospital and Beavers 2012; 2014). Summaries and studies related to the complexity and richness of the CNMI and Guam fisheries are incorporated here by reference: Hensley and Sherwood (1993); Allen and Bartram (2008); Western Pacific Regional Fishery Management Council (2009a; 2009b); Allen and Amesbury (2012); Hospital and Beavers (2012); Kotowicz and Richmond (2013); Severance et al. (2013); Hospital and Beavers (2014); Ayers (2018); Kleiber et al. (2018); Chan (2024); Dombrow et al. (2025).

Fisheries in the CNMI are managed under both federal and territorial authority. The WPRFMC regulates the U.S. EEZ through Fishery Ecosystem Plans for pelagic, bottomfish, coral reef, crustacean, and precious coral fisheries (Western Pacific Regional Fishery Management Council 2005; 2009a). For territorially managed fisheries, the CNMI Division of Fish and Wildlife and the Guam Division of Aquatic and Wildlife Resources regulate nearshore and reef fisheries. The North Mariana Longline Fishing Prohibited Area prohibits commercial fishing within a buffer zone extending 30 nm seaward from the shoreline of each island within the CNMI, and purse seine vessels are excluded from operating within the U.S. EEZ. Illegal, unreported, and unregulated (IUU) fishing is a concern that undermines sustainable fisheries management and threatens the livelihoods of those who rely on legal fishing practices (The Maritime Executive 2020).

Pelagic fisheries in the Mariana Archipelago (Guam and the CNMI) are dominated by small-vessel operations, typically using boats less than 25 ft in length, that target highly migratory species such as skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), wahoo (*Acanthocybium solandri*), and mahi-mahi (*Coryphaena hippurus*) (Western Pacific Regional Fishery Management Council 2009a; 2009b). These fisheries primarily employ trolling gear and frequently operate around anchored FADs, which enhance catch rates and reduce fuel costs (Bell et al. 2015). Fishing trips range from nearshore waters out to offshore banks and seamounts, with most vessels remaining within approximately 50 mi of shore.

Deep-slope **bottomfish fisheries** are an important component of local food systems and small-scale commerce. These hook-and-line fisheries target species such as *Etelis carbunculus*, *Etelis coruscans*, and *Pristipomoides filamentosus* snappers at depths of 50–400 m along slopes and offshore banks.

Nearshore **reef fisheries**, largely non-commercial, supply protein for household consumption and cultural exchange. These fisheries employ hook-and-line, spears, nets, and gleaning to harvest surgeonfish, parrotfish, rabbitfish, goatfish, and groupers.

In the CNMI and especially in Guam, there is a **recreational and for-hire** charter fleet, with small-boat, one- to two-day trips targeting pelagic and bottomfish species for purposes ranging from full-time commercial fishing to part-time recreational, cultural, and tourism-related activities (Chan 2024).

Crustacean fisheries are small-scale, nearshore, and primarily supply local consumption, with spiny and slipper lobsters as the main targets and little to no commercial export. Most harvesting occurs in shallow waters within 3 nmi, using hand-picking or diving. Currently, there are no active commercial fisheries for deepwater shrimp or Kona crab, while slipper lobster harvest is marginal and subject to localized regulations. There is to date no precious coral fishery in the Mariana Archipelago.

Aquaculture is not a dominant activity in the CNMI, but five small operations produce tilapia and shrimp for local consumption (Pacific Community 2026b). In Guam, tilapia ("cherry snapper") and marine prawns are the main products (Pacific Community 2026a). No aquaculture activities occur offshore.

3.10.2 Impact Analysis

3.10.2.1 Alternative A: Proposed Action

Commercial and non-commercial fishing activities (including port-based, transiting, and harvesting operations) that overlap with Proposed Action activities may experience space-use conflicts that could cause a variety of adverse outcomes, such as precluding fishers from fishing grounds (along with a possible reduction in landings), incurring more travel time offshore to avoid vessels, triggering entanglement events or gear loss with buoys or sampling equipment, creating congestion among fishers outside of the Proposed Action Area if fishers are displaced, and increasing competition or congestion for port space.

Fisheries benefits that could arise from coordination between the fishing and offshore mineral industries include (1) port upgrades that improve fisheries infrastructure; (2) deterrence of illegal fishing; and (3) moorings and buoys that act as de facto FADs, which could increase fishing opportunities and provide meaningful support to both the local fishing sector and the broader community.

Pelagic fisheries that overlap with the Proposed Action Area are the most likely to be affected. The western area, being closer to shore, is more likely to have these space-use conflicts. Survey vessels, moorings, and buoys could temporarily displace fishing effort, increase transit times, or result in gear entanglement or loss. If not clearly communicated, the placement of moorings and buoys may pose navigational hazards. However, given the limited range of the small-boat fisheries, they are unlikely to frequently operate in the areas, but any displacement of offshore fishers closer to shore could increase competition near FADs or cause other congestion. The bottomfish fishery, operating at depths less than 400 m, is unlikely to be directly disturbed due to the depths of the Proposed Action Area (860 to 7,650 m), but acoustic disturbance could indirectly affect prey availability or alter species behavior. Recovery of lost survey equipment may cause localized bottom disturbance, potentially impacting benthic habitats important to bottomfish. Other fisheries are unlikely to experience notable space-use conflicts because they have minimal, no, or infrequent overlap with either the western or eastern areas.

To fulfill BOEM's responsibilities under OCSLA and minimize conflicts and environmental impacts during preliminary activities, a fishery-related lease stipulation is proposed and is also addressed in a BMP (**Appendix C**). The Fisheries Communication Plan (FCP) aims to reduce spatial and operational conflicts between offshore mineral activities and fishing operations. The Fisheries and Wildlife Awareness Training (FWAT) reduces the potential conflicts with fishers and minimizes adverse interactions with wildlife during lease activities. These lease stipulations are included for planning and analysis only; their presence in this EA does not represent final agency action or regulatory approval. Any final stipulations would undergo interagency consultation, public review, and formal adoption during the lease issuance process per 30 CFR 581.17.

3.10.2.2 Alternative B: No Action

Under the No Action Alternative, no commercial leases would be issued in the Proposed Action Area. However, BOEM anticipates that ongoing and planned activities would continue to occur throughout the region during the timeframe of this EA. The fishing industry already faces overlapping pressures from marine mineral projects and fishing effort outside the U.S. EEZ, existing MPAs, IUU fishing, vessel traffic, habitat degradation, and changing ocean conditions. The No Action Alternative would not substantially reduce these ongoing impacts compared to the Proposed Action.

3.10.3 Conclusion

These analyses address present uses, predicted project-dependent uses which increase the level of demand, and an assessment of individual and collective impacts. The Proposed Action is unlikely to cause substantial, long-term impacts to fisheries. With robust implementation of a FCP, FWAT, and adaptive management, potential negative impacts from the Proposed Action will be minimized.

3.11 Societal Factors

3.11.1 Affected Environment

This section provides background for societal factors for preliminary activities in the Proposed Action Area. Given the distance from shore to the lease areas and the uncertainty around employment and port usage for future surveys, no single city or county is expected to be the primary recipient of the impacts of the Proposed Action. Therefore, the societal impacts of the Proposed Action include all islands and associated communities of the CNMI and Guam. Societal factors discussion is divided into three sub-topics: economy and demographics, land and port use, and quality of life and culture.

3.11.1.1 Economy and Demographics

The Mariana Archipelago, comprising Guam and the CNMI, is in Micronesia in the western Pacific Ocean. The economies of the CNMI and Guam are shaped by their unique political status, geographic isolation, and demographic composition. Guam, an unincorporated territory of the United States, had a population of 153,836 in 2020, while the CNMI, a U.S. commonwealth, reported a population of 47,329 in the same year (CNMI Central Statistics Division 2017; Guam Bureau of Statistics and Plans 2024). Both territories have experienced population decline or stagnation in recent decades, largely due to outmigration and economic shifts. Guam's median age is 33.7 years, and the CNMI's is 34.4 years, reflecting a relatively young but aging population compared to previous decades.

Ethnic diversity is a defining feature of both societies. In Guam, 46% of residents identify as Native Hawaiian or Other Pacific Islander (including Chamorro), 35.5% as Asian (primarily Filipino), and the remainder as White, Black, or other ethnicities (Guam Bureau of Statistics and Plans 2024). The CNMI's population is similarly diverse. Filipinos make up about 35% of the population, Chamorros about 32%, and Carolinians 5%, with the remainer consisting of other Pacific Islanders and Asians. Migration patterns have been influenced by labor demands, particularly during the CNMI's garment industry boom in the 1990s and early 2000s, and by the ongoing Compact of Free Association, which facilitates migration from the Federated States of Micronesia, Palau, and the Marshall Islands.

Economically, both territories are service-oriented and heavily dependent on external factors. Guam's economy is anchored by tourism, U.S. military spending, and public administration. In 2022, Guam's gross domestic product (GDP) was $6.91 billion, with tourism and federal expenditures as primary drivers (Guam Bureau of Statistics and Plans 2024). The CNMI's economy, once buoyed by garment manufacturing, has shifted toward tourism, government employment, and retail trade following the closure of garment factories in the late 2000s (CNMI Central Statistics Division 2017). In 2019, the CNMI's GDP was $1.18 billion, with tourism accounting for a substantial share of economic activity.

Labor force participation in Guam was 61.7% in 2023, with an unemployment rate of 4.3% (Guam Bureau of Statistics and Plans 2024). In the CNMI, labor force participation was 72.3% in 2010, with an unemployment rate of 11.2% (CNMI Central Statistics Division 2017). Median household income in Guam was $58,289 in 2019, while in the CNMI it was $31,362 in 2019, reflecting important disparities in economic opportunity and cost of living.

3.11.1.2 Land and Port Use

Land tenure and use in both territories are shaped by a combination of traditional practices, statutory law, and federal interests. In the CNMI, land ownership is restricted to persons of Northern Mariana descent, with communal and family-based tenure systems prevalent (CNMI Central Statistics Division 2017). Public lands are managed by the Marianas Public Land Authority, with allocations for homesteads, commercial leases, government use, and conservation. Saipan, the largest island, has the highest population density and the most developed infrastructure, while Rota and Tinian remain more rural and less densely populated.

Guam's land ownership is a mix of private, government, and U.S. military holdings. Over 30% of Guam's land is controlled by the U.S. Department of War for bases and training areas (Guam Bureau of Statistics and Plans 2024). The remainder is divided among private owners, the Government of Guam, and the Chamorro Land Trust, which administers leases for Indigenous Chamorros. Land use is regulated through zoning laws, with industrial and commercial zones concentrated near ports and urban centers.

Port infrastructure is critical to both economies. Guam's primary port, Apra Harbor, is a major deepwater facility accommodating commercial shipping, containerized cargo, fuel bunkering, and military vessels. The port supports customs, immigration, and vessel repair services, and is vital for the import of food, fuel, and manufactured goods, as well as for the export and transshipment of fishery products (Guam Bureau of Statistics and Plans 2024). In the CNMI, the main commercial port is located on Saipan, with smaller facilities on Tinian and Rota. These ports support cargo, fishing, and limited cruise ship operations (CNMI Central Statistics Division 2017), and infrastructure for mineral handling or large-scale industrial activities is limited.

Transportation networks in both territories are adequate for current economic activity but may require upgrades for expanded industrial use. Public transportation is limited, with small fleets of buses and ferries serving local needs. Federal and local funds have been allocated for infrastructure improvements, though project timelines and impacts vary.

3.11.1.3 Quality of Life and Culture

Quality of life in Guam and the CNMI is shaped by a blend of traditional values, multicultural influences, and contemporary socioeconomic realities. Both societies are characterized by strong extended-family networks, village-based social organization, and a high degree of community engagement (CNMI Central Statistics Division 2017; Guam Bureau of Statistics and Plans 2024).

Multilingualism is common, with English, Chamorro, Carolinian, Filipino, and other Pacific and Asian languages spoken at home (CNMI Central Statistics Division 2017). Educational attainment has improved over time; in 2020, 79.4% of Guam's adults and 82.4% of CNMI's adults were high school graduates, and about 20% in both jurisdictions held a bachelor's degree or higher (CNMI Central Statistics Division 2017; Guam Bureau of Statistics and Plans 2024).

Chamorro and Carolinian cultural practices remain vibrant in the Mariana Archipelago. Community events such as fiestas, village festivals, and traditional dances are widely celebrated. Language preservation efforts, cultural education programs, and the revitalization of traditional arts and navigation are ongoing (Mushynsky et al. 2022). Community-based organizations and local government initiatives support cultural resilience and adaptation to modern challenges.

3.11.2 Impact Analysis

3.11.2.1 Alternative A: Proposed Action

BOEM proposes to issue up to six leases for preliminary seabed mineral exploration activities in two areas, the eastern area and western area (**Figure 1-1**). In the eastern area, the seabed depth ranges from 1,130 to 7,650 m, with the nearest shore point over 120 mi from both Guam and

Saipan; in the western area, the depths range from 860 to 5,690 m, with the nearest shore point at about 46 mi from Guam and 57 mi from Saipan (**Table 1-1**).

Demographics and Economy. Direct economic interactions between proposed activities and the current economy are unlikely. Incidental linkages from the Proposed Action to demographics or economy are possible. Leasing activities that could affect the abundance or distribution of harvested species have potential implications for pelagic fisheries. If lease-related activity were to generate employment, training, or service contracts for residents, modest benefits may be realized in a setting where jobs are scarce. Impacts on population size and demographics are not expected, as few people are expected to relocate because of the proposed activities.

Port and Land Use. If there are incidental influences on land use, it could increase demand for industrial development in areas with limited zoning and communal land ownership. Increased use or expansion of port operations may strain existing facilities. Given that proposed activities will occur offshore, no additional impacts are expected for land use apart from port maintenance and potential improvements.

Culture and Quality of Life. Impacts to culture and quality of life may include temporary changes to access and use of communal or traditional fishing areas, and culturally significant coastal sites, which could affect subsistence practices and community cohesion. Increased activity near the ports may cause potential short-term disruptions to daily life. Chamorro and Carolinian cultural practices remain vibrant and have adapted to modernization by reviving traditional practices. This resilience reflects a commitment to preserving life and resources while maintaining the core values (Mushynsky et al. 2022). Thus, culture and quality of life are unlikely to be notably affected by proposed activities.

3.11.2.2 Alternative B: No Action

Under the No Action Alternative, no offshore leasing or associated preliminary activities would occur in the Proposed Action Area. As a result, the existing economic, demographic, land, port, and cultural conditions in Guam and the CNMI would remain unchanged. No new employment, industrial development, or port expansion would be expected, and no notable changes to local economies, land tenure, or port infrastructure are anticipated. Traditional land use, community structure, and cultural practices, including subsistence fishing and communal events, would continue without disruption or alteration from offshore leasing activities.

3.11.3 Conclusion

The Proposed Action assumes six companies may conduct business in the archipelago. Six offices potentially could be set up, likely near ports, and the number of estimated vessel trips conducting preliminary activities is presented in **Tables 2-8 and 2-9**. The use of the port facilities would have minimal effect, and the resources are expected to completely recover after preliminary activities are complete.

The Proposed Action is not expected to substantially impact the social factors of Guam and the CNMI relating to economy and demographics, land and port use, and quality of life and culture.

3.12 Navigation and Vessel Traffic

3.12.1 Affected Environment

Commercial shipping and fishing vessels are the bulk of vessel traffic types in the CNMI. For analysis of vessel traffic in the Proposed Action Area, vessel data was downloaded from the NOAA (2024). The analysis used a summary of Automatic Identification Systems (AIS) vessel traffic positions between 2017 to 2023. Due to the remoteness of the area under analysis, AIS data may be incomplete.

The general interpretation of the data as shown in **Figure 3-2** is that the brighter magenta colors indicate higher density, and, as the values decrease, they move closer to light blue. The NOAA data available from 2017 to 2023 (**Figure 3-2**) provides an aggregate of AIS-broadcasted points of tanker vessel concentration south of the Port of Saipan and between the Eastern and Western Lease Areas of the Proposed Action Area. Cargo vessels have aggregated points that mimic track lines from all directions. Fishing is limited within the Proposed Action Area, and the image does not differentiate between commercial, recreational, and for-hire fisheries or the activities the vessels are engaged in (actively fishing, transiting, etc.). However, there are three distinct routes in the southern portion of the Proposed Action Area, running north-northwest/south-southeast, and northeast to southwest. Towing vessel activity around the Proposed Action Area is sparse, with two distinct informal north-northeast to south-southwest routes running to/from the Port of Saipan and the Unincorporated U.S. Territory of Guam. Any leisure (passenger, pleasure, etc.) vessel activity in the area is estimated to be included with track lines within the ‘Other’ image, along with other vessel types such as ferries, tugs, etc. There is no differentiation among the varied vessels within this group, and it is unclear which tracks represent leisure vessel activity. In general, most of the AIS-broadcasted points for all vessel types are found to be in the southernmost region of the Proposed Action Area(**Figure 3-2**).

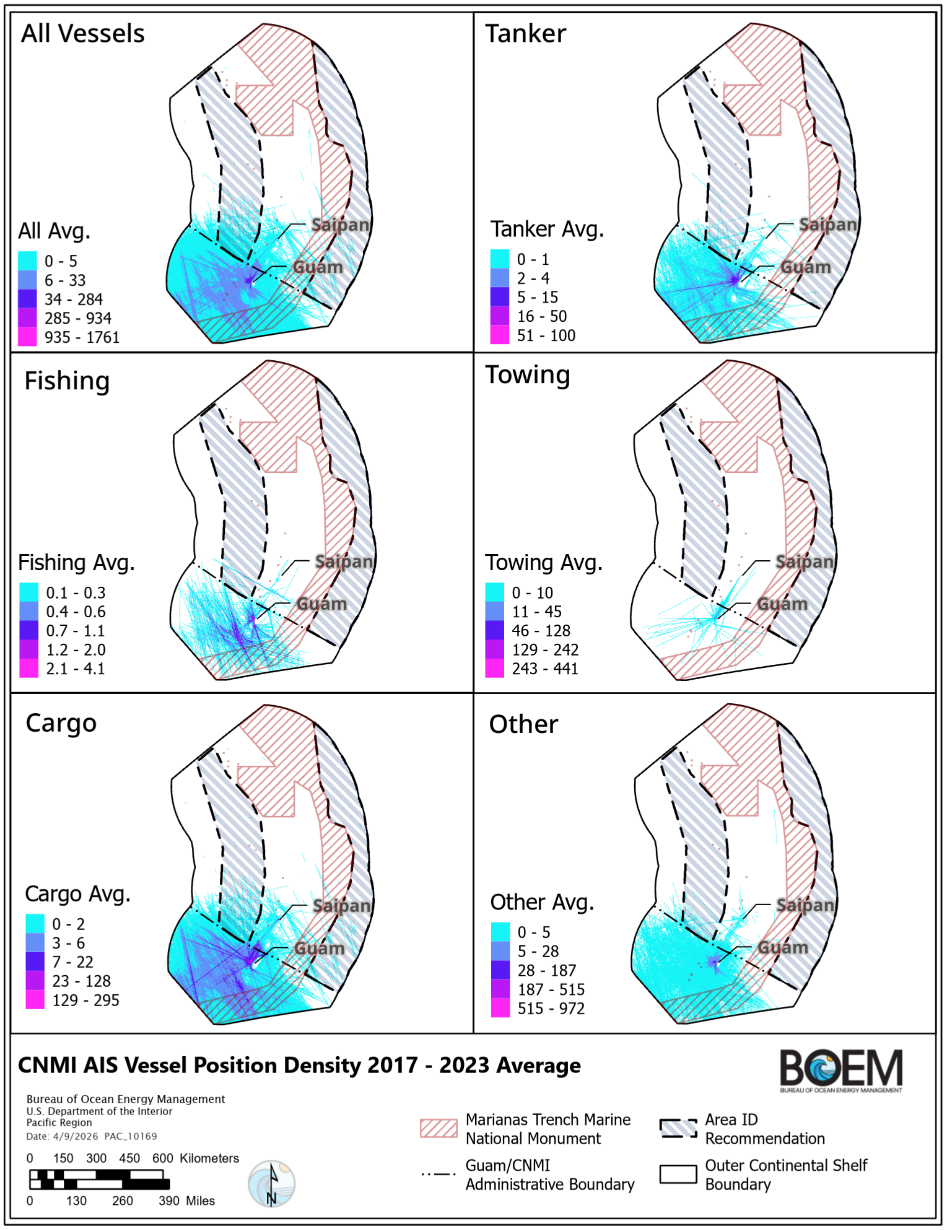

Figure 3-2. NOAA Office for Coastal Management data of AIS density, for all vessels, received between 2017 and 2023

The Port of Saipan is the port identified for possible use in the navigation and vessel traffic geographic analysis area. Port of Saipan has navigational aids and harbor buoys, but no formal routing measures (traffic separation schemes, precautionary areas, safety fairways, anchorage areas) exist in the area. The Proposed Action Area does not have seasonal management areas with federally established vessel speed regulations. There are seven Marine Protected Areas (MPAs) in the CNMI (**Figure 3-3**): (1) Managaha Marine Conservation Area; (2) Bird Island Sanctuary; (3) Forbidden Island Sanctuary; (4) Tinian Marine Reserve, Tinian; (5) Sasanhaya Bay Fish Reserve; (6) Laolao Bay Sea Cucumber Sanctuary; and (7) Lighthouse Reef Trochus Sanctuary. None currently have transit restrictions.

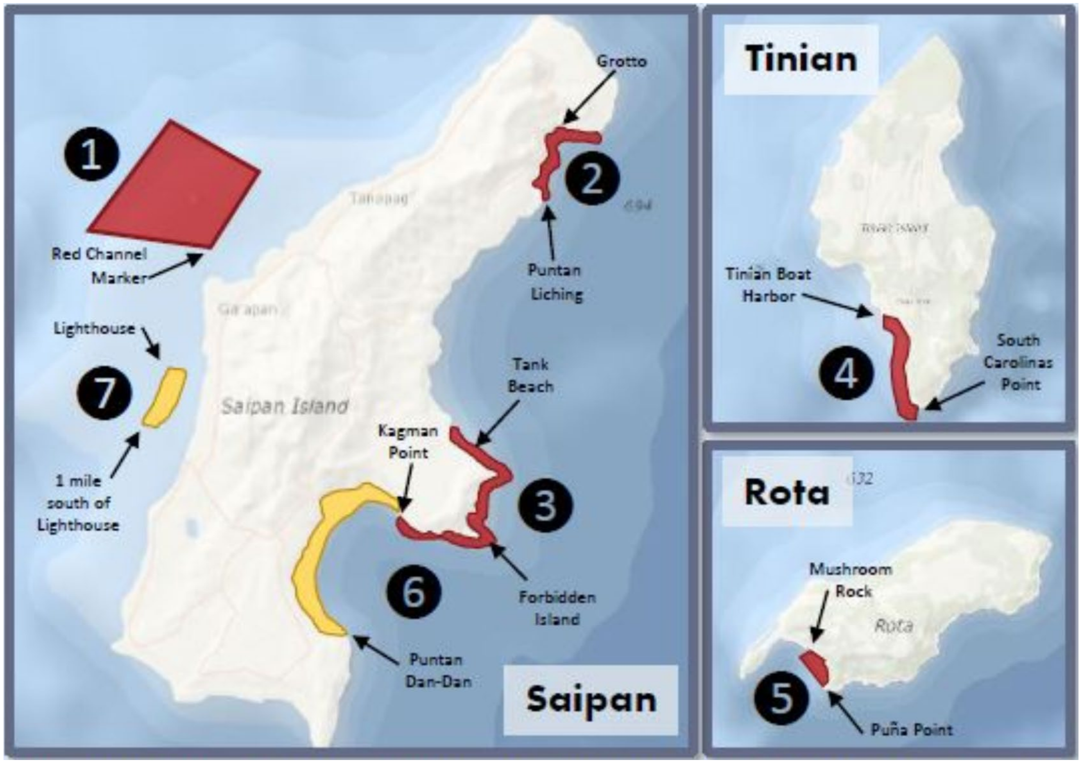

Figure 3-3. CNMI MPAs

Source: Division of Coastal Resources Management (2018)

3.12.2 Impact Analysis

A navigation safety and vessel traffic analysis was conducted using NOAA Office for Coastal Management data of an aggregate of the combined 7 years of AIS-broadcasted pings separated by vessel type (NOAA 2024). All NOAA AIS data originates from land-based receivers and are generally limited in waters beyond 40 to 50 mi of the coast. Due to the remoteness of the area and the Proposed Action Area's distance from land, vessel traffic within the Proposed Action Area could be under-represented by the land-based receivers. The available annual data did not distinguish between vessel activities (e.g., transit, dead in the water, actively fishing), limiting the ability to comprehensively assess potential impacts on navigation safety. Track line counts provide a broad overview of traffic volume by vessel type from year to year, as vessel activities can vary or shift with seasonal changes. This analysis is important for preserving existing and historical navigation routes for safety and vessel traffic.

The informal north-northeast to south-southwest routes between the east and west of the Proposed Action Area seem to be important to the towing industry. Although data may be incomplete, the vessel types most frequently transiting and conducting operations within the Proposed Action Area are fisheries and commercial shipping. The fisheries that conduct activities in the southern region of the Proposed Action Area may need to go somewhere else to fish. Commercial shipping vessels impacted by the Proposed Action would need to avoid the vessels conducting preliminary activities by adjusting course. **Tables 2-8 and 2-9** anticipate a combined total of 348 (156.2 rounded up to 157 [**Table 2-8**] + 191 [**Table 2-9**]) vessel trips for operational activities across six commercial leases, with an estimated two to five vessels in the lease areas at one time. It is assumed vessels associated with the Proposed Action would utilize the Port of Saipan, although this is not confirmed.

Vessels deploying equipment to the seafloor at depths in the Proposed Action Area could take a minimum of 2 hours and could be on station for multiple days. Vessels in or near this route for an extended period could cause temporary detectable impacts, particularly to transiting commercial shipping vessels and fisheries. Multiple vessels added to the southern portion of the Proposed Action Area could temporarily cause space-use conflicts with any offshore use of the area. Activity from fishing vessels in the southern part of the area are further considered in the discussion on commercial fishing (**Section 3.10**).

There are no formal routing measures in or around the Proposed Action Area. Private buoys are regulated per USCG Oceania District PATON requirement. Collision risk can be minimized or eliminated if mariners and vessel operators follow the *Convention on the International Regulations for Preventing Collisions at Sea* (International Maritime Organization 1972). Traffic in and out of the Port of Saipan, including vessels relating to preliminary activities, could lead to an increase in port congestion, which could affect the port infrastructure (**Section 3.11.1.2**). Port congestion is the overcrowding of port due to infrastructure stress, such as limited berth space. Due to the limited vessel traffic identified in the area, the presence of up to five project-related vessels at any one time may be an increase from existing baseline vessel traffic levels. However, this would not result in a perceptible or long-term impact due to the 2,600 linear ft of available berthing space and the recently widened and deepened channel, turning basin, and berthing areas. The short-term presence is not expected to notably affect the port's ability to accommodate current commercial shipping, towing or fisheries activities.

3.12.2.1 Alternative A: Proposed Action

The Proposed Action is to issue up to six leases that authorize preliminary activities. Impacts from the Proposed Action, in combination with ongoing activities, are unlikely to result in notable temporary impacts for commercial shipping, as routine functions and activities would not be disrupted. Long-term impacts for fisheries are not expected and are further discussed in **Section 3.10**. The resultant impacts from the Proposed Action, such as increased vessel presence (including survey and sampling vessels) and the presence of buoys, would result in temporary impacts for navigation and vessel traffic that routinely use the Proposed Action Area.

3.12.2.2 Alternative B: No Action

Under the No Action Alternative, commercial shipping, fishing vessels, passenger vessels, and leisure or pleasure vessels that transit to and from the Port of Saipan would remain unimpacted by the Proposed Action.

3.12.3 Conclusion

Port congestion (**Section 3.11.1.2**) in and out the Port of Saipan is a possibility due to limited infrastructure, but any effects would be temporary and are not expected to result in long-term impacts. The number of vessels at sea at one time is expected to be two to five, which therefore limits the number of vessels requiring re-supply in the port.

Multiple vessels added from the Proposed Action to the southern parts of the Proposed Action Area, which have a relatively higher concentration of fishing activities compared to the rest of the Proposed Action Area, could affect the types of fisheries conducted in the Proposed Action Area. The commercial shipping industry may adjust course and routes to avoid areas where the lessee's vessel operates. Mariners and lessees may use the USCG Oceania District Local Notice to Mariners, if available, to make informed decisions on planned and ongoing activities within the Proposed Action Area and inland waters to minimize navigation safety risks.

3.13 Marine Cultural Resources

3.13.1 Affected Environment

The geographic analysis area for marine cultural resources is the Area of Potential Effects (APE), defined as the depth and breadth of the seabed that could be affected by seafloor- and bottom-disturbing activities associated with preliminary activities (**Figure 1-1**). The APE for preliminary activities includes the discrete horizontal and vertical areas of the seafloor that may affect marine cultural resources on or below the seafloor, if present. These activities may include but are not limited to subsurface geotechnical investigations and deployment of scientific equipment.

BOEM will meet the reasonable and good faith effort requirements for the identification and evaluation of marine cultural resources through the evaluation of existing databases, reports, and regional studies identifying potential or nonpotential marine cultural resources, and through consultation with the CNMI Historic Preservation Office, Guam Historic Preservation Officer, and other consulting parties (**Appendix F**, Attachment A) identified through consultation conducted pursuant to Section 106 of the National Historic Preservation Act (NHPA).

BOEM reviewed existing and available information regarding marine cultural resources that may be present within the APE, including data concerning possible cultural resources not yet identified. To date, the APE has not been subjected to a complete and comprehensive marine archaeological identification survey. Submerged cultural resources that may be located within the proposed commercial lease areas may include marine archaeological resources, which are the physical remnants of past human activity that occurred at least 50 years ago and are submerged underwater. These may include both Pre-Contact Period (1600 Before Common Era [BCE] or earlier through 1521 Common Era [CE]); Indigenous archaeological sites associated with Pre-Latte (1500 BCE to 1000 CE) and Latte (1000 to 1700 CE) cultures; and Post-Contact Period (1521 CE to present) archaeological sites such as historic shipwrecks and downed aircraft.

BOEM conducted a review of reported shipwrecks in BOEM’s Pacific OCS Shipwreck Database. Although this database does not provide a complete listing of all potential shipwrecks on the Pacific OCS, it serves as a baseline source of existing and available information for the purposes of corroborating and supporting identification efforts.

The APE has no potential for the presence of inundated Pre-Contact terrestrial sites because the water depths (1,130–7,650 m in the eastern area and 860–5,690 m in the western area) are well below the lowest sea levels during human habitation of the Mariana Islands. At approximately 3000 BCE sea levels in the Mariana Islands were 1.8 m higher than their current levels, resulting in the earliest known habitation sites now being located approximately 150 m inland from the current shoreline and buried at depths of up to 1 m (Carson and Hung 2021). Micronesian watercraft and/or associated artifacts from the Pre-Contact Period or later could, however improbable, exist within the APE. Micronesian shipwrecks are extremely unlikely to be encountered mostly because of their inherent buoyancy. Pacific voyaging canoes used a double-hull design to achieve stability, instead of the use of ballast (Haddon and Hornell 1938). As a result, "…[s]ubmerged wreck sites (unintentional or accidental losses while in use) for voyaging canoes may therefore be very rare, if they exist at all, in the Pacific (Maritime Heritage Program 2017)." So far, the only in situ voyaging canoes have been discovered at nearshore terrestrial wet sites, instead of in oceanic contexts (Sinoto 1983; Johns et al. 2014; Maritime Heritage Program 2017; BOEM 2024). The likelihood of discovering or encountering artifacts from lost Micronesian watercraft in the APE also is unlikely.

After European contact, the timeline for maritime heritage resources in the CNMI can be divided into six periods: Early European Exploration and Spanish Colonial (1521–1898 CE), German Colonial (1899–1914 CE), Japanese Mandate (1914–1941 CE), World War II (1941–1945 CE), and postwar (1945–present) (Carrell 2009). Of these, vessel and aircraft losses from World War II are the most numerous. Based on the information available at this stage of early leasing, BOEM has determined that shipwrecks and downed aircraft are the cultural resources most likely to be encountered in the APE, given its water depth and distance from land. BOEM understands the Pacific Islanders place a deep cultural significance to the ocean itself and through consultation may determine if these lease areas or certain portions are culturally significant to specific communities.

Seafaring has characterized the CNMI for millennia. Consequently, shipwrecks could be found within the APE and could reflect a variety of vessel types and time periods. Research suggests at least 147 reported vessel losses in the CNMI and Guam, with locations for at least 72 vessels, several of which have been found (Carrell 2009). Numerous aircraft have been documented in both the historic and archaeological records, especially nearshore (McKinnon 2015). Although no submerged archaeological sites are currently confirmed in the APE, historical records report vessels as having been lost within the APE, especially the western area. Twelve Japanese vessels were reported lost during World War II within the APE, including merchant marine transports, submarines, a gunboat, a repair ship, and a fleet tanker (Carrell 2009). Military vessels and aircraft, whether American or Japanese, are protected under the Sunken Military Craft Act (10 U.S.C. § 113) and also may be submerged grave sites. The potential presence, and potential dangers, of unexploded ordinance also should be considered at submerged World War II-era archaeological sites (Raupp et al. 2015).

In consultation with other federal partners, BOEM marine archaeologists searched or coordinated reviews of multiple cultural resources databases (Automated Wreck and Obstruction Information System; BOEM Pacific OCS Shipwreck Database; U.S. Naval History and Heritage Command [USNHHC]; and Defense POW/MIA Accounting Agency) and received reports of missing vessels and aircraft. The USNHHC reported three US Navy shipwrecks and four US Navy aircraft wrecks in the APE.

Regarding marine cultural resources in the APE, BOEM considered details particular to deepwater environments that could affect the preservation of potential archaeological sites. These conditions are described in the following information, excerpted from Maritime Heritage Program (2017); BOEM (2024): “In extreme water depths, burial, survival, and preservation of a wreck warrants close consideration. Burial is extremely unlikely at the water depths in the APE owing to very low sedimentation rates and quiescent bottom conditions typically found in open ocean, deepwater settings. Despite low sedimentation, conditions may also be anoxic or feature low oxygen levels that could enable preservation of wooden shipwrecks. In comparison, if there are sufficient oxygen levels or other processes, organisms that depend on organic material may destroy wooden hulls. Preservation of non-wooden shipwrecks would similarly depend on conditions. However, if a wreck is found with sufficient diagnostic artifacts in concentration, the older wooden shipwreck site may possibly be eligible for National Register of Historic Places inclusion as an archaeological site (artifact concentration) rather than relatively intact wreck or discrete object” under the NHPA.

3.13.2 Impact Analysis

The issuance of commercial leases for marine minerals and subsequent preliminary activities in the CNMI OCS have potential for encountering marine cultural resources, including submerged Pre-Contact Period archaeological sites and Post-Contact Period submerged cultural resources such as shipwrecks and downed aircraft. Due to the lack of survey information in this area of the Pacific Ocean, the potential for the presence of submerged historic sites, consisting of shipwrecks, downed aircraft, or other cultural resources, remains unknown.

The seafloor- and bottom-disturbing preliminary activities allowed with lease issuance (i.e., the collection of box core and free-fall grab samples and the deployment of UTPs, moorings, landers, and scientific equipment) have minimal potential to adversely affect marine cultural resources, if present.

If marine cultural resources are found to exist that have not yet been identified or discovered, then the unanticipated discovery protocol would be followed as described in the Lease Stipulations (**Appendix C**) would require the avoidance during seafloor- and bottom-disturbing activities of any known cultural resources, if any properties are identified (**Appendix C**) would require the lessee to ensure a Qualified Marine Archaeologist is involved in specific surveys and inspections of samples, reviews all imagery to identify if any potential archaeological resources are present in the sampled areas, monitors the video feed in real time if an ROV survey is conducted near a potential or newly discovered archaeological resource, and conducts unanticipated discovery protocols in the event of a discovery or unanticipated effect. Obtaining survey data for mineral leasing in the ocean supports informed decisions that reduce uncertainty and improve resource management.

Considering the preliminary activities for the Proposed Action, BOEM anticipates that the impacts associated with ongoing and reasonably foreseeable planned actions in the APE have minimal potential to result in adverse impacts to marine cultural resources, if present.

3.13.2.1 Alternative A: Proposed Action

This alternative proposes to issue up to six leases in the 279,644 km^2 total lease area. These include potential impacts from the deployment of moorings, landers, and UTP equipment, the acquisition of free-fall grab samples and box core samples, and other bottom-disturbing activities.

3.13.2.2 Alternative B: No Action

Under this alternative, commercial leases would not be issued offshore the CNMI. The impacts of ongoing activities and planned actions on marine cultural resources within the deepwater environment of the APE is largely unknown. Implementation of the No Action Alternative is not expected to meaningfully alter ongoing impacts to marine cultural resources from existing and potential future actions.

3.13.3 Conclusion

While impacts on marine cultural resources associated with the Proposed Action could occur, BOEM anticipates existing federal historic preservation and environmental laws and regulations would reduce the magnitude of overall impacts on cultural resources by implementing requirements to avoid, minimize, and/or mitigate project-specific impacts on cultural resources. These requirements ensure that lessees avoid, minimize, and/or mitigate project-specific impacts on cultural resources, reducing the severity of impacts in most cases.

4 Consultation and Coordination

BOEM initiated an EA process when the Proposed Action Area was finalized March 16, 2026. Guidance detailed in 40 CFR 1501.10(f) and the DOI NEPA Handbook (516 DM 1 – U.S. Department of the Interior Handbook of National Environmental Policy Act Implementing Procedures, Feb 2026) outlines that a public comment period on a draft EA is only included "where applicable," reinforcing that it is not required under NEPA. BOEM will not be publishing a draft EA or opening for public comments for this leasing action.

4.1 Coastal Zone Management Act (CZMA)

The CZMA requires that federal actions that have potential to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of a state's or territory's federally approved coastal management program (15 CFR 930 Subpart C). Coastal states and territories can also review certain federal agency actions in offshore areas under the CZMA (16 U.S.C. §§ 1451–1466).

BOEM is preparing two separate Negative Determinations under 15 CFR 930.35 to determine that issuing leases and related activities offshore the CNMI will not affect any coastal use or resources in the CNMI nor in Guam. The Negative Determinations will be provided to the CNMI Coastal Zone Management Program and the Guam Coastal Zone Management Program at least 90 days prior to lease issuance per 15 CFR 930.35.

4.2 NHPA

Section 106 of the NHPA (54 U.S.C. § 306108) and its implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment. BOEM has determined that issuing marine minerals leases on the OCS offshore the CNMI constitutes an undertaking subject to Section 106 NHPA because the resulting preliminary activities have the potential to cause effects on historic properties.

BOEM initiated consultation through letters, sent via email, with the CNMI Historic Preservation Officer, Guam Historic Preservation Officer, Mariana Islands National Wildlife Refuge and MTMNM (USFWS and NOAA), War in the Pacific National Historical Park (Guam), and American Memorial Park (Saipan) (National Park Service), as well as additional consulting parties, including the University of Guam, Northern Marianas College, and Matua Council for Native Chamorro Advancement. Consulting parties were invited to provide comments and input regarding the identification of historic properties and potential effects on those historic properties from this undertaking.

Consistent with 36 CFR 800.4(d)(1), BOEM made a Finding of No Historic Properties Affected. BOEM sent a draft Finding and associated documentation to all consulting parties. BOEM requested concurrence on the draft Finding from the CNMI Historic Preservation Officer and the Guam Historic Preservation Officer and invited comments from all consulting parties. BOEM sent the final Finding of No Historic Properties Affected to consulting parties via email (**Appendix F**).

4.3 Endangered Species Act

Section 7(a)(2) of the ESA (16 U.S.C. § 1537) requires that federal agencies shall both "…utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species…" and, "…ensure that any action authorized, funded, or carried out… is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species...which is determined…to be critical…". To satisfy its ESA obligations, BOEM consults with the USFWS and NMFS on projects that could affect any listed species and/or their CH under the jurisdiction of the services. BOEM is currently in discussions with NMFS and USFWS regarding the Proposed Action.

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4.4 MMPA

To ensure compliance with the MMPA, BOEM lease requirements will stipulate that lease holders must not conduct any activity under their lease that may result in an incidental taking of marine mammals until the appropriate authorization has been issued under the MMPA of 1972 as amended (16 U.S.C. § 1361 et seq.). The lessee must determine the need for an Incidental Harassment Authorization (IHA), which allows the incidental take of marine mammals during the specified activities. If the applicant determines the need for an IHA, they must apply to NMFS, which, after evaluation, would either authorize incidental take or deny the IHA application. BMPs apply in federal waters of the OCS and are intended to minimize or eliminate potential impacts on resources considered in the EA, which include marine mammals.

4.5 Magnuson-Stevens Conservation and Management Act

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, BOEM is required to consult with the NMFS regarding potential impacts to EFH from the Proposed Action. As of the publication of this EA, the EFH consultation process is ongoing. BOEM will continue to coordinate with NMFS to ensure that all regulatory requirements are met and that any recommendations or conservation measures resulting from the consultation will be considered in the final decision-making process. Updates regarding the status and outcomes of the EFH consultation will be provided in the Final EA or subsequent decision documents.

4.6 MTMNM and MPAs

There are no NOAA-designated National Marine Sanctuaries within or adjacent the CNMI. However, the region includes the federally designated MTMNM, which encompasses the Trench, Volcanic, and Islands Units and is comanaged by the USFWS and NOAA. The CNMI has several locally established MPAs, including Managaha Marine Conservation Area, Bird Island Sanctuary, Forbidden Island Sanctuary, and others designated under the CNMI law. These protected areas contribute to the conservation of marine habitats but are distinct from the National Marine Sanctuary System.

4.7 Other Acts and Agencies

4.7.1 The Jones Act

The Merchant Marine Act of 1920, also called the Jones Act, is applicable to U.S. states and Puerto Rico, but not to U.S. territories and possessions in the Pacific Ocean unless a presidential proclamation is issued.

4.7.2 U.S. Environmental Protection Agency

The USEPA ensures that federal agencies thoroughly evaluate and address potential environmental impacts under NEPA. In accordance with 40 CFR Part 6, the USEPA incorporates NEPA requirements into its own actions; for this Proposed Action, oversight is provided by USEPA Region 9. Additionally, the USEPA's Office of Federal Activities manages the filing and public availability of NEPA documents.

4.7.3 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) is a cooperating agency for the Biological Assessment. USACE possesses jurisdiction by federal law pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403). Section 10 of the Rivers and Harbors Act (33 CFR 320.2(b)) prohibits the unauthorized obstruction or alteration of any navigable waters of the United States. The authority of the Secretary of the Army to prevent obstructions to navigation in navigable waters of the United States was extended to artificial islands, installations, and other devices on the seabed, to the seaward limit of the OCS, by Section 4(f) of the OCSLA of 1953 as amended (43 U.S.C. § 1333(e)). Department of the Army permits are required for the construction of artificial islands, installations, and other devices on the seabed, to the seaward limit of the OCS, pursuant to Section 4(f) of the OCSLA as amended pursuant to 33 CFR 322.3(b). In the future, USACE Section 404 permits may be required for larger surface float buoys. Activities that BOEM lease holders may undertake that involve installing devices on the seabed would require USACE authorization under Section 10 of the Rivers and Harbors Act. Geotechnical sampling is considered “work,” an activity the Corps regulates. Per 33 CFR 320.1 (b)(2), “other structures or work including excavation, dredging, and/or disposal activities, in navigable waters of the United States,” and (7) “Nationwide general permits for certain categories of activities” are regulated activities. The term work is also defined in 33 CFR 322.2(c).

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Appendix A: Area Identification Memorandum and Survey Assumptions

Appendix A1

Area Identification Memorandum

United States Department of the Interior
BUREAU OF OCEAN ENERGY MANAGEMENT
Pacific OCS Region
760 Paseo Camarillo, Suite 102
Camarillo, CA 93010-6064

Memorandum

To: Acting Director

From: Douglas P. Boren
Regional Director, Pacific Regional Office

DOUGLAS BOREN Digitally signed by DOUGLAS BOREN Date: 2026.03.13 13:40:21 -07'00'

Subject: Area Identification Recommendation for the Commonwealth of Northern Mariana Islands Outer Continental Shelf (OCS) Mineral Leasing Process

Area Identification (Area ID) is a major step in the Bureau of Ocean Energy Management's (BOEM) Outer Continental Shelf (OCS) mineral leasing process to develop a recommendation for an area to be carried forward for further leasing consideration and environmental analysis offshore the Commonwealth of Northern Mariana Islands (CNMI). Pursuant to 30 CFR 581.14, after considering the available OCS mineral resources, environmental data, and information, and the comments received from interested parties, including through the Request for Information and Interest (RFI), BOEM recommends tracts to be considered for a proposed lease offering. The recommended tracts would be considered in the forthcoming environmental analysis conducted for the activities that would be permissible under the proposed lease offering.

This memorandum documents your Area ID decision in accordance with 30 CFR 581.14. As noted above, your decision identifies the tracts to be carried forward for further leasing consideration and environmental analysis. The Area ID decision is not a final decision to lease nor is it an irreversible or irretrievable commitment of resources. The Area ID decision to support a potential OCS mineral lease sale offshore the CNMI is documented by your signature and marking your choice on the last page of this memorandum. A copy of this memorandum and the associated attachment will be made available on BOEM's website for public viewing and downloading.

I. Background

The Trump Administration recognizes that an overreliance on foreign critical minerals and their derivative products could jeopardize U.S. defense capabilities, infrastructure development, and technological innovation. To support and facilitate domestic production of critical minerals, President Trump issued a series of Executive Orders which direct the Department of the Interior (DOI) bureaus to facilitate and expedite critical mineral permitting, leasing, and ultimately development of critical minerals on the OCS. In response, on November 12, 2025, BOEM issued an RFI for commercial leasing for OCS seabed critical minerals offshore the CNMI (90 Fed. Reg. 50-872). The RFI requested information and comments on, and indications of interest in, the leasing of OCS minerals in the RFI Area. The RFI Area is located to the east of the Mariana Trench National Marine Sanctuary and extends to the northern, southern, and eastern limits of the OCS offshore the CNMI. It comprises approximately 35.5 million acres (143,595 square kilometers [km^2]) with approximate water depths ranging from 3,700–25,100 feet (1,130–7,650 meters). BOEM considered available OCS mineral resources, environmental data, and information and interest received in response to the RFI when considering whether to proceed with additional steps leading to a potential OCS mineral lease sale offshore the CNMI.

II. Comments Received in Response to the RFI

In response to the RFI, BOEM received comments both opposing and supporting the proposed commercial lease sale in and around the RFI Area. Through January 12, 2026, BOEM received a total of 65,585 public comment submissions in response to the RFI (Docket BOEM-2025-0351). Of the total 65,585 public submissions, 1,672 have been identified as unique; 58,592 copies were associated with 29 form letter campaigns, petitions, and letters with multiple signatories; and 5,321 were considered duplicate or not germane. Pursuant to 30 CFR 581.14, BOEM considered these comments in developing an Area ID recommendation for a proposed lease sale for OCS minerals offshore the CNMI. **Attachment 1 provides an RFI comment summary**. Key highlights of the comments received are noted below:

- Governor of the Commonwealth of the Northern Mariana Islands David M. Apatang submitted a letter stating that he will neither fully support nor fully oppose advancing seabed mining activities based on information contained in the RFI. He requested that prior to any leasing decisions, the following be conducted: comprehensive scientific data and baseline environmental information, a full Environmental Impact Statement (EIS), clear economic benefit pathways, and meaningful government-to-government and community engagement.
- Governor of Guam Lourdes A. Leon Guerrero, Lieutenant Governor Josh Tenorio, and other top government leaders of Guam submitted several letters stating joint opposition to the proposed commercial leasing of OCS minerals offshore the CNMI. Top government leaders requested: a halt to the leasing process; inclusion of Guam in further discussion and decisions; initiation of a regional EIS; sufficient scientific research and analysis of the environmental, ecological, economic, and marine life impacts of seabed mining; and assurance that any future policy aligns with U.S. commitments to Indigenous rights and environmental protection.
- The Guam Legislature submitted Resolution No. 132-38 (COR) which reaffirms a moratorium on deep-sea mining and opposes BOEM's offshore mineral leasing proposal near the CNMI.
- Commenters cited the growing global consensus against deep-sea mining, noting that approximately 40 organizations in approximately 40 countries, over 65 major corporations, 37 financial institutions, and more than 940 marine scientists and experts have called for a moratorium.
- Commenters requested that the governments of the CNMI and Guam be transparently consulted and engaged in any leasing decisions in the RFI Area.
- Commenters expressed concern about irreversible damage to deep-sea ecosystems, and highlighted potential threats to marine food webs, endangered species, coral reefs, fisheries, noise pollution, light pollution, important national monuments such as

the Mariana Trench National Monument, and toxic releases associated with mining activities.

- Commenters emphasized the biodiversity and slow recovery of benthic communities, including rare and undiscovered species, particularly on seamounts and hydrothermal vents. They suggested mitigation measures such as plume elimination, selective harvesting, third-party monitoring, and spatial restrictions; they also urged BOEM to create avoidance zones and protective buffers (e.g., 5-mile "no-mining" areas) for sensitive and culturally significant sites.
- Commenters described sediment plumes that can potentially travel hundreds of miles or kilometers as detrimental to water quality by disturbing and redistributing sediment on the seafloor, smothering benthic communities, and discharging any unwanted mud, silt, and debris from the above-surface mining vessel.
- Commenters expressed concern about the potential for transboundary impacts from deep-sea mining activities, including spillover effects from oil spills, drilling discharge, and sediment plumes, as well as increased vessel traffic and geochemical and water temperature alteration across the CNMI and into neighboring islands.
- Commenters expressed concerns about impacts to commercial and subsistence fisheries, including threatening commercially important fish species and the $5.5 billion Pacific tuna industry.
- Commenters expressed concerns over the impact that deep-sea mining would have on tourism and recreation in the CNMI and Guam, including interfering with activities like whale watching, diving, fishing tours, and snorkeling.
- Commenters discussed the lack of comprehensive baseline data and ongoing environmental monitoring in the RFI Area, and emphasized the need to characterize habitats, document species interactions, and assess existing human impacts to prevent and mitigate deep-sea mining effects.
- Commenters urged respect for Indigenous rights and sovereignty in ocean resource decisions, citing cultural, spiritual, and ancestral ties to the Mariana Islands.
- Commenters stated that BOEM must fully consult with the Indigenous people of the CNMI, give weight to local concerns, hold public hearings, and provide education resources as part of any leasing process.
- Commenters expressed concern that mining would destroy underwater cultural heritage sites including shipwrecks, airplane wrecks, submerged landscapes, and archaeological materials that are largely unrecorded and irreplaceable.
- Commenters stated that leasing in the proposed area could mitigate national security risks, provide large quantities of critical minerals and revenue for the U.S. Treasury, and support ocean resource economy initiatives.
- Commenters expressed concerns that current proposals do not guarantee local job creation, investment in infrastructure, or meaningful benefit sharing frameworks with the CNMI or Guam.
- Commenters expressed support for BOEM advancing exploration and evaluation of potential commercial leasing, emphasizing the importance of the U.S. Exclusive Economic Zone (EEZ) and the need for federal oversight.
- A commenter stated that the RFI Area lies within a marine mineral prospective region for ferromanganese crust and nodules and is therefore suitable for OCS mineral

development, and also suggested fully excluding seafloor sulfide and cobalt-rich crust seabed mineral resources from consideration for future mining leases, describing the invasive effects this type of mining would have on the area.

- Commenters stated that BOEM should develop a clear leasing schedule to allow for the incorporation of ongoing data collection efforts.
- Commenters provided a variety of comments regarding rent and royalty rates, lease size, and lease contraction. Industry comments expressed support for BOEM's proposal not to charge rent during the first five years of leases; for BOEM to suspend rental payments during Plan reviews; and suggested that royalty rates should be based on revenues generated, no higher than 3 percent, and reduced to 1.5 percent for the first five years. Other commenters stated that BOEM should ensure royalty rates provide a fair return, reject low rates proposed by industry of 3 percent or lower, and that robust royalty and compensatory mitigation programs be put in place to offset impacts to ocean resources and the local economy.
- Commentors expressed support for large lease areas by suggesting a minimum lease area size of 25,000 km^2 and that the lease area sizes are consistent with the size of other International Seabed Authority (ISA) exploration contracts (75,000 km^2).
- A commenter said that a two-stage lease contraction schedule, with the first contraction reduced to no more than 25 percent of the original lease area and the second reduced to 5 to 10 percent of the original lease area, seems reasonable but that the contraction parameters should be clearly defined in advance.

III. Indications of Interest Received in Response to the RFI

BOEM received indications of interest from several companies in response to the RFI. Indications of interest identified areas of interest in the RFI Area and several included additional areas west of the CNMI, as shown in the Indications of Interest Heat Map (Figure 1).

Indications of interest and comments identified polymetallic nodules in the RFI Area to the east. In addition to interest in the RFI Area, there were multiple expressions of interest in polymetallic sulfides to the west of the CNMI. In both areas, the primary minerals for commercial development include potential commercially viable quantities of cobalt, nickel, copper, manganese, zinc, rare earth elements, along with other minerals that may prove economically viable to extract and process in the future.

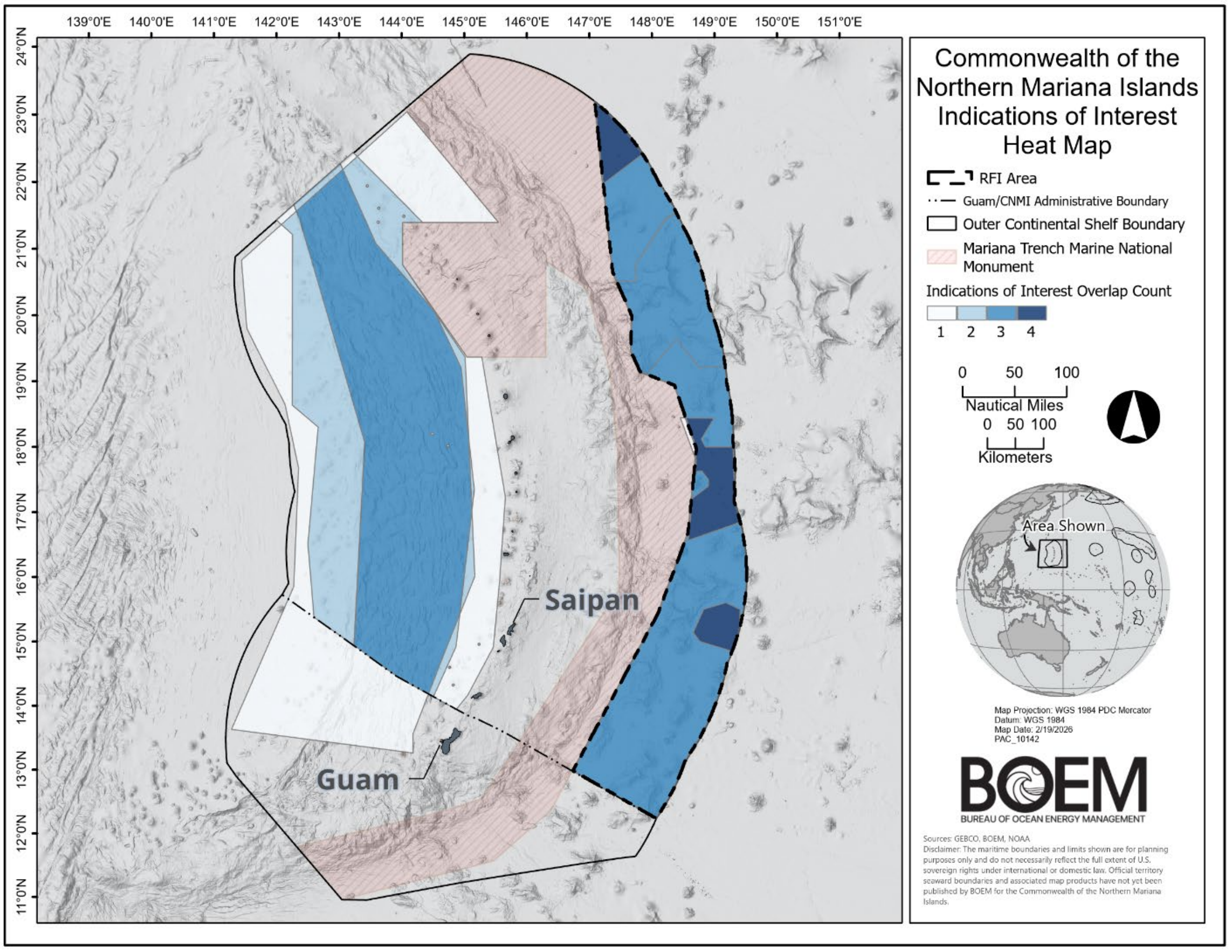

Figure 1: Indications of Interest Heat Map. The highest priority areas are shown as dark blue, lower priority areas shown in lighter shades of blue, and the lowest priority area shown in white.

IV. Recommendation

In formulating the Area ID recommendation, BOEM considered the available OCS mineral resource information, environmental data and information, comments received in response to the RFI, and indications of interest in OCS mineral leasing. The presence of any minable orebody is unknown, and additional prospecting is needed to discover and delineate OCS minerals, hence, the size of the tracts for potential leasing is relatively large. The recommended area includes two geographically distinct areas, one east and one west of the CNMI as shown in Figure 2. The area east of the CNMI is 35,483,044 acres (143,595 km^2) or 6,502 whole or partial blocks and is 128 mi (206 km) from Saipan and 127 mi (205 km) from Guam at its closest point. The area west of the CNMI is 33,618,369 acres (136,049 km^2), or 6,248 whole or partial blocks, and is 57 mi (91 km) from Saipan and 46 mi (74 km) from Guam at its closest point. The southern boundary of the recommended area is north of the OCS Administrative Boundary between the CNMI and Guam on the OCS.

The recommended area located east of the CNMI and the Mariana Trench National Marine Monument is consistent with indications of interest and prospective seabed mineral regions identified by the U.S. Geological Survey (USGS) in and around the RFI Area for ferromanganese crusts and polymetallic nodules, as shown in the CNMI Marine Minerals Prospective Regions Map (Figure 2), which is based on the USGS Global Marine Mineral Prospective Regions Viewer[1] and Global Marine Minerals Prospective Regions Map.[2]

The recommended area located west of the CNMI is consistent with indications of interest. However, published information on prospective areas for polymetallic sulfides is limited. The USGS Global Marine Mineral Prospective Regions Viewer[1] is presently limited to areas prospective for ferromanganese crusts and nodules. The viewer does not display the USGS outline of areas prospective for polymetallic sulfide deposits. Instead, the USGS regional outline of prospective areas for polymetallic sulfide deposits is depicted on a static map[2] and the rationale described in a separate USGS publication.[3] These USGS sources support the area being prospective for polymetallic sulfides because the geologic setting is a back-arc basin, which are known to be regions where hydrothermal vents form.[3] USGS states that under certain conditions hydrothermal vents can form polymetallic sulfide deposits.

Additionally, data contained in the InterRidge Vents Database,[4] which provides a comprehensive list of active submarine hydrothermal vent fields aggregated from USGS reports and other research efforts, lists multiple identified active vents in the recommended area to the west of the CNMI. The presence of these hydrothermal vents is the result of the circulation of hydrothermal fluids, which are a necessary component for the formation of polymetallic sulfide deposits. The presence of a hydrothermal vent does not directly correlate with the presence of a polymetallic sulfide deposit. When present, the majority of a deposit is buried beneath sediment, making detection difficult without physical sampling and application of geophysical exploration methods. To date, no field work within the area has been conducted expressly for the purpose of locating polymetallic sulfide deposits using physical sampling or geophysical exploration techniques. The presence of polymetallic sulfide deposits in the area is therefore inferred based on the geologic setting and presence of hydrothermal vents.

The RFI noted that BOEM, based on information received, would determine if any responses identify specific areas of interest in and around the RFI Area that could support commercial mineral development. With the inclusion of the additional western area that was included in several indications of interest, the recommended area is approximately twice the size of the RFI Area. Collectively, all areas with three or more indications of interest are fully contained within the acreage/blocks included in the Area ID recommendation.

The recommendation is for selected tracts east and west of the CNMI to be considered in the environmental analysis conducted for the proposed lease offering. BOEM will consider available

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[1] USGS Global Resource Viewer. September 24, 2024. World Regions of Interest for Ferromanganese Minerals
[2] USGS Global Marine Mineral Prospective Regions Map. January 31, 2025. https://www.usgs.gov/media/images/global-marine-mineral-prospective-regions-map.
[3] USGS Fact Sheet 2025-3017: April 2025. fs20253017.pdf - U.S. Geological Survey Global Seabed Mineral Resources
[4] Beaulieu, SE; Szafrański, KM (2020): InterRidge Global Database of Active Submarine Hydrothermal Vent Fields

environmental information and comments received through the RFI that inform the environmental review of activities permissible under a lease which are preliminary activities[5] needed to prepare plans for comprehensive technical and environmental review by BOEM. The comments received in response to the RFI will also inform future project specific environmental analysis if leases are issued and plans are submitted by lessees for work under their lease.

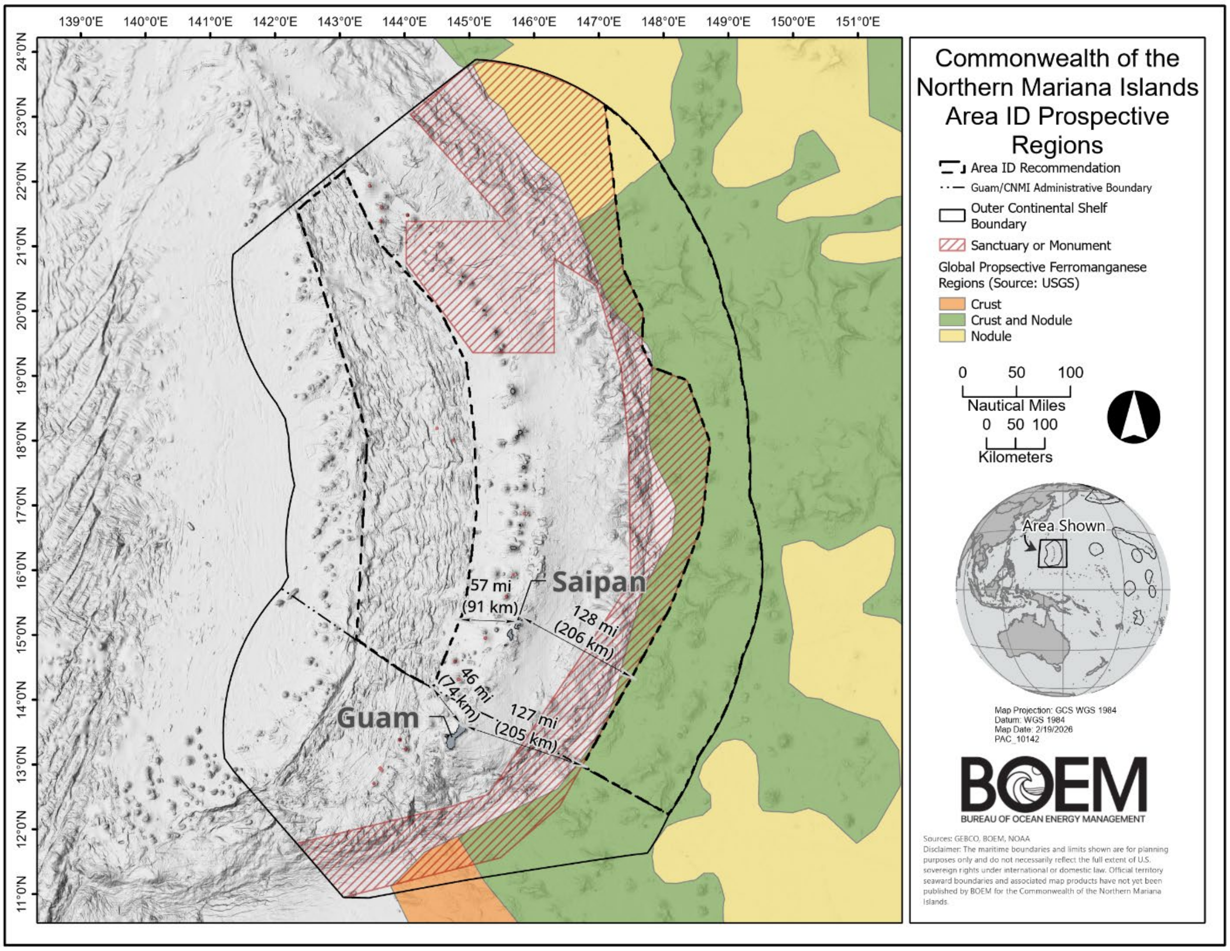

Figure 2: CNMI Marine Minerals Prospective Regions Map. Global prospective ferromanganese regions for crusts are shown in orange, and prospective ferromanganese regions for nodules are shown in yellow, based on the USGS Global Marine Mineral Prospective Regions Map[6]

We recommend that you consider for environmental analysis for potential leasing all available blocks within the CNMI RFI Area plus an additional area to the west of the CNMI, as shown in the CNMI Area ID Map (Figure 3). This Area ID recommendation

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[5] Preliminary activities are bathymetric, geological, geophysical, mapping, and other surveys necessary to develop a comprehensive Delineation, Testing, or Mining Plan. 30 CFR 582.21(d).

[6] USGS Coastal and Marine Hazards and Resources Program. Global Marine Mineral Prospective Regions Map. January 31, 2025. https://www.usgs.gov/media/images/global-marine-mineral-prospective-regions-map.

constitutes an area of approximately 12,750 whole or partial blocks covering approximately 69,101,413 acres. This Area ID recommendation does not commit DOI to future leasing or a specific number of blocks or acreage to be offered at the lease sale stage.

- This Area ID recommendation provides flexibility as BOEM completes the required consultations, environmental analyses, and development of reasonable alternatives pursuant to National Environmental Policy Act (NEPA) and other statutes.
- The environmental analysis, which will be completed before making any decisions to hold a lease sale, will inform potential exclusions and best management practices that can be applied to leases issued in a potential CNMI OCS mineral lease sale.

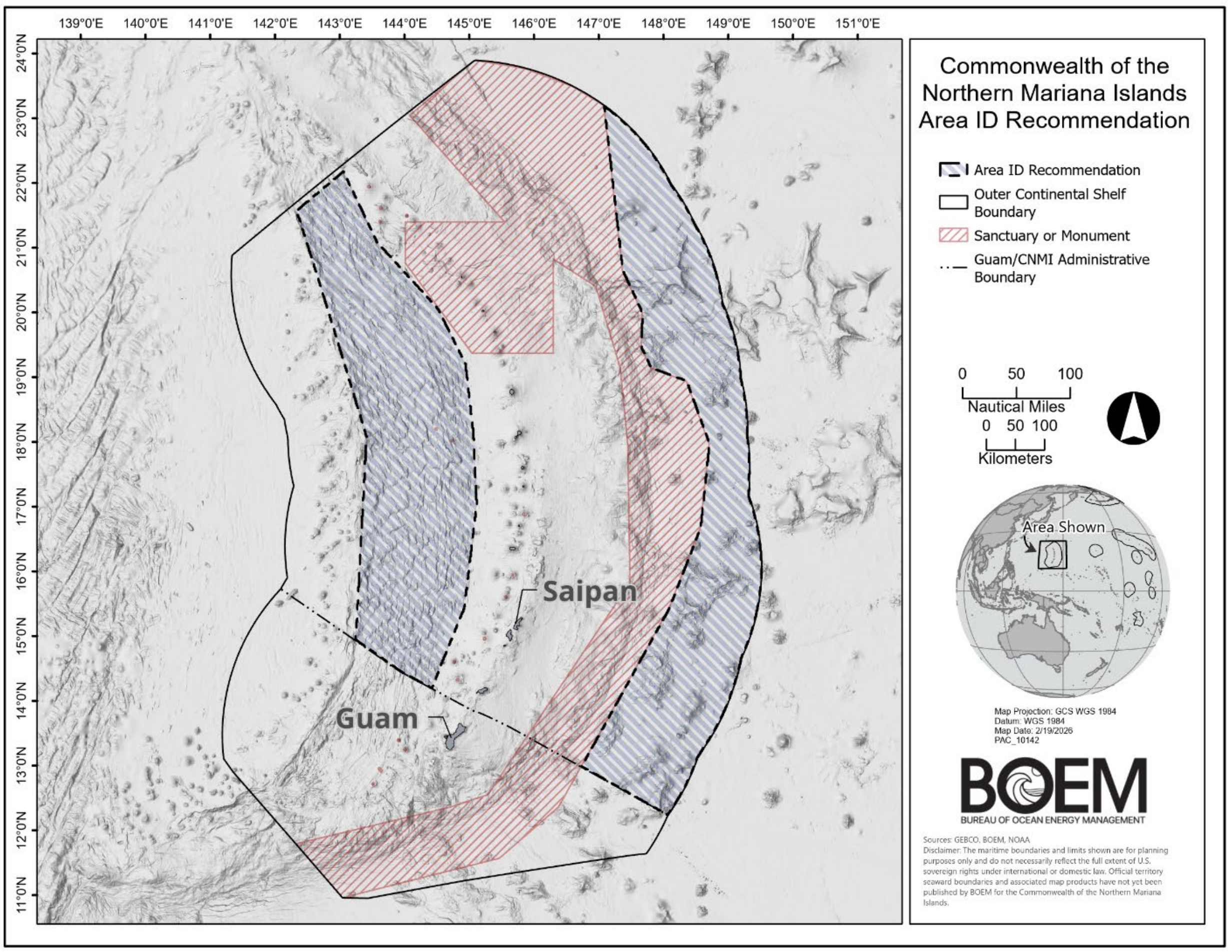

Figure 3: CNMI Area ID Recommendation Map.

V. Decision Options

Please indicate your decision by signing and dating this memorandum and marking appropriately below:

☑ I concur with the recommendation. Please continue with the Area ID announcement.

______ I have made edits to modify the Area ID recommendation; please finalize and continue with the Area ID announcement.

______ Please stop preparations for the Area ID announcement.

MATTHEW GIACONA Digitally signed by MATTHEW GIACONA Date: 2026.03.16 12:30:30 -04'00'

Matthew N. Giacona
Acting Director
Bureau of Ocean Energy Management

3-16-2026
Date

Attachment 1. BOEM CNMI RFI Public Comment Summary Report

U.S. Department of the Interior
Bureau of Ocean Energy Management

BOEM Commercial Leasing for Outer Continental Shelf Minerals Offshore the Commonwealth of Northern Mariana Islands

Request for Information and Interest

Public Comment Period

Docket BOEM-2025-0351

Condensed Summary Report

January 26, 2026

Prepared by

ICF

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Introduction

The Bureau of Ocean Energy Management (BOEM) published a notice in the Federal Register (FR) on November 12, 2025 (90 FR 50872) requesting information and comments on, and indications of interest in, the leasing of Outer Continental Shelf (OCS) minerals in and around an area offshore the Commonwealth of the Northern Mariana Islands. BOEM The comment period was extended on December 12, 2025 and closed on January 12, 2026.

Through January 12, 2026, BOEM received a total of 37,856 public comment submissions in response to the RFI (Docket BOEM-2025-0351). Of the total 37,856 public submissions, 1,666 have been identified as unique (324 substantive and 1,342 non-substantive); 36,138 copies were associated with 29 form letter campaigns,[1] petitions, and letters with multiple signatories; and 52 were considered duplicate or not germane. The 324[2] substantive submissions and form letter campaigns are reflected in today's report.

[1] BOEM is still tabulating the number of form letter copies associated with one campaign that were received via email. The number is anticipated to be in excess of 20,000 comments and is not included in the counts in this paragraph.
[2] Two substantive commenters submitted 17 additional submissions that only contained reference or supporting material with no additional comment text. These comments were flagged for "Cites data, reference or publications" but do not appear in this report as they are not coded to an issue. The total count of substantive comments with text included in this report is 307.

General Comments

A few commenters expressed support for BOEM advancing exploration and evaluation of potential commercial leasing, emphasizing the importance of the U.S. Exclusive Economic Zone (EEZ) and the need for federal oversight.

Many commenters express significant concern about irreversible damage to deep sea ecosystems, and highlight potential threats to marine food webs, endangered species, coral reefs, fisheries, noise pollution, light pollution, and toxic releases associated with mining activities. Some commenters cited potential violations of numerous laws including the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), Marine Mammal Protection Act, Endangered Species Act, and Coastal Zone Management Act (CZMA).

Many commenters cited the growing global consensus against deep sea mining, noting that approximately 40 organizations in approximately 40 countries, over 65 major corporations, 37 financial institutions, and more than 940 marine scientists and experts have called for a moratorium.

Many commenters called for respect of Indigenous rights and sovereignty in decision-making about ocean resources, emphasizing their deep cultural, spiritual, and ancestral connections to the ocean surrounding the Mariana Islands. Some commenters cited principles such as FPIC and the United Nations Declaration on the Rights of Indigenous Peoples.

Several commenters requested 30- and 120-day extensions to the comment period.

Background

Support for Deep Sea Mining Prospects

Some commenters wrote that leasing in the proposed area could mitigate national security risks, provide large quantities of critical minerals, provide revenue for the U.S. Treasury, and support blue economy initiatives.

Concerns Over the Necessity and Efficiency of Deep Sea Mining

Some commenters questioned the RFI's justification for the need for critical minerals, saying:

- Emerging technologies and innovations in recycling are beginning to replace the need for deep sea minerals;
- Deep sea mining can only provide 4 of the 60 USGS-defined critical minerals, all of which are already readily available;
- Terrestrial sources of critical minerals already exist and their extraction is more efficient; and
- Deep sea mining is unnecessary, inefficient, and unsuitable for meeting clean energy goals.

Commenters said that deep sea mining is economically unfeasible due to falling demand and prices for key minerals, rising operational costs, and advances in battery technology that reduce reliance on seabed resources. Another commenter said there is no evidence that it is yet possible to recover seabed nodules at scale.

Some commenters disputed the notion that deep-sea mining in the RFI area would be beneficial for national security, reasoning that it would alienate allies who have imposed moratoria on deep-sea mining, that military operations depend on predictable ocean conditions, and that deep-sea mining could cause ecological problems that lead to resource scarcity and geopolitical instability.

Expanded Definition "State" under OCSLA, General Legal Authority, and Other Legal Issues

Some commenters reasoned that a national security or a "militarized" framing, based in an executive order, cannot expand BOEM's authority beyond the activities that OSCLA authorizes. Commenters cited the Supreme Court's Loper Bright decision and the Major Questions doctrine as a rationale to support the position that BOEM is attempting to exceed its narrow statutory authority, and also argued that the 2022 amendments to OCSLA only authorized territorial wind leasing, and that OCSLA is otherwise focused on oil and gas, without authorizing mineral mining.

A commenter wrote that OCSLA requires that BOEM balance mineral development with environmental protection and consider the needs of affected communities. Another commenter remarked that the RFI failed to do this balancing and as such, is arbitrary and capricious. Some commenters remarked that OCSLA does not include a revenue-sharing formula for territorial OCS leasing to guarantee CNMI a significant share of economic value or a provision to give CNMI authority or veto over decisions.

A commenter described the inclusion of CNMI within the definition of "State" as illegitimate and as contrary to the CNMI Covenant. Another commenter said that treating CNMI waters as a U.S. EEZ is to treat it as empty water and to disregard obligations to non-self-governing peoples, United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) rights, and Covenant protections.

Historical, Cultural, and Indigenous Rights Considerations

Many commenters wrote that indigenous people, including those of CNMI, have a right to free, prior, and informed consent (FPIC) for development projects within their territories, and generally urged BOEM to achieve such consent before moving beyond the RFI stage. Other commenters generally criticized the proposed leasing as a violation of the Covenant, which requires the United States to respect the self-determination of the people of CNMI.

Geopolitical and International Law Considerations

A commenter stated that there are serious geopolitical risks with the United States pursuing deep sea mining outside the UNCLOS framework. Other commenters remarked that many other countries have declined to pursue deep-sea mining until an international framework can be established or outright banned it, including neighboring island countries. Other commenters generally emphasized the need for governance frameworks for deep-sea mining before proceeding with leasing.

Coordination and Consultations

Government of CNMI and U.S. Federal Agencies

Commenters requested that the government of CNMI, Guam, and local governments be transparently consulted and engaged in any leasing decisions in the RFI area. A commenter remarked that the CNMI Covenant requires that the U.S. and CNMI governments regularly consult on matters affecting their relationship. Some commenters criticized the RFI process, stating that no representatives of the CNMI or Guam governments were included in its drafting or given prior notice of its publication.

One commenter requested that CNMI officials be included in monitoring and oversight of any future mining activities in the area. Another commenter urged that CNMI officials and agencies be included in the development of governance, permitting, revenue-sharing, and regulatory frameworks. Another commenter called for the creation of official CNMI working groups advisory committees.

Some commenters remarked that governments of CNMI and Guam have the right to initiate a Federal-State task force, and that BOEM should honor any such request. One of these commenters added that under OCSLA, BOEM must "accept recommendations" from CNMI and Guam related to leasing, prior to issuing a final sale.

Indigenous Peoples of CNMI

Many commenters generally said that BOEM must fully consult with the indigenous people of CNMI as part of any leasing process around CNMI and incorporate their input in any future decision, including by giving significant weight to local concerns, holding public hearings with adequate advance notice and language support, providing culturally appropriate educational resources, and generally assisting local communities in assessing risks and benefits. Some commenters remarked that the indigenous peoples of CNMI, the Chamorro and Carolinian peoples, possess information that would be crucial for leasing in the area, including knowledge of ocean systems, marine species behavior, and seasonal patterns.

Some commenters remarked that such consultations are needed to fulfill the FPIC rights of the indigenous peoples of CNMI, consistent with UNDRIP. Other commenters more generally said that the consultations must be not only informative, but determinative for future leasing plans and respect the agency of the local indigenous peoples. Other commenters stated that indigenous governance structures, like the Chamorro Tribe, must be considered sovereign tribal governments with standing in BOEM deliberations.

Other Coordination and Consultations

Some commenters recommended consulting and engaging with other individuals and entities, including local organizations in CNMI, fishermen, regional fishery and ocean management entities, customary leaders, small businesses, and community elders. A commenter recommended that BOEM ensure all consultation is culturally inclusive, proactive, and accessible.

Commenters requested that this consultation include providing clear summaries of official documents relevant to the leasing process, holding in-person public meetings to listen and to provide information on multiple islands, and providing transparent environmental data. Another commenter urged BOEM to incorporate public consultation mechanisms into all decision-making processes related to deep-sea mining.

A commenter requested that BOEM formally convey territorial concerns to the Secretary of the Interior and Congress, particularly that without establishing statutory revenue-sharing, any deep sea mining in the area would be viewed locally as "profoundly inequitable."

Leasing Process

A few commenters, including a Federal agency, said that BOEM should develop a clear leasing schedule to allow for the incorporation of ongoing data collection efforts.

Multiple commenters expressed concern about the governance for seabed mining, saying that the International Seabed Authority (ISA) has delayed decisions on exploitation regulations, the local government in Guam and CNMI does not have the institutional capacity to oversee seabed mining, and the federal government will need to administer and oversee the project or provide direct financial support to CNMI for it to be administered locally.

An industry commenter suggested that BOEM adopt a performance-based environmental framework that qualified bidders will be required to commit to meeting. A commenter said that if BOEM proceeds with leasing, they must ensure compliance with Clean Water Act requirements.

A commenter suggested the creation of preservation reference zones that are similar to mined areas in biological, physical, and chemical properties to provide a comparison to show whether changes in mining-impacted areas are natural or caused by the mining activity.

A commenter said that competitive leasing is not appropriate for hard mineral mining claims.

Rental and Royalty Rates

An industry commenter expressed support for BOEM's proposal not to charge rent during the first five years of leases, and encouraged BOEM to suspend rental payments while BOEM reviews testing and exploitation plans. The commenter favored a structure that relies more heavily on royalty payments, similar to the structure employed in the Cook Islands. An industry commenter said that it is premature to set rental rates because there needs to be some reconnaissance work to determine whether there is profitable mineral exploitation in this area.

Industry and other commenters suggested royalty rates:

- No higher than 3 percent, and also incorporate a lower royalty rate of 1.5 percent for the first five years of paying royalties; and
- Based on revenues generated, not on the nodules themselves.

Commenters stated that BOEM should ensure royalty rates provide a fair return to BOEM and to reject low rates proposed by industry of 3 percent or lower. A commenter recommended that robust royalty and compensatory mitigation programs be put in place to offset impacts to ocean resources and the local economy.

Auction Format and Lease Size

An industry commenter expressed support for transparent, competitive bidding mechanisms such as an ascending oral bid auction with low minimum bid levels. A commenter favored a sealed bid format. Another commenter supported transparent financial terms and bid formats for competitive fairness and public benefit.

A commenters suggested leases sizes:

- 75,000 km^2 leases consistent with other ISA exploration contracts; or
- Minimum areas of 25,000 km^2 if smaller areas are necessary.

Lease Contraction Clauses

A commenter said that the two-stage lease contraction schedule seems reasonable, but said the contraction parameters should be clearly defined in advance with the first contraction reduced to no more than 25 percent of the original lease area and the second reduced to 5 to 10 percent of the original lease area.

A commenter said that they could not meaningfully comment on the parameters of a lease contraction on the basis that a leasing program involving potentially just one leaseholder is not appropriate or workable.

Liability and Bonding Concerns

A commenter raised concerns about the liability of companies for damages from their actions and recommended that BOEM require all applicants to obtain adequate insurance and provide financial assurance to ensure compliance with lease terms, ensure coverage for environmental damage, and cover decommissioning obligations. A commenter said that since annual rental payments are not required under 30 CFR 581.27, environmentally risky activities can occur with insufficient financial accountability and without any guaranteed financial benefit to the affected territories.

Baseline Data Collection and Environmental Assessment

Many commenters discussed the lack of comprehensive baseline data in the RFI areaA commenter asked BOEM to make available to interested parties the data that has been collected in the RFI area from various research missions. A commenter urged BOEM to complete the Maritime Heritage Study that was terminated in September 2025. Another commenter said that leasing would unlock private-sector capital for high resolution bathymetry and backscatter, habitat classification and biodiversity baselines, and long-term oceanographic and geochemical monitoring. The commenter said that these data sets would materially advance NOAA's scientific mission.

Commenters said that baseline data are needed to characterize habitats, document species and their interactions, and quantify existing anthropogenic impacts on the local deep sea ecosystem so that impacts from deep sea mining can be prevented and mitigated. Several commenters also discussed the need for ongoing environmental monitoring. A commenter stated that current monitoring technologies are not capable of detecting some of the most ecologically important forms of disturbance such as sediment plumes, shifts in microbial communities, and changes in geochemical gradients.

Survey Technologies and Methodologies

Industry commenters described various technologies for underwater mapping, sampling, positioning, and monitoring, including AUVs, underwater positioning and communication systems, seabed mapping technology, water column acoustic technology, and inspection and monitoring technology.

RFI Area Information

Commenters stated that BOEMs written description of the RFI Area contains a directional mistake about its location, saying that the RFI states that the area was west of the Mariana Trench, when it is east. Commenters said that the area, which is approximately 35.4 million acres, includes abyssal plains, seamounts, guyots with depths ranging from 1,130 to 7,650 meters. A commenter added that the area consists of 6,502 whole or partial Outer Continental Shelf (OCS) lease blocks.

Several commenters described the region as sitting on ancient oceanic crust and containing prominent geological features. A commenter stated that the RFI Area lies within a marine mineral prospective region for ferromanganese crust and nodule deposits which makes the RFI area suitable for OCS mineral development. The same commenter suggested comprehensive exclusion of seafloor sulfide and cobalt-rich crust seabed mineral resources from consideration for future mining leases and discussed the invasive effects mining would have on the area.

Potential Hazards on the seabed in and around the RFI Area

Many commenters said that there is insufficient baseline geological, ecological, and cultural data, with some commenters citing the termination of BOEM's maritime heritage study. Commenters also discussed active volcanic conditions which make the region unpredictable and are potential hazards to fragile ecosystems, fisheries, and biodiversity. Commenters added that underwater cultural heritage, including shipwrecks, plane wrecks, and ancestral sites, remain largely undocumented and could be irreversibly damaged by mining. Some commenters expressed concern about the presence of human remains in submerged aircraft from World War II.

Many commenters expressed concern that BOEM lacks the foundational scientific, archaeological and ecological data needed to evaluate potential mining impacts.

Other Uses of the RFI Area

Commenters stated that other uses of the RFI area include shipping routes, tourism and recreation, and commercial and recreational fishing. Additional uses include submarine telecommunication and scientific research in marine science.

Impacts on Ecosystems and Species

Mariana Trench National Monument and Other Areas of Concern

Several commenters expressed concern about effects on the Mariana Trench National Monument from deep-sea mining in the area due to the rich biodiversity, important hydrothermal vents, seamount habitats, and the monument's importance to food chains, fishing security, diverse species, food webs, and more. A few commenters referenced specific features of the Monument, including the submerged caldera at Maug, the waters around Asuncion and Farallon de Pajaros, and Sirena Deep as hotspots of complexity and diversity. Some commenters expressed concern that the proposed mining actions would violate proclamations that established the Monument and regulations governing the preservation and management of the area.

Water Quality

Several commenters described sediment plumes as detrimental to water quality by disturbing and redistributing sediment on the seafloor and smothering benthic communities while mining and second, by discharging any unwanted mud, silt, and debris from the above-surface mining vessel. Commenters said that, with ocean currents, sediment discharge and plumes can travel hundreds of miles or kilometers. Several commenters said that mining could release heavy metals and toxins into the water that will bioaccumulate in the tissues of pelagic fish consumed by humans.

Pelagic and Benthic Communities

A commenter shared concerns over the health of different phytoplankton and zooplankton species that live in the pelagic habitats near the Mariana Trench, stating that plankton form the base of the food web, with many marine species feeding on them. A commenter stated that deep sea mining activities could disrupt the migratory pathways and alter foraging behaviors of pelagic species like tuna, marine mammals, and turtles.

Commenters wrote that the vast majority of the seafloor has yet to be mapped, but the deep sea environment—and seamounts in particular—is known to host extraordinary biodiversity characterized by low population densities and slow recovery rates. Commenters also said there is a major gap in knowledge regarding the species which inhabit the abyssal, bathypelagic, and mesopelagic zones. A commenter said that there is extensive benthic microbial data from many samples in the western part of the CNMI region, but not in the RFI area.

Several commenters discussed the biodiversity and sensitivity of benthic communities, including endemic and rare species, as well as countless undescribed and undiscovered benthic species. Of particular concern are seamounts and hydrothermal vents, which host a great diversity of species that also differs across spatial scales. Commenters stated that the CNMI EEZ deep sea areas are home to biological communities that are distinct from other regions in the Pacific. Citing the length of recovery and growth time in benthic communities and habitats, several commenters remarked that the impacts from deep sea mining will be essentially permanent.

Commenters likewise described the ecosystem services that nodules offer benthic communities. A commenter said that cobalt-rich crusts host nursery, foraging, and migration habitats essential to fisheries that support CNMI food security and cultural practice, while another commenter cited research showing that deep-sea organisms depend on polymetallic nodules to survive.

Impact Producing Factors (IPFs)

Several commenters expressed concern about noise, light, and chemical/waste pollution from deep-sea mining activities and their potential to destroy deep-sea ecosystems and pelagic species, sharks, whales, and dolphins, the seafloor, and more. Several commenters discussed these impacts as being cumulative stressors and asserted that ecosystems and marine life affected by these stressors would be slow to recover, if at all.

Some commenters added that migratory species such as sea turtles and whales would be particularly vulnerable to noise and light pollution. Some commenters asserted that noise pollution interferes with marine animal communication, navigation, foraging, and reproduction, and can even cause behavioral changes among certain species, especially marine mammals and cetaceans.

Some commenters asserted that deep-sea species are accustomed to stable and dark, quiet environments and these combined effects of disturbance might lead to unpredictable impacts. A couple of commenters added that light from deep-sea mining will affect marine wildlife from the seafloor to the surface, and can even disorient birds and attract species such as squids. A few commenters also discussed impacts from increased vessel traffic in and around the lease area, including vessel strikes on marine species.

Fish and Essential Fish Habitat

Several commenters expressed concern about the impact of mining activities on fish populations and species, including those crucial to international fisheries and stocks important to food security, including tuna, bottomfish, and other pelagic fish. Commenters discussed effects such as changes in behavior and migration patterns, stunted growth, reduced forage, reproductive outputs, and more.

A commenter expressed concern about the effect of sediment plumes on certain ray populations, including the potential to cause harm while filter feeding, harm to deep-diving reef mantas, and generally the presence of understudied and endangered ray species within and around the leasing area.

Commenters described the EFH for Pacific pelagic fisheries as the marine water column from the surface to a depth of 1,000 meters, and from the shoreline to the outer boundary of the EEZ is for juveniles and adults, while the surface to 200 meters of depth is designated EFH for egg/larval stages. They added that for the American Samoa Bottomfish fishery, the water column from the surface to a depth of 400 meters is designated EFH for all life stages.

Birds, Sea Turtles, and Marine Mammals

A couple of commenters expressed concern about the effects on seabirds, including impacts to foraging grounds, prey availability such as forage fish, transfer of invasive species into the CNMI, the introduction of artificial light and noise, and more.

A commenter stated that green sea turtle and hawksbill sea turtle species occur within the proposed leasing area, and asserted that deep-sea mining could affect them through sediment plumes, noise, and light.

Several commenters expressed concern about noise and sediment plume impacts, as well as vessel traffic and ship strikes, to marine mammals like humpback, beaked, and sperm whales, as well as numerous species of dolphins. Commenters cited numerous species that occur within the Mariana Archipelago and surrounding areas.

Environmental Sensitivity and Marine Productivity

Several commenters generally discussed the relative environmental sensitivity and marine productivity in and around the CNMI RFI, including but not limited to rich and biodiverse ecosystems, abundance of distinct species, some of which are endangered, and important national monuments, such as the Mariana Trench National Monument. Some commenters asserted that scientists are still discovering new species, ecosystems, and deep-sea features within the RFI area, and that many species there may still be unknown to science.

Commenters expressed concern about the potential loss of biodiversity from deep-sea mining and extremely slow recovery timelines for deep-sea ecosystems, including irreversible long-term damage. A commenter cited recent trials using a commercial nodule collector showing biodiversity loss with the type of equipment that would be used for the proposed mining operations. A commenter cited in particular the biodiversity of intertidal zones, as well as Coral and Seagrass Areas of Special Significance within the RFI.

Several commenters discussed the function of deep-sea life and ecosystems in dark oxygen and microbial production, nutrient recycling, and carbon sequestration processes, with some calling the deep ocean the "largest carbon sink on Earth." A couple of commenters expressed concern that vessels and equipment used to support mineral extraction might have the potential to bring invasive species into the RFI area.

Cross Boundary Impacts

Several commenters expressed concern about the potential for transboundary impacts from deep-sea mining activities across the CNMI and into sister islands like Guam, Micronesia, and Palau, including spillover effects from oil spills, drilling discharge, and sediment plumes, as well as increased vessel traffic and geochemical and water temperature alteration.

Mitigation

Some commenters generally discussed the need to establish mitigation measures and response and management practices for areas affected by deep-sea mining. Commenters also expressed concern about the lack of proven methodologies to mitigate environmental impacts and the challenges of restoring or simply managing and overseeing sites affected by deep-sea mining.

Commenters proposed certain mitigation measures, including plume elimination, selective harvesting requirements, third-party monitoring, and spatial restrictions. A few commenters urged BOEM to establish avoidance areas and protective buffers (such as a 5-mile "no-mining" zone) for culturally significant and sensitive areas. A commenter urged BOEM to require that contractors establish a Hazard Disaster Mitigation Reserve Fund that would cover response, monitoring, and remediation.

ESA, MMPA, NEPA, CZMA, NHPA

Commenters generally discussed the intent and need of the ESA and the incidence of endangered species in and around the waters of CNMI and Guam waters, including marine mammals, sea turtles, sharks, and other species. A commenter asserted that deep sea mining in the RFI area would require consultation with NMFS and U.S. FWS under the ESA due to the presence of numerous ESA-protected species, federally protected critical habitat for ESA-listed species, and likely harm to ESA-listed species from deep sea mining.

A commenter asserted that the proposed deep sea mining in the project area would violate the MMPA, unless BOEM were to specifically obtain take authorization.

Commenters expressed concern that deep sea mining and OCS mineral leasing would likely conflict with the goals of Guam's Coastal Zone Management Program, which protects marine environments and cultural heritage. A few commenters stated that such activities could present a legal barrier under the CZMA, which requires Federal actions affecting the coastal zone to be consistent with approved territorial programs.

A couple of commenters asserted that the proposed program would trigger Section 106 of the NHPA, where BOEM is required to consider the effects of its actions on historic properties and to consult with relevant stakeholders. Some commenters added that consultation with Guam's historic preservation office and other Chamorro and Refaluwasch parties must occur before any issuing of leases, and that consultation must be coordinated with NEPA review.

Cultural and Socioeconomic Information

Subsistence and Commercial Fisheries

Commenters expressed concerns about impacts to commercial and subsistence fisheries from proposed deep-sea mining activities. Commenters identified multiple potential impact pathways to fisheries from deep-sea mining, such as sediment plumes, noise and light pollution, vessel traffic, and bioaccumulation of heavy metals like manganese, nickel, copper, and cobalt. A few commenters said that deep sea mining would threaten commercially important fish species, including the $5.5 billion Pacific tuna industry.

Commenters described the different types of fishing methods and gear employed in the CNMI including handlines, long lines, bottom fishing methods, nets, and traps. One commenter remarked that seasonal use patterns are critical and that many fisheries rely on predictable migration routes and spawning periods, which could be disrupted by industrial activity. One commenter said that while no Indigenous fishing is currently being conducted in the RFI area, the CNMI is interested in establishing a longline fleet, which could introduce spatial conflicts with the proposed lease area. The commenter said that if the fleet were to be established, it would most likely employ pelagic longline methods.

Commenters discussed that fisheries in the CNMI and Guam are vital for food security, food sovereignty, and economic stability, with many residents relying on subsistence fishing to feed their families. A few commenters remarked that approximately 96 percent of CNMI residents who fish do so for subsistence purposes, with an estimated 450,000 pounds of coastal subsistence catch valued at nearly one million dollars annually. Several commenters expressed concerns that DSM activities would contaminate seafood, compounding consumption hazards in both local and global seafood supply chains. A few commenters expressed concerns that depleted or contaminated fish stocks would increase the region's dependence on expensive and processed imported foods.

Commenters said that the RFI lacks clear recommendations for reducing conflicts between mining and fishing operations, particularly for small-scale and Indigenous fishers. Commenters questioned whether there would be compensation or remediation if fisheries collapse or livelihoods are affected by mining activities.

Impacts on Other Industries

Several commenters expressed concerns over the impact that deep sea mining would have on tourism and recreation in the CNMI and Guam, including interfering with activities like whale watching, diving, fishing tours, and snorkeling. A few commenters specifically said that depletion of coral reefs would threaten the area's tourism pull while others described tourism as a primary, consistent form of revenue for the area, supporting local economic independence and resilience.

Benefit Sharing and Statutory Protections

Several commenters expressed concerns that current proposals do not guarantee local job creation, investment in CNMI infrastructure, or meaningful benefit sharing frameworks with Guam or the CNMI. More specifically, a few commenters expressed concern that under existing statutory frameworks, royalties, rents, and bonus bids from DSM would go directly to the U.S. Treasury.

Cultural Concerns and Information on Indigenous Peoples

Many commenters remarked that the ocean is not only a resource but a fundamental part of Chamorro and Refaluwasch identity and cultural heritage. Commenters described the ocean as an ancestor, provider, teacher, and living entity that connects Indigenous communities across generations and islands. Commenters stated that Indigenous ways of life are deeply intertwined with the ocean through traditional practices, legends, and spiritual beliefs.

Many commenters described the seafaring traditions of Indigenous communities, saying that the proposed leasing area interferes with traditional navigation routes and wayfaring techniques. Commenters likewise expressed concern that the environmental impacts of DSM would compromise their ability to engage in traditional medicine and healing practices along with culturally significant ceremonies. Many commenters also described fishing's role in culture and subsistence, then expressing concerns that DSM would interfere with Indigenous people's fishing-oriented traditions.

Commenters expressed concern that mining would destroy underwater cultural heritage sites including shipwrecks, airplane wrecks, submerged landscapes, and archaeological materials that are largely unrecorded and irreplaceable. Several commenters also shared that seamounts and trenches hold cosmological importance and appear in oral histories, creation narratives, and place-based genealogies of Indigenous peoples.

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Information Memorandum

Subject: Calculation of Geotechnical Sampling and Geophysical Survey Effort for Seabed Massive Sulfides Development and Polymetallic Nodules in the Commonwealth of the Northern Mariana Islands.

Summary: The Bureau of Ocean Energy Management (BOEM) Pacific Region's Engineering and Technical Review Section (ETRS) has developed a model to calculate the amount of survey effort that would likely be conducted by lessees as approved preliminary activities in their leased areas, for Seabed Massive Sulfides and Polymetallic Nodules, in preparation of a delineation, testing, or mining plan. This model produces estimates of survey effort (days and trips), and bottom disturbance (in m^2 and % of lease) for these preliminary activities. These estimates are required for production of an environmental analysis of OCS mineral leasing actions. This memo is specific to the Commonwealth of the Northern Mariana Island (CNMI) Exclusive Economic Zone (EEZ).

Background: Federal actions resulting in critical mineral leasing in CNMI's Exclusive Economic Zone (EEZ) require an environmental analysis. In support of this, two models were produced by BOEM Pacific ETRS to calculate an estimate for surveying and sampling effort that would provide enough data to inform a delineation, testing or mining plan submission.

The two models differ in the resource to be developed, polymetallic manganese nodules (PNM) and seafloor massive sulfides (SMS). Both resources, in CNMI, exist in separate oceanographic and geological conditions. PMN can be present on the deep abyssal plains and hills on older ocean crust and are likely to be present east of the Marianas Trench. SMS could be present near and around the Mariana Trough, an active spreading center west of the Marianas Islands.

The two resources also differ in their presentation. PMN are typically on the seabed, largely unburied. It is thought that a "mineable resource" of PMN would have to be at least 6,000 km^2 in size to make economic sense, if the nodule abundance is high enough. SMS exist near a seafloor spreading center as the end state of extinct hydrothermal venting. These deposits are small, less than a km across, and could be partially buried. It is thought that SMS might only extend "off axis" 10-20km from an active spreading center. SMS might still exist but would likely be buried past this limit (Sen et al, 2024).

The sizes and provenance of the two deposits have distinct impact on the type of survey work that would be utilized to discover the deposits. PMN prospecting usually starts with a large regional effort to map the seabed using low or medium frequency hull mounted multibeam echo sounders (MBES). This is followed by a grid pattern of box cores, free fall grab samplers, and drop cameras. The grid can have sample sites of up to 50km. However, even with a grid this size, a mineable PNM resource of 6,000 sq km could be detected. Follow on surveys with more geotechnical work, and higher resolution AUV surveys would follow defining the resource in greater detail. Only very dense survey work would be required during a delineation survey (BOEM 2026 AS EA APPENDIX 1).

SMS prospecting differs in many ways from PNM prospecting. Typically, the first step is to, again, conduct a large regional effort to map the seabed using hull mounted MBES. In addition, a chemical oceanography effort is undertaken to try to find evidence of active plumes of water that have passed through a hydrothermal system. Once active hydrothermal vents are located ETRS envisions a very dense survey effort undertaken with AUVs to find inactive or extinct hydrothermal sites “off axis” of the spreading center. These inactive and extinct sites were moved by the tectonics of the spreading center, separated from their heat source, and are no longer active (Jamison and Gartman, 2020). This type of survey, still in the prospecting stage, requires a very close line spacing near 150m for the AUV. Any discovered SMS sites would then be explored by ROV, with camera, sonar, and direct sampling of the seabed. Typically, a rock drill would be then used to sample into the seabed to try to find the thickness of the SMS, as the size, thickness, and makeup of the SMS is needed to determine its economic potential. BOEM has currently taken the stance that use of a rock drill, seismic surveys, electromagnetic surveys, and piston coring should be considered in a delineation plan and is not part of the preliminary activities.

Discussion of survey work performed to assess PNM is found in the PNM section below. Three PNM assessments were consulted to ascertain the typical approach by industry to find a mineable resource of PNM. A model was developed by ETRS and used for a potential lease lase in American Samoa. ETRS revisited this model, and adapted it to the size of a potential CNMI PMN lease sale.

Typical survey efforts for SMS detection were based largely off an assessment done by Nautilus Minerals for their lease near Papa New Guinea (Nautilus Minerals Niugini Ltd, 2018). Searching for active hydrothermal sites is common on scientific cruises. Methods for detecting off axis extinct SMS resources are still somewhat unknown. ETRS has developed a likely scenario for finding these resources. Discussion of these surveys is in the SMS section below.

Surveys and survey effort for PMN (leases in the eastern area): Discussion on developing the model for survey effort and bottom disturbance can be found in “Calculation on Geotechnical Sampling and Geophysical Survey Effort for Deep Water Critical Mineral Development” (BOEM 2026). This memo, and model, were developed for the American Samoa Environmental Analysis (BOEM 2026). The model remains mostly the same for CNMI with a few exceptions. Ranges for values provided by the model have been changed to reflect 5%, average, and 95%. This is in line with what BOEM provides in other documentation such as the National Assessment of United States Oil and Gas Resources. Another difference is the slight modification of the total lease area and lease size, as the CNMI leases in the eastern area are slightly larger. Two lease and three lease alternatives were modeled in this exercise. Table 1 provides the size of the leases in the Eastern Area.

Survey Area Size	Sq km
Eastern leasing area (total)	138,000
Lease Area – Two Leases	69,000
Lease Area – Three Leases	46,000
Area of Interest - Two Leases	13800 (9510 to 18090)
Area of Interest - Three Leases	9200 (6340 to 12060)

Table 1: Sizes of Eastern Lease Area in two, and three lease options.

As with the previous American Samoa memo this memo continues to expect that lessees would conduct surveys with increasing resolution during their preliminary activities. These surveys are a “coarse survey” across their entire lease, a “medium survey” using AUVs and a denser free fall grab and box core effort, and a “Area of Interest” survey with denser AUV and geotechnical sampling. In addition, several oceanography cruises are likely to be conducted, deploying oceanographic moorings and environmental landers. Environmental work, including surveying of Preservation Reference Zones (PRZ) would also take place. The calculated survey effort for the coarse, medium, and fine surveys are provided in Table 2,Table 3, and Table 4.

Preliminary Activities - Coarse Survey	Entire Eastern Lease Area	Three Lease	Two Lease	Units
Line Spacing - Low Frequency MBES	10 (8.8 to 11.2)	10 (8.8 to 11.2)	10 (8.8 to 11.2)	km
Line Spacing - Medium Frequency MBES	5 (4.4 to 5.6)	5 (4.4 to 5.6)	5 (4.4 to 5.6)	km
Number of Free Fall Grab Samples (15km grid)	567.9 (257.5 to 1038.2)	189.3 (85.8 to 346.1)	283.9 (128.8 to 519.1)	count
Number of Box core 50km	62.1 (32.1 to 116.2)	20.7 (10.7 to 38.7)	31 (16.1 to 58.1)	count
Survey Duration Low Freq MBES	56.9 (45.9 to 70.2)	19 (15.3 to 23.4)	27.6 (22.2 to 34.2)	days
Survey Duration High Freq MBES	112.7 (91.7 to 137.8)	37.6 (30.6 to 45.9)	54.9 (44.5 to 67.3)	days
Survey Duration Free Fall Grab	81.7 (51.3 to 121.9)	27.2 (17.1 to 40.6)	40.8 (25.6 to 61.1)	days
Survey Duration 50km Box Core	32.8 (18.1 to 58.4)	10.9 (6 to 19.5)	16.4 (9 to 29.3)	days
Trips - Low Frequency MBES	4.8 (4.2 to 5.6)	2.4 (2.1 to 2.8)	3 (2.6 to 3.6)	trips
Trips - Medium Frequency MBES	7.5 (6.4 to 9)	3.8 (3.2 to 4.5)	5.1 (4.2 to 6.1)	trips
Trips - Free Fall Grab Samplers	6 (4.5 to 8.1)	3 (2.2 to 4)	4 (2.9 to 5.6)	trips
Trips - Box Cores	3.6 (2.9 to 4.9)	1.8 (1.4 to 2.4)	2.2 (1.7 to 3.2)	trips

Table 2: Survey estimates for coarse survey.

Preliminary Activities - Medium Survey	Entire Eastern Lease Area	Three Lease	Two Lease	Units
AUV 15km Survey Duration	100.6 (47.9 to 214.2)	33.5 (16 to 71.4)	49.8 (23.7 to 106.1)	days
AUV 15km Survey Linemiles	6133.4 (3782.6 to 16203.6)	3066.7 (1891.3 to 8101.8)	4600 (2836.8 to 12152.6)	km
Number of 10km Box Core	1353.5 (419 to 3237.3)	451.2 (139.7 to 1079.1)	676.8 (209.5 to 1618.7)	count
Survey Duration 10km Box Core	589.4 (188.2 to 1390.3)	196.5 (62.7 to 463.4)	294.7 (94.1 to 695.1)	days
Trips - AUV 15km Survey	7 (4.3 to 12.5)	3.5 (2.2 to 6.3)	4.7 (2.7 to 8.9)	trips
Trips - 10km Box Core	31 (11.1 to 70.8)	15.5 (5.6 to 35.4)	22.8 (7.9 to 52.6)	trips

Table 3: Survey effort for medium survey.

Preliminary Activities - Area of Interest	Entire Eastern Lease Area	Three Lease	Two Lease	Units
AOE AUV Survey Linemiles	5141.6 (3388.4 to 7353)	2570.8 (1694.2 to 3676.5)	3854.8 (2535.1 to 5518.6)	km
AOE AUV Survey Duration	278.1 (208.1 to 353.7)	92.7 (69.4 to 117.9)	125.7 (92.6 to 161.7)	days
AOI Multiple AUV Survey Duration	195.7 (148.7 to 246.2)	65.2 (49.6 to 82.1)	84.5 (63.7 to 106.9)	days
Number of UTP stations for Multiple AUV	443.3 (268.8 to 666.6)	147.8 (89.6 to 222.2)	221.6 (134.5 to 333.8)	count
Number AOI Box Core	565.9 (279.1 to 982.1)	188.6 (104.3 to 305.9)	282.8 (156.3 to 457.9)	count
Duration AOI Box Core	242.6 (131 to 399.3)	80.9 (43.7 to 133.1)	121.2 (65.5 to 198.5)	days
Trips - AOI AUV Survey	15.7 (12 to 19.9)	7.8 (6 to 9.9)	10.3 (7.7 to 13.3)	trips
Trips - AOI Multiple AUV Survey	11.6 (9.1 to 14.5)	5.8 (4.6 to 7.2)	7.2 (5.6 to 9.1)	trips
Trips - AOI Box Cores	13.9 (8.4 to 21.9)	7 (4.2 to 10.9)	10 (5.8 to 15.8)	trips

Table 4: Calculated survey effort for AOI surveys.

Calculated bottom disturbance for the coarse, medium, and fine surveys is presented in Table 5.

Bottom Disturbance	**Three Lease**	**Two Lease**	**Total for the leases in the Eastern Area m^2**
Dredging	57201.2 (22624.1 to 114538.2)	85530.4 (34349.9 to 171854.4)	171603.7 (67872.4 to 343614.7)
Free Fall Grab - Coarse Survey	94.6 (39.1 to 181.5)	142 (58.6 to 273.5)	283.9 (117.4 to 544.5)
Box Core - Coarse Survey	20.7 (9.5 to 40.4)	31 (14.3 to 60.4)	62.1 (28.4 to 121.3)
Box Core - Medium Survey	451 (130.1 to 1101.9)	676.5 (193.9 to 1650.8)	1353 (390.2 to 3305.7)
Box Core - Fine Survey	188.6 (93 to 327.4)	282.8 (139.1 to 489.6)	565.9 (279.1 to 982.1)
UTP Deployments	134.9 (67.4 to 239.4)	202.1 (101.8 to 359.2)	404.7 (202.2 to 718.2)
Total Bottom Disturbance (Incl. Dredging)	58131.6 (23537.9 to 115461)	86859.4 (35679.1 to 173224.6)	174394.9 (70613.6 to 346383.1)
Total Bottom Disturbance (Without Dredging)	815.2 (494.8 to 1583.3)	1224.4 (740 to 2378.2)	2445.6 (1484.5 to 4750)

Table 5: Calculated bottom disturbance for geotechnical and HRG surveys.

Survey effort for oceanographic moorings, environmental monitoring with landers, and surveying of PRZs is given in Table 6.

Oceanography Survey	**Three Lease**	**Two Lease**	**Total for the leases in the Eastern Area m^2**	**Units**
Water Sampling, Current Meter Deployments, Lander Deployments	43.1 (36.2 to 50.2)	64.6 (54.3 to 75.3)	129.2 (108.6 to 150.6)	days
Water Sampling, Current Meter Retrieval, Lander Retrieval	43.1 (36.2 to 50.2)	64.6 (54.3 to 75.3)	129.2 (108.6 to 150.6)	days
Mooring AUV Survey	3.4 (3.1 to 3.8)	5.1 (4.6 to 5.8)	10.3 (9.2 to 11.5)	days
PRZ AUV Survey	20 (17.6 to 23.3)	30 (26.4 to 35)	60.1 (52.9 to 69.9)	days

Table 6: Survey effort for oceanographic surveys.

Bottom disturbance for oceanographic deployments is given in Table 7.

Oceanography Survey Bottom Disturbance	**Three Lease m2**	**Two Lease m2**	**Total for the leases in the Eastern Area m^2**
Bottom Disturbance Oceanographic Moorings	186.7 (95 to 303.8)	280 (142.5 to 455.6)	560 (285 to 911.3)
Bottom Disturbance Landers	7.3 (5 to 9.6)	11 (7.6 to 14.4)	21.9 (15.1 to 28.8)

Table 7: Bottom disturbance calculations for oceanographic surveys.

Percentage of bottom disturbance compared to the size of the leases in the Eastern Area is given in Table 8.

Percentage Bottom Disturbance	Total for the leases in the Eastern Area
Dredging	0.0000012456%
Free Fall Grab - Coarse Survey	0.0000000019%
Box Core - Coarse Survey	0.0000000004%
Box Core - Medium Survey	0.0000000078%
Box Core - Fine Survey	0.0000000038%
UTP Deployments	0.0000000029%

Table 8: Percentage of bottom disturbance from preliminary activities.

Calculation of the number of ships that could be in the PNM leases has been determined by using a very compressed time schedule or five years for lessees to accomplish all of the surveys. In addition, it was assumed that due to weather or fleet availability that only half the year would be available for survey work and that several tenders would also be used. Table 9 presents the number of ships that would be working if these constraints were applied.

Maximum Number of Ships Operating At Once	Ships
Three Lease	1.9 (1.1 to 2.8)
Two Lease	2.5 (1.5 to 3.9)
Total for the leases in the Eastern Area	5 (3 to 7.8)

Table 9: Number of ships in the leases in the Eastern Area if all survey work were to be completed in five years.

Surveys and bottom disturbance for Seabed Massive Sulfides: There is only one assessment for SMS that BOEM is aware of. The Preliminary Economic Assessment of the Solwara Project, Bismarck Sea, PNG, by Nautilus Minerals Niugini Ltd (Nautilus Minerals Niugini Ltd, 2018). The assessment describes some of the historical research cruises that were conducted over the Solwara 1 site, leading to its discovery. A combination of survey methods was employed by these research cruises, including chemical oceanography cruises to detect plumes, submersible investigation, deep-tow video, dredging, and sonar surveys. In all 25 research cruises were conducted in the area. Later surveys, conducted by Nautilus Minerals, included bathymetric surveys, HRG, electromagnetic surveys, seismic surveys, and ROV surveys. Sample collection was conducted by direct sampling from an ROV, piston coring, and the use of a submersible rock drill. Twelve geophysical and sampling surveys were undertaken by the company. The company also conducted four cruises employing seafloor, ROV, and surface drilling techniques.

To determine what a representative exploration survey effort would look like ETRS used the Nautilus assessment along with scientific literature that describes searching for SMS. The ETRS derived representative survey is conducted in several phases. First a large bathymetric and chemical oceanography effort is undertaken by the lessee. This involves mapping of the entire area with hull mounted multibeam. CTDs and water samples are taken throughout the area, either as static points or as a Tow-Yo towed CTD (of combination of both). These surveys are designed to find the active hydrothermal vents and indicate the axis of the spreading center.

Detecting the off axis inactive or extinct hydrothermal sites would likely require a very dense HRG survey effort. ETRS simulated the use of multiple AUVs to conduct this portion of the survey, and estimated that six AUVs would likely be used. The distance a lessee might survey off-axis is unknown, however ETRS estimated that it was likely that a lessee could survey up to 20km off axis. In this case, for CNMI it is presumed that only the off axis area west of the Mariania Trough would be explored.

The amount of potential SMS deposits is unknown in the CNMI EEZ. Distance between SMS back arch basin deposits are given by (Hannington et al, 2011). ETRS collected the distances presented by the paper and used a range of 60 (10 to 210) km between deposits. This yielded a total amount of possible SMS deposits of 104.6 (41.2 to 242.6) per lease.

ROV exploration of the deposits would follow, with sampling directly via manipulator and push cores. Likely, these ROV visits to the deposits would be used to determine the most valuable deposits for future delineation. While sampling with a ROV via manipulator or push core causes limited disturbance with the sampling device itself it is common for the ROV to rest on the seafloor during the procedure. ETRS used the size of an ROV as the bottom disturbance for these samples.

Nautilus Minerals conducted other types of surveys in the Solara area, using electromagnetic surveys, seismic survey, and drilling. It is likely that the SMS industry would like to employ these types of survey during preliminary activities, however BOEM is not reviewing these survey methods at this time.

Assumptions for the various inputs to the model are given in Table 10.

Assumptions	**Low (5%)**	**Most Likely**	**High (95%)**	**Units**
Length of Critical Minerals Leasing Area - North		890		km
Length of Critical Minerals Leasing Area - West		115		km
EM120 MBES Line Spacing	10	12	14	km
EM302 MBES Line Spacing	4	5	6	km
Chemical Oceanography CTD Grid	5	10	15	km
Vessel Speed while YoYo CTD	1	1.5	2	km
Prospecting Box Core Grid - 50km - single	25	50	75	km
Vessel Speed While MBES Surveying	6	8	10	knots
TowYo CTD Linespacing	5	10	20	knots
Vessel Speed While Transiting	9	11	13	knots
Length of Spreading Center (Two Lease)	350	410	445	km
Length of Spreading Center (Three Lease)	246	276	296	km
Length of Off-Axis survey	10	15	20	km
AUV Survey Speed	3	4	5	m/s
AUV Daily Turnaround	2	4	6	hours
AUV Line spacing	125	150	175	meters
One Deposit found per	10	60	210	sq km
ROV Investigation Time per Deposit	2	5	8	days
ROV Grappler Samples Taken per Deposit	10	20	30	count
ROV Push Cores per Deposit	5	10	15	count
Piston Cores per Deposit	5	10	20	count
Rock Drill per Deposit	1	4	8	count
Survey Maintenance	5	10	25	percent
Survey Weather	5	10	25	m sq
Days Per CTD	2	4	6	percent
Hours Per CTD/Core	6	8	10	hours
UTP Grid	6	8	10	km
Length of Transit from Saipan to Survey Area	140	450	800	km
Days Between Crew Changes	20	30	42	days
Days Between Failures Requiring Return to Port	20	25	30	days

Table 10: Assumptions used for SMS model.

Nautilus Minerals did not use oceanographic moorings or environmental landers in their assessment. ETRS, however, believes that they might be used by the SMS industry. Without an indication on the amount of moorings or landers that might be used in SMS exploration, ETRS used the calculation from the estimates in PNM exploration. Table 11 and Table 12 give the assumptions for these surveys.

Assumptions - Oceanographic Surveys	**Totals for the Leases in the Western Area**	**Two Lease**	**Three Lease**	**Units**
Mooring Per Lease	16.1	8.1	5.4	count
Landers	10.8	5.4	3.6	count

Table 11: Assumptions on amount of moorings and landers.

Assumptions - Oceanographic Surveys Bottom Disturbance	**Low**	**Most Likely**	**High**	**Units**
Bottom Disturbance Moorings	12.6	28.3	78.5	m sq
Bottom Disturbance Landers	1	2	3	m sq

Table 12: Assumptions on bottom disturbance for Oceanographic Moorings and Landers.

The size of the leases in the Western Area are given in Table 13. These sizes are roughly equal to the area ID for sulfides exploration in the CMNI EEZ.

Survey Area Size	**Sq km**
Totals for the Leases in the Western Area	135280
Lease Area (Two leases)	67640
Lease Area (Three lease)	45093

Table 13: Survey area sizes.

Using these assumptions ETRS modeled the survey duration, trips, and bottom disturbance of the survey efforts. Using an @Risk plugin for excel the distributions of the various inputs was determined. Calculations for the survey duration and bottom disturbance were created and a Latin Hypercube simulation with 50,000 iterations was conducted. A range of probability was then determined for each output. The probabilities are presented in this format "mean (%5 to 95%)". As an example, the length in days of a bathymetric survey for the a lease in the Western Area is 46.3 (38.2 to 56.1) days. Meaning the mean length of the survey has been calculated as 46.3 days, with 5% chance it would be shorter then 38.2 and 95% chance it would be shorter than 56.1 days. Table 14 presents the results of the bathymetric, AUV, and ROV survey effort calculations.

Preliminary Activities - Sulfides	**Totals for the Leases in the Western Area**	**Two Lease**	**Three Lease**	**Units**
MBES Survey EM122	116.2 (105.2 to 128.8)	58.1 (52.6 to 64.4)	39.2 (35.6 to 43.4)	100 km
MBES Survey EM304	275.2 (243.7 to 312)	137.6 (121.8 to 156)	92.2 (81.7 to 104.5)	100 km
AUV Offset Survey	815.2 (625.6 to 1020.9)	407.6 (312.8 to 510.4)	276.2 (212.8 to 344.4)	100 km
Survey Duration EM122	46.3 (38.2 to 56)	23.2 (19.1 to 28)	16.1 (13.3 to 19.4)	days
Survey Duration EM304	109.8 (89.4 to 134.4)	54.9 (44.7 to 67.2)	37.9 (30.9 to 46.1)	days
Survey Duration Tow Yo Survey	146.6 (89.6 to 230)	73.3 (44.8 to 115)	49.7 (30.4 to 77.3)	days
Survey Duration Single AUV Survey	824.7 (607.9 to 1079.6)	412.3 (303.9 to 539.8)	313.9 (231.9 to 408.6)	days
Survey Duration 6x AUV Survey	395 (298.1 to 502.7)	197.5 (149 to 251.3)	168.3 (127.4 to 213.4)	days
Survey Duration ROV Survey	1381.3 (465.9 to 3299.3)	690.7 (232.9 to 1649.7)	467.4 (159.1 to 1123.9)	days
Trips MBES EM122	5.4 (4.7 to 6.3)	2.7 (2.4 to 3.1)	2.2 (1.9 to 2.5)	trips
Trips MBES EM304	10.1 (8.3 to 12.2)	5.1 (4.2 to 6.1)	3.8 (3.2 to 4.5)	trips
Trips Single AUV Offset Survey	62.9 (45.5 to 83.6)	31.2 (23.3 to 40.2)	40.3 (30.4 to 51.7)	trips
Trips 6x AUV Survey	31.2 (23.3 to 40.2)	15.6 (11.7 to 20.1)	13.4 (10.1 to 17.2)	trips
Trips ROV Survey	104 (36.1 to 247.2)	15.6 (11.7 to 20.1)	13.4 (10.1 to 17.2)	trips

Table 14: Survey effort for preliminary activities SMS exploration

Bottom disturbance is presented in Table 15. Piston coring and rock drill activities are not preliminary activities but have been calculated for illustrative purposes.

Bottom Disturbance (m2)	Totals for the Leases in the Western Area	Two Lease	Three Lease
ROV Grappler	9056.6 (2771.8 to 22129.1)	4528.3 (1385.9 to 11064.6)	3074.1 (940.1 to 7611)
ROV push Cores	4529.4 (1389.1 to 11135.5)	2264.7 (694.5 to 5567.8)	1535.2 (472.3 to 3807.6)
Piston Cores	10208.6 (2436.6 to 26822.3)	5104.3 (1218.3 to 13411.2)	3453.6 (824.7 to 9084.8)
Rock Drill	8579 (2288.1 to 21758.5)	4289.5 (1144.1 to 10879.3)	2903.9 (776.9 to 7368.6)
UTP	1471.6 (794.9 to 2229.9)	735.8 (397.4 to 1115)	498.8 (269.8 to 757.8)

Table 15: Bottom disturbance in m2 for preliminary activities (excluding piston core and rock drill activities).

Percent bottom disturbance for the leases in the Western Area are given in Table 16.

Percentage Bottom Disturbance	Totals for the Leases in the Western Area
ROV Grappler	0.000006695%
ROV push Cores	0.000003348%
Piston Cores	0.000007546%
Rock Drill	0.000006342%
UTP	0.000001088%
Moorings	0.000000337%
Landers	0.000000016%

Table 16: Percent bottom disturbance in the leases in the Western Area from preliminary activities (excluding piston cores and rock drill activities).

Line miles and survey duration for oceanographic surveys are given in Table 17.

Oceanography Survey	**Totals for the Leases in the Western Area**	**Two Lease**	**Three Lease**	**Units**
Tow Yo Survey Linemiles	72 (47 to 108.8)	36 (23.5 to 54.4)	24.3 (15.9 to 36.5)	100 km
Survey Duration Tow Yo Survey	146.6 (89.6 to 230)	73.3 (44.8 to 115)	49.7 (30.4 to 77.3)	days
Survey Duration Static CTD	63.7 (30.8 to 121.9)	31.9 (15.4 to 60.9)	21.6 (10.5 to 41.1)	days
Duration Mooring Deployment/Recovery	29.3 (27.3 to 31.6)	14.7 (13.6 to 15.8)	9.8 (9.1 to 10.5)	days
Duration Lander Deployment/Recovery	20.7 (19.2 to 22.4)	10.4 (9.6 to 11.2)	7.4 (6.8 to 8)	days
Trips Tow Yo Survey	12.8 (8.5 to 19.2)	6.4 (4.2 to 9.6)	4.7 (3.2 to 6.8)	trips
Trips Static CTD Survey	6.7 (4.2 to 11.1)	3.4 (2.1 to 5.5)	2.6 (1.8 to 4.1)	trips
Trips Deploy/Recover Moorings	29.3 (27.3 to 31.6)	14.7 (13.6 to 15.8)	9.8 (9.1 to 10.5)	days
Trips Deploy/Recover Landers	20.7 (19.2 to 22.4)	10.4 (9.6 to 11.2)	7.4 (6.8 to 8)	days

Table 17: Survey duration and trips for oceanographic surveys.

Oceanography Survey Bottom Disturbance	**Totals for the Leases in the Western Area**	**Two Lease**	**Three Lease**
Bottom Disturbance Oceanographic Moorings	549 (279.4 to 893.3)	274.5 (139.7 to 446.7)	183 (93.1 to 297.8)
Bottom Disturbance Landers	21.5 (14.8 to 28.2)	10.8 (7.4 to 14.1)	7.2 (4.9 to 9.4)

Table 18: Oceanography survey bottom disturbance.

Calculation of the number of ships that could be in the SMS leases has been determined by using a very compressed time schedule of five years for lessees to accomplish all of the surveys. In addition, it was assumed that due to weather or fleet availability that only half the year would be available for survey work and that several tenders would also be used. Table 19 presents the number of ships that would be working if these constraints were applied.

Maximum Number of Ships Operating At Once	Ships
Two Lease	2.3 (1.1 to 4.6)
Three Lease	1.6 (0.8 to 3.2)
Totals for the Leases in the Western Area	4.6 (2.2 to 9.2)

Table 19: Maximum number of ships operating in the SMS area.

Conclusion: Calculation of bottom disturbance and survey effort for the western and eastern lease areas in CNMI have been calculated. Table 20 and

Effect	Two Lease	Total Western Lease Area (Two Leases)	Three Lease	Total Western Lease Area (Three Leases)	Units
Bottom Disturbance	7827.8 (3264.4 to 17420.1)	15655.7 (6528.8 to 34840.2)	5296.5 (2214.6 to 11822.5)	15889.4 (6643.7 to 35467.4)	m2
Line Miles	50557.2 (40732.2 to 61149.8)	101114.3 (81464.5 to 122299.5)	34155.6 (27624.4 to 41174.4)	102466.9 (82873.2 to 123523.2)	km
Days	1041.5 (558.9 to 2016.7)	2083 (1117.8 to 4033.4)	740.6 (411.3 to 1402.9)	2214.5 (1226.7 to 4201)	days
Trips	85.9 (49.5 to 158.8)	171.8 (99.1 to 317.5)	63.7 (38.7 to 113.4)	191 (116.2 to 340.1)	trips

Table 21 present the total amount of bottom disturbance, line miles, survey days, and trips for the leases in the Eastern Area and the leases in the Western Area.

Effect	Two Lease	Total Eastern Lease Area (Two Leases)	Three Lease	Total Eastern Lease Area (Three Leases)	Units
Bottom Disturbance	1980.6 (1261.9 to 3068.6)	3615.2 (2277.2 to 5724.3)	1436.6 (919 to 2185.3)	3618.2 (2279.7 to 5739.3)	m2
Line Miles	30686.7 (26075.2 to 37591.3)	47393.5 (39261.9 to 60802.4)	25151.6 (21679.6 to 29968.7)	47495 (39342.5 to 60836.8)	km
Days	903.2 (650 to 1328.4)	1638.3 (1147.6 to 2484)	668.1 (491.4 to 951.8)	1668 (1174.5 to 2504.7)	days
Trips	79.7 (59.6 to 111.9)	144 (105.4 to 207.5)	62.3 (48.2 to 84.5)	156.2 (117.1 to 220.6)	trips

Table 20: Total bottom disturbance, line miles, survey days, and trips for the leases in the Eastern Area.

Effect	Two Lease	Total Western Lease Area (Two Leases)	Three Lease	Total Western Lease Area (Three Leases)	Units
Bottom Disturbance	7827.8 (3264.4 to 17420.1)	15655.7 (6528.8 to 34840.2)	5296.5 (2214.6 to 11822.5)	15889.4 (6643.7 to 35467.4)	m2
Line Miles	50557.2 (40732.2 to 61149.8)	101114.3 (81464.5 to 122299.5)	34155.6 (27624.4 to 41174.4)	102466.9 (82873.2 to 123523.2)	km
Days	1041.5 (558.9 to 2016.7)	2083 (1117.8 to 4033.4)	740.6 (411.3 to 1402.9)	2214.5 (1226.7 to 4201)	days
Trips	85.9 (49.5 to 158.8)	171.8 (99.1 to 317.5)	63.7 (38.7 to 113.4)	191 (116.2 to 340.1)	trips

Table 21: Total bottom disturbance, line miles, survey trips, and trips for the leases in the Western Area.

A combined amount of bottom disturbance, line miles, days of survey, and trips is given in Table 22

Totals	Two Leases	Three Lease	Units
Bottom Disturbance	19213.6 (10117.5 to 38302.6)	19513.7 (9991.2 to 39107.5)	m2
Line Miles	146093.1 (126603.5 to 167185.9)	149959.8 (127755.7 to 174649.3)	km
Days Survey	3669.7 (2704.1 to 5623.9)	3881.4 (2668.2 to 5985.9)	days
Trips	311.1 (238.3 to 456.3)	347.1 (254.3 to 505.2)	Trips

Table 22: Totals for both the Eastern and Western lease areas.

The percentage of total bottom disturbance for all activities in both the eastern and western lease areas, excluding dredging, is given in given in Table 23.

Percent Bottom Disturbance	Value
PMN and SMS	0.0000064%

Table 23: Percentage bottom disturbance for eastern and western lease areas combined.

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Appendix A2

Survey Assumptions: Additional Survey Technical Specifications and Examples

Overview

This appendix summarizes technical information for some of the survey equipment expected to be used during preliminary activities. Examples of representative, available technology at the time of this writing are provided.

Autonomous Underwater Vehicles

Kongsberg's Hugin AUV was developed in the late 1990s to perform deepwater surveys where traditional methods were no longer feasible. The Hugin AUV has become the industry standard AUV used for hydrographic and geophysical surveys within the petroleum and renewable industries. The early systems used an aluminum hydrogen peroxide "fuel cell" battery and quickly changed to lithium-ion battery. Over the past few decades, advances in battery and sensor technology, together with improvements in computer hardware and software, have significantly enhanced AUV capabilities. These developments have increased survey endurance, enabling longer underwater missions, while also improving the resolution and georeferencing accuracy of the data collected. Other advances in technology allow AUVs to operate independently of direct support from a vessel and allow a single vessel to support multiple AUV systems simultaneously.

Table A2-1 describes representative payloads that an AUV can carry. **Table A2-2** shows the representative AUV payload, including navigation equipment.

Table A2-1. Representative AUV - Kongsberg Hugin 6000, summary of specifications

AUV	Characteristic
Physical Dimensions	19.7 ft (6 m) long, 2.5 ft (0.75 m) diameter
Weight	3,307 pounds (1,500 kilograms) (in air), neutrally buoyant (in water)
Endurance	60–80 hours Rechargeable Lithium-Ion Polymer Batteries
Speed range	2–6 knots (operational speed ~ 3.5 knots)
Depth rating	19,685 ft (6,000 m)

Table A2-2. Representative AUV payload including navigation equipment

AUV Payload / Equipment	Make / Model	Acoustic Information (if acoustic)	Intent / Coverage	Lateral Distance (m) to Level B Threshold[1]
MBES	Kongsberg EM2040	Frequency: 200–400 kHz Operational Power: 150W Source Level: 218 dB re 1 μPa Beam Width: 0.4° x 0.7° (400 kHz)[2]	Bathymetric mapping	N/A
Side-scan Sonar	Edgetech 2205	Frequency 230/410 kHz Operational Power: 200 W Source Level 226 dB re 1 μPa Beam Width: 0.2° x 0.2[2]	Target identification, seabed sediment delineation	N/A
Sub-bottom Profiler	Edgetech DW216	Frequency: 2–16 kHz Operational Power: 200 W Source Level: 176 to 180 dB	Seabed structure imaging	8.7
Magnetometer	Ocean Floor Geophysics, Inc. Self Compensating Magnetometer	See Note 3	Detect ferrous materials	N/A
Forward-looking Sonar	Imagenex 837A Delta T – 120°V x 10°H	Frequency: 260 kHz[2] Operational Power: 22 to 32 Volts DC at less than 5 W Source Level: See Note 4. Beam Width: 3°, 1.5°, 0.75°	Obstacle avoidance multibeam sonar	N/A
Conductivity, Temperature, and Density Profiler	SAIV AS CTD Profiler 208	See Note 3	Critical for MBES data quality and improves subsea positioning	N/A
Doppler Velocity Log	Nortek DVL	Frequency: 500 kHz[2] Operational Power: 4 W average Source Level: See Note 4. Beam Width: 4°	Bottom tracking, provides information on currents experienced by AUV for navigation.	N/A
Depth Sensor	Paroscientific Digiquartz D50	See Note 3	Provides accurate depth values for navigation	N/A
Digital Altimeter	Kongsberg Mesotech, Ltd.	Frequency: 200 kHz or 675 kHz[2] Operational Power: 22 to 28 Volts DC external power source Source Level: See Note 4. Beam Width: 2.7° (675 kHz), 10° (200 kHz)	Provides accurate altitudes above seabed to assist in maintaining required AUV flight altitude	N/A

AUV Payload / Equipment	Make / Model	Acoustic Information (if acoustic)	Intent / Coverage	Lateral Distance (m) to Level B Threshold[1]
Inertial Motion Unit	Honeywell HG9900	See Note 3	Provides motion information for navigation	N/A
AUV Novatel Global Navigation Satellite System	NovAtel	See Note 3	For surface navigation; state-of-the-art system with sub-meter accuracy, uncertainty conforming to IHO special order	N/A
HD Camera + Lights (Optional)	CathX Ocean M12 A1000 UHD stills camera	See Note 3	Stills camera: supplemental AUV system (not required for planned survey activities but could be used for data collection)	N/A
Turbidity, Fluorescence, Dissolved Oxygen	FLNU (RT)D	See Note 3	Water quality sensors: supplemental AUV system (not required for planned survey activities but could be used for data collection)	N/A
cNODE Ultra-Short Baseline (USBL) Beacon	Kongsberg TDR30V or TD40V USBL Transponder 206dB TX x 85dB Rx	Frequency: 21–31 kHz Operational Power: Battery-powered (charger is 110 or 120 W) Source level: 206 dB Beamwidth: 30° horizontal and vertical Ping Rate: between 1 and 10 seconds	Underwater positioning to communicate with the surface system deployed from the surface support vessel	45–48
cNODE Modem Explorer	Kongsberg Modem Explorer 34 with TDR40V Transponder	Frequency 21–31 kHz Operational Power: 100 W Beamwidth: +/- 20° Vertical Duty cycle: 50%	Acoustic modem between survey vessel and AUV; transmits vehicle health and decimated HRG data; receives navigation updates and survey commands	45–48
UTP Array on Seabed	Kongsberg cNODE Maxi	Further details in Table A2-3	Further details in Table A2-3	45–48

AUV Payload / Equipment	Make / Model	Acoustic Information (if acoustic)	Intent / Coverage	Lateral Distance (m) to Level B Threshold[1]
Survey Support Ship USBL System	Kongsberg HiPAP 502	Frequency: 21–31 kHz Operational Power: 15 W Source Level: See Note 4. Beam Width: Dynamically alters the beam using electronic beam control Ping Rate: 1–10 Hz[3, 4]	Mounted on the survey support vessel; provides accurate subsea positioning of cNODE UTP and cNODE USBL beacons, enabling accurate subsea navigation; USBL used to directly position the AUV during operations in the export cable siting corridors and could also assist in AUV positioning in the lease area	31.20

Key: AUV = autonomous underwater vehicle; dB = decibel; DC = direct current; kHz = kilohertz; MBES = multibeam echosounder; re 1 μPA = underwater sound pressure referenced as 1 micro-Pascal; USBL = ultra-short baseline; UTP = underwater transponder positioning; W = watts

Notes:

1. Level B harassment for nonmilitary readiness activities means any act of pursuit, torment, or annoyance with the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, feeding, or sheltering. Changes in behavior that disrupt biologically significant behaviors or activities for the affected animal are indicative of take by Level B harassment under the Marine Mammal Protection Act.
2. Operating frequencies are above all relevant marine mammal hearing thresholds and therefore are not possible sources of disturbance to marine mammals.
3. Proposed equipment is non-acoustic or otherwise not a possible source of disturbance to marine mammals.
4. Information not specified by the manufacturer.

Underwater Transponder Positioning (UTP)

Acoustic energy travels farther in water than other forms of energy, such as light. As a result of this characteristic, underwater sound has been used to support the positioning of vessels and systems under the water for decades in the form of ultra-short or long baseline positioning systems. The use of AUVs required improved accuracy. As such, researchers at Kongsberg Marine developed UTP to be used in tandem with the HUGIN AUV (Hegrenæs et al. 2009). Weighted transponders (with or without a flotation collar) are placed on the seafloor and transmit a location signal only when interrogated by the AUV. **Table A2-3** describes representative specifications and acoustic characteristics of typical UTPs.

Table A2-3. UTP support equipment details for AUV

UTP	Characteristic
Physical Dimensions	**Weighted Deployment** The UTP transponder will comprise a 132-pound (60-kilogram) steel clump weight, 16- to 33- ft (5- to 10-m) rope, and the UTP transponder. The UTP transponder will be in a flotation collar suspended 19 to 36 ft (5 to 11 m) above the seabed. The footprint of each UTP transponder weight is less than 15 ft^2 (1.4 m^2). The total area of seabed impacted is conservatively (highest reasonable case) estimated at 27 x 15 ft^2 (1.4 m^2) plus 13 x 21.5 ft^2 (2m^2), a total area of 684.5 ft^2 (64 m^2).
Acoustic Characteristics	Frequency: 21–31 kHz Operational Power: Battery-powered 10–14.4 volts DC Source level: 206 dB Beamwidth: 30° horizontal and vertical Ping rate: 1–10 Hz.

Geotechnical Sampling Equipment

Direct sampling of the seabed is important to determine the presence and makeup of seabed minerals. For polymetallic nodules, box cores and free floating grab samplers are used by industry to conduct geotechnical surveys. For sulfides, BOEM envisions that direct sampling by ROVs will be used. Box cores consist of a 0.5–1.0 m^2 box and a large swinging spade that sinks into the seabed; the top and bottom of the box core is sealed when lifted back to the surface. The box core is deployed via a ship and is connected to an oceanographic winch. Free floating grab samplers consist of weights and a float with a sample basket to take the sample. Free floating grab samplers are not connected to a vessel and operate mechanically. When the free floating grab sampler is deployed at the surface, it is negatively buoyant and sinks to the seabed. Once it contacts the seabed, the ballast is released, and the buoyant force of the float closes the sample basket and returns the grab sampler to the surface for retrieval.

Both systems can also employ use of cameras, CTDs, USBL beacons, dissolved oxygen sensors, and other equipment. Typically, box cores are tracked by USBL navigation to the seabed and can be positioned within several hundred meters of the intended target. Free floating grab samplers typically are not tracked by USBL. The vessel will deploy a free floating grab sampler and transit to the next deployment site. Several free floating grab samples can be deployed with the vessel returning later to retrieve the samplers at the surface.

ROVs would sample seafloor massive sulfides using their manipulator. Push cores, which are small tubes pushed into the seabed to retrieve a sample, could be used. In addition, small scoops have been used by manipulators, along with physically retrieving a sample with the manipulator's claw from the seabed.

Surface Vessel Multibeam and Sub-bottom

Deep water bathymetry requires use of a "full ocean depth" multibeam. There are two in general use today. The Kongsberg EM12x and EM30x models of multibeam (the x is the version number, now at 4). These are a 12kHz (low frequency) multibeam and a 30kHz (medium frequency) multibeam, respectively. The EM124 multibeam is typically installed on large research vessels, while the EM304 is installed on smaller vessels. Both multibeams function similarly with an array of transmit transducers mounted parallel to the keel of the vessel, with an array of receive transducers perpendicular to the keel. This is called the Mills Cross configuration. Using this arrangement "beams" of bathymetric soundings can be measured in a fan shape perpendicular to the motion of travel of the vessel. Backscatter, which is the intensity of the return, and water column data, which is the reflectivity of the water column, are also typically recorded.

Kongsberg also manufactures the SB29, an add on for these multibeams, that is a separate transducer that allows for sub-bottom profiling. This transducer emits a sub-bottom sonar pulse that is detected by the multibeam's receive transducers. If not so equipped, some research vessels have a separate deep water sub-bottom profiler that is a standalone unit.

The main functional difference between the two multibeam is the frequency and power of the transmitted sonar pulse. With the EM124, the lower frequency sonar, a swath width of 10km+ can be achieved in 5,000m+. With the medium frequency sonar, the EM304, the swath width is only about 3km. The medium frequency sonar will lead to more survey lines being needed to run to achieve the same result as the larger, low-frequency sonar.

Appendix B: Protected Species Lists

Table B-1. Marine birds that could occur within or near the Proposed Action Area

Common Name	Scientific Name	The CNMI Name	Guam Name	Carolinian Name	Special Status
South Polar Skua	*Stercorarius maccormicki*	-	-	-	IUCN-LC
Pomarine Jaeger	*Stercorarius pomarinus*	-	-	-	IUCN-LC
Parasitic Jaeger	*Stercorarius parasiticus*	-	-	-	IUCN-LC
Long-tailed Jaeger	*Stercorarius longicaudus*	-	-	-	IUCN-LC
Brown Noddy	*Anous stolidus*	Fåhang dankolo	Fåhang	Sche'e'lap	IUCN-LC
Black Noddy	*Anous minutus*	Fåhang dikike'	Fåhang	Rees	IUCN-LC
Blue-billed White Tern	*Gygis candida*	-	CHunge’	Geeghi	IUCN-LC
Sooty Tern	*Onychoprion fuscatus*	Giree'girak	-	Meshe'gua	IUCN-LC
Gray-backed Tern	*Onychoprion lunatus*	-	-	-	BCC, IUCN-LC
Bridled Tern	*Onychoprion anaethetus*	-	-	-	IUCN-LC
Little Tern	*Sternula albifrons*	-	-	-	IUCN-LC
Gull-billed Tern	*Gelochelidon nilotica*	-	-	-	BCC, IUCN-LC
Black Tern	*Chlidonias niger*	-	-	-	IUCN-LC
White-winged Tern	*Chlidonias leucopterus*	-	-	-	IUCN-LC
Whiskered Tern	*Chlidonias hybrida*	-	-	-	IUCN-LC
Common Tern	*Sterna hirundo*	-	-	-	IUCN-LC
Black-naped Tern	*Sterna sumatrana*	-	-	-	IUCN-LC
Great Crested Tern	*Thalasseus bergii*	-	-	-	IUCN-LC
Black-headed Gull	*Chroicocephalus ridibundus*	-	-	-	IUCN-LC
Laughing Gull	*Leucophaeus atricilla*	-	-	-	IUCN-LC
Black-tailed Gull	*Larus crassirostris*	-	-	-	IUCN-LC
Lesser Black-backed Gull	*Larus fuscus*	-	-	-	IUCN-LC
Slaty-backed Gull	*Larus schistisagus*	-	-	-	IUCN-LC
White-tailed Tropicbird	*Phaethon lepturus*	Fagpi-apa'ka	Utak	Su'ghu'bwesch	IUCN-LC
Red-tailed Tropicbird	*Phaethon rubricauda*	-	-	-	BCC
Laysan Albatross	*Phoebastria immutabilis*	-	-	-	BCC
Black-footed Albatross	*Phoebastria nigripes*	-	-	-	BCC
Short-tailed Albatross	*Phoebastria albatrus*	-	-	-	E
Wilson's Storm-Petrel	*Oceanites oceanicus*	-	-	-	IUCN-LC

Common Name	Scientific Name	The CNMI Name	Guam Name	Carolinian Name	Special Status
Leach's Storm-Petrel	*Hydrobates leucorhous*	-	-	-	IUCN-VU
Band-rumped Storm-Petrel	*Hydrobates castro*	-	-	-	BCC, IUCN-LC
Matsudaira's Storm-Petrel	*Hydrobates matsudairae*	-	-	-	IUCN-VU
Tristram's Storm-Petrel	*Hydrobates tristrami*	-	-	-	BCC, IUCN-LC
Juan Fernandez Petrel	*Pterodroma externa*	-	-	-	IUCN-V
White-necked Petrel	*Pterodroma cervicalis*	-	-	-	IUCN-V
Bonin Petrel	*Pterodroma hypoleuca*	-	-	-	IUCN-LC
Bulwer's Petrel	*Bulweria bulwerii*	-	-	-	BCC, IUCN-LC
Streaked Shearwater	*Calonectris leucomelas*	-	-	-	IUCN-NT
Wedge-tailed Shearwater	*Ardenna pacifica*	Lifa'ru	Payå'ya	Lifo'ro	IUCN-LC
Short-tailed Shearwater	*Ardenna tenuirostris*	-	-	-	IUCN-LC
Sooty Shearwater	*Ardenna grisea*	-	-	-	IUCN-NT
Flesh-footed Shearwater	*Ardenna carneipes*	-	-	-	IUCN-NT
Christmas Shearwater	*Puffinus nativitatis*	-	-	-	BCC, IUCN-LC
Hutton's Shearwater	*Puffinus huttoni*	-	-	-	IUCN-E
Bryan's Shearwater	*Puffinus bryani*	-	-	-	IUCN-CR
Tropical Shearwater	*Puffinus bailloni*	-	-	-	IUCN-LC
Bannerman's Shearwater	*Puffinus bannermani*	-	-	-	IUCN-EN
Newell's Shearwater	*Puffinus newelli*	-	-	-	T, IUCN-CR
Lesser Frigatebird	*Fregata ariel*	-	-	-	IUCN-LC
Great Frigatebird	*Fregata minor*	Paya'ya	Gå'ga' Månglo'	Asaf	BCC, IUCN-LC
Abbott's Booby	*Papasula abbotti*	-	-	-	IUCN-EN
Masked Booby	*Sula dactylatra*	-	-	-	IUCN-LC
Brown Booby	*Sula leucogaster*	Lu'ao	Lu'ao	O'mwo'o'bwe sch	IUCN-LC
Cocos Booby	*Sula brewsteri*	Lu'ao	Lu'ao	O'mwo'o'bwe sch	
Red-footed Booby	*Sula sula*	Lu'ao talisai	Lu'ao	Amwo	IUCN-LC

IUCN = International Union for Conservation of Nature
Status: T = Federally Threatened, E = Federally Endangered, IUCN-C = Least Concern, IUCN-CR = Critically Endangered, IUCN-E = Endangered, IUCN-NT = Near Threatened, IUCN-V = Vulnerable, BCC = Bird of Conservation Concern

Table B-2. Marine mammal species in the Pacific and their critical habitat (CH), Endangered Species Act (ESA), and Marine Mammal Protection Act (MMPA) status

Common Name	Scientific Name	ESA/MMPA Status	Stock Location	CH
Blue whale	*Balaenoptera musculus*	Endangered/Depleted	Central N Pacific, Eastern N Pacific	NA
Fin whale	*Balaenoptera physalus*	Endangered/Depleted	CA/OR/WA, Hawaii, NE Pacific	NA
Sei whale	*Balaenoptera borealis*	Endangered/Depleted	Eastern North Pacific, Hawaii	NA
Sperm whale	*Physeter macrocephalus*	Endangered/Depleted	CA/OR/WA, Hawaii, North Pacific	NA
Gray whale	*Eschrichtius robustus*	Endangered/Depleted	Western North Pacific, Eastern North Pacific	NA
Dwarf sperm whale	*Kogia sima*	-	CA/OR/WA, Hawaii	NA
Pygmy sperm whale	*Kogia breviceps*	-	CAOR.WA, Hawaii	NA
Bryde's whale	*Balaenoptera edeni*	-	Eastern Tropical Pacific, Hawaii	NA
Humpback whale	*Megaptera novaeangliae*	Endangered*/Depleted	American Samoa	NA
Humpback whale	*Megaptera novaeangliae*	Endangered/Depleted	Central America/Southern Mexico, CA/OR/WA, Western North Pacific	86 FR 21082; 2021; Alaska and West Coast regions
Humpback whale	*Megaptera novaeangliae*	-	Hawaii	NA
Minke whale	*Balaenoptera acutorostrata*	-	CA/OR/WA, Hawaii	NA
North Pacific right whale	*Eubalaena japonica*	Endangered/Depleted	Eastern North Pacific	74 FR 190000; 2008; Alaska Region
Killer whale	*Orcinus orca*	-	Eastern North Pacific Transient	NA
Killer whale	*Orcinus orca*	Endangered/Depleted	Eastern North Pacific Southern Resident	86 FR 14668, 2021
False killer whale	*Pseudorca crassidens*	-	American Samoa, Palmyra Atoll	NA
False killer whale	*Pseudorca crassidens*	Endangered/Depleted	Hawaiian Islands	83 FR 35062; 2018; Hawaii Islands
Pygmy killer whale	*Ferresa attenuata*	-	Hawaii	NA
Short-finned pilot whale	*Globicephala macrorhynchus*	-	CA/OR/WA, Hawaii	NA

Common Name	Scientific Name	ESA/MMPA Status	Stock Location	CH
Melon headed whale	*Peponocephala electra*	-	Hawaii	NA
Baird's beaked whale	*Berardius bairdii*	-	CA/OR/WA	NA
Balinville's beaked whale	*Mesoplodon densirostris*	-	Hawaii	NA
Cuvier's beaked whale	*Ziphius cavirostris*	-	CA/OR/WA, Hawaii	NA
Longman's beaked whale	*Indopacetus pacificus*	-	Hawaii	NA
Mesoplodont beaked whale	*Mesoplodon spp.*	-	CA/OR/WA	NA
Fraser's dolphin	*Lagenodolphis hosei*	-	Hawaii	NA
Risso's dolphin	*Grampus griseus*	-	CA/.OR/WA, Hawaii	NA
Northern right whale dolphin	*Lissodelphis borealis*	-	CA/OR/WA	NA
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	-	North Pacific, CA/OR/WA	NA
Rough-toothed dolphin	*Steno bredanensis*	-	American Samoa, Hawaii	NA
Spinner dolphin	*Stenella longirostris longirostris*	-	American Samoa, Hawaii	NA
Spotted dolphin, Pantropical	*Stenella attenuate attenuata*	-	Hawaii	NA
Striped dolphin	*Stenella coeruleoalba*	-	CA/OR/WA, Hawaii	NA
Bottlenose dolphin	*Tursiops truncatus*	-	CA/OR/WA, Hawaiian Islands	NA
Short-beaked common dolphin	*Delphinus delphis*	-	CA/OR/WA	NA
Long-beaked common dolphin	*Delphinus capensis*	-	CA	NA
Dall's porpoise	*Phocoenoides dalli*	-	CA/OR/WA	NA
Harbor porpoise	*Phocoena phocoena*	-	Central CA, Northern CA-Southern Oregon, Northern OR-WA coast	NA
Steller sea lion	*Eumetopias jubatus*	Delisted (but CH still in effect)/-	Eastern (west coast region)	50 FR 226.202,1985

Common Name	Scientific Name	ESA/MMPA Status	Stock Location	CH
Steller sea lion	*Eumetopias jubatus*	Endangered/Depleted	Western (Alaska region)	59 FR 30715, 1994
California sea lion	*Zalophus californianus*	-	U.S.	NA
Northern elephant seal	*Mirounga angustirostris*	-	CA	NA
Northern fur seal	*Callorhinus ursinus*	-	CA	NA
Northern fur seal	*Callorhinus ursinus*	-/Depleted	Eastern Pacific	NA
Harbor seal	*Phoca vitulina richardsi*	-	CA, OR/WA	NA
Guadalupe fur seal	*Arctocephalus townsendi*	Threatened/Depleted	Mexico	NA
Hawaiian monk seal	*Neomonachus schauinslandi*	Endangered/Depleted	Hawaii	50 CFR 226.201, 2015

NA: Not applicable. Species listed under ESA with no designated CH or species not listed under ESA without a designated CH.
*Humpback whale American Samoa stock is not listed under ESA, but IUCN classified this stock as endangered in 2008 (Childerhouse et al. 2008).

Table B-3. Sea turtle species and their critical habitat (CH), Endangered Species Act (ESA) status, and their stock or distinct population segments (DPS)

Common Name	Species	Stock or DPS	ESA Status	CH
Green Turtle	*Chelonia mydas*	East Pacific DPS, Central North Pacific DPS, Southwest Pacific DPS	Threatened	Proposed 88 FR 46572, 2023
Green Turtle	*Chelonia mydas*	Central South Pacific DPS, Central West Pacific	Endangered	Proposed 88 FR 46572, 2023
Hawksbill Turtle	*Eretmochelys imbricata*	Throughout range	Endangered	NA (only outside the Pacific)
Leatherback Turtle	*Dermochelys coriacea*	Throughout range	Endangered	77 FR 4169, 2012
Loggerhead Turtle	*Caretta caretta*	North Pacific Ocean DPS, South Pacific DPS	Endangered	NA (only outside the Pacific)
Olive Ridley Turtle	*Lepidochelys olivacea*	Mexico's Pacific coast breeding population	Endangered	NA
Olive Ridley Turtle	*Lepidochelys olivacea*	All other populations	Threatened	NA

Appendix C: Best Management Practices

This *Commonwealth of Northern Mariana Islands (CNMI) Critical Minerals Environmental Assessment* (EA) describes Proposed Actions that will occur if leases are issued within the CNMI Outer Continental Shelf (OCS). The Proposed Actions evaluated in this EA are called preliminary activities in the CFR and the purpose of Preliminary Activities is to collect data and information for future federal decisions and reviews required for Delineation, Testing, and Mining Plans (30 CFR 582.21d). Once a lease is issued, results of environmental monitoring activities are required as part of Delineation, Testing, and/or Mining Plans, as well as other environmental data as the Director may require (30 CFR 582.28). Requirements may include appropriate environmental protection measures, mitigation measures, monitoring protocols, and/or adaptive management strategies pursuant to authorities under 43 U.S.C. § 1334.

The EA describes best management practices (BMPs), which are procedures or conditions related to a specific action. **Chapter 3** of the EA discusses the justification for the use of each BMP in reducing or removing a potential impact on a resource. BMPs described below are established standards of protection adapted from other industry and research actions, which utilize identical equipment, for application to the deeper remote waters offshore the CNMI.

The BMPs listed below are draft and will be part of a public review within the Proposed Leasing Notice and language is considered final when the Final Leasing Notice is published. BMPs listed in **Section C.2** is intended to be included as stipulations for the CNMI Lease and are also currently part of concurrent consultations with the NOAA National Marine Fisheries Service's (NMFS's) Pacific Islands Regional Office.

C.1 Best Management Practices Associated with Lease Issuance

BMP-1: Lease Preliminary Activities and Survey Notices

For purposes of this lease, "Preliminary Activities" means activities performed by the Lessee that are consistent with the activities described in the Commercial Leasing for Minerals Offshore CNMI Environmental Assessment (EA), provided to the Lessee with this lease. If the Lessee proposes any other activities not included in the EA prior to submitting a Delineation, Testing, and/or Mining Plan(s), they must notify the Lessor (through BOEM) at least 60 days prior to undertaking the activity. BOEM will notify the Lessee if any additional analysis or consultation to protect species listed under the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA), or to protect historic or cultural properties, are required prior to the Lessee undertaking the activity.

The Lessee must give written notice to BOEM at least 30 days prior to initiating any Preliminary Activities on the lease. In the notice, the Lessee must describe in detail those activities that will be conducted and the time schedule for conducting those activities (30 CFR 582.21(d)) necessary to develop comprehensive Delineation, Testing, and/or Mining Plan(s). Each distinct activity (e.g., mobilization) must be identified in one or more written notices.

The Lessee must include in each written notice details of the proposed Preliminary Activities (e.g., bathymetric, geological, geophysical, mapping, or other surveys) to be conducted and timelines for the activities. The Lessee must demonstrate in its notice that these proposed Preliminary Activities conform to the requirements of the Outer Continental Shelf Lands Act (OCSLA; 43 U.S.C. §§ 1331 et seq.); are safe; do not unreasonably interfere with other uses of the Outer Continental Shelf (OCS), including those for national security and defense; conform to sound conservation practices for the Leased Minerals (as well as other OCS resources not subject to this lease) and protect the rights of the Lessor; and do not cause undue or serious harm or damage to the human, marine, or coastal environment. The notice must also demonstrate that it complies and is consistent with the analyses in the Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response issued by National Marine Fisheries Service (NMFS) related to this lease, and the Incidental Take Authorization issued by NMFS under the Marine Mammal Protection Act (if applicable) in place at the time of submission. The Lessor will review the notice and report to the Lessee if the notice is insufficient to demonstrate compliance with these provisions.

The Lessee must provide sufficient detail in each notice to reasonably enable the Lessor's review, including, but not limited to the following information:

- A description and illustration of the geographic areas involved in the activity;
- Details of the activities to be conducted and the time schedule of activities;

- The specifications of each vessel and each piece of equipment including towed, deployed, and/or autonomous with associated operating specifications such as source level, transmission frequency, directionality, beamwidth, and pulse repetition rate;

- A brief synopsis of proposed baseline environmental survey methods for surveys listed above, and sampling approaches, the spatial/temporal design, and data and metadata standards used for collection and reporting.

The Lessor may require meeting(s) with the Lessee regarding proposed Preliminary Activities prior to the commencement of such activities. The request will be made promptly after the Lessor receives the notice of Preliminary Activities, as provided by this lease, and the meeting(s) will be scheduled so as not to unreasonably delay the Preliminary Activities. The Lessee must ensure the presence at this meeting of all relevant personnel, crew members, and subject matter experts, as requested by the Lessor. Topics may include responsibilities, chains of command, communication procedures, monitoring procedures, operational procedures, and content of the notice. New personnel must be briefed as they join the work in progress.

BMP-2: Pre-Survey Meeting(s) with the Lessor

The Lessor may require meeting(s) with the Lessee regarding proposed Preliminary Activities prior to the commencement of such activities. The request will be made promptly after the Lessor receives the notice of Preliminary Activities, as provided by this lease, and the meeting(s) will be scheduled so as not to unreasonably delay the Preliminary Activities. The Lessee must ensure the presence at this meeting of all relevant personnel, crew members, and subject matter experts, as requested by the Lessor. Topics may include responsibilities, chains of command, communication procedures, monitoring procedures, operational procedures, and content of the notice. New personnel must be briefed as they join the work in progress.

BMP-3: Preliminary Activities Reporting

The Lessee must submit reports, synthesized data, and raw data of Preliminary Activities, and results of environmental monitoring activities within 90 days after the completion of preliminary survey activities. Preliminary activity completion dates must be provided in the associated Preliminary Activities notice described in the Lease Stipulations, “Lease Preliminary Activities and Survey Notices.” If there are delays or changes to the completion dates, the Lessee must notify the Lessor as soon as practical. The Lessee must publicly share all collected environmental data, and associated metadata, except as directed under Freedom of Information Act (FOIA) Exemption 4 or 30 CFR 582.5.

The report of Preliminary Activities conducted on the lease must include:

- A description of work performed;

- Charts, maps, or plats depicting the area and leases in which Preliminary Activities operations were conducted specifically identifying the lines of geophysical traverses and/or the locations where Preliminary Activities were conducted;

- The dates on which the operations were performed;
- A narrative summary of mineral occurrences; environmental hazards; and effects of the activities on the environment, aquatic life, archaeological resources, or other uses and users of the area in which the activities were conducted;
- Information on all interactions with fishing vessels or gear, as described in a Lease Stipulation for a “Fisheries Communication Plan”;
- Information on all samples collected on the lease, including location, conditions encountered, such as minerals, water, gas, or unusual conditions, and the sample analysis;
- A synopsis of baseline environmental survey methods conducted during Preliminary Activities and a reference to associated data/metadata documentation;
- Information on unrecovered equipment, such as oceanographic buoys; and
- Any other environmental mitigation and monitoring measures showing compliance evidence related to on-lease Preliminary Activities to satisfy conditions from relevant stipulations, other relevant leasing documents, the proposed action in the Commercial Leasing for Minerals Offshore American Samoa Environmental Assessment, and consultations that will result in an Endangered Species Act Section 7(a)(2) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) Essential Fish Habitat (EFH) Response pursuant to section 305 (b) of the MSA for the Bureau of Ocean Energy Management’s Commercial Leasing for Minerals Offshore the CNMI issued by the National Marine Fisheries Service (NMFS) that is in progress at the time of this writing. The NMFS 2026 ESA and EFH Response will be posted online when the consultations are completed. All maps must be appropriately marked with reference to official lease boundaries and elevations marked with reference to sea level. When applicable, vertical projections and cross sections will accompany plan views.

The Lessee must keep all original data and information available for inspection or duplication by the Lessor at the expense of the Lessee as long as the lease continues in force. Should the Lessee choose to dispose of original data and information once the lease has expired, said data and information must first be offered to the Lessor free of cost and will, if accepted, become the property of the Lessor. Navigation information showing the location(s) where samples were taken must be retained for as long as the lease continues in force.

BMP-4: Research Site Access

The Lessor, its designated representative, or any entity to which the Lessor provides access, retains the right to access, for research purposes, the site of any operation or activity conducted under this lease. The Lessor will make a good faith effort to provide prior notice of needs for access. This provision does not limit the Lessor's authority to access the lease for other purposes, including, but not limited to, inspections conducted pursuant to 30 CFR 285.822.

BMP-5: Protection of Birds

a. Lighting

Any lights used to aid marine navigation by the Lessee, operators, or contractors during any lease activities, except during times of emergency, must be described on the U.S. Coast Guard Private Aids to Navigation Application form. Lighting on project vessels must be directed inboard and downward, or shielded, to reduce upward illumination and illumination of adjacent waters, thereby reducing the potential for birds to be attracted to work areas. Light from cabin windows must be reduced with shades, blinds, or shields that block exiting light. A PSO or crew member must inspect lighted work areas daily for birds that may have been attracted to artificial lighting.

b. Injured Bird and Annual Bird Reporting

If an injured bird is discovered on a vessel, the bird will be transported on the next returning work vessel to an approved wildlife care facility. A log of all birds found onboard a vessel that may have been attracted by artificial light during a particular project will be maintained, with the status and health of birds on retrieval and release as applicable. The log will be provided to BOEM no more than 90 days following the completion of Preliminary Activities as part of the protected species reporting requirements described in Lease Stipulations.

The protected species report provided to BOEM must document any dead birds found on vessels and structures during Preliminary Activities. The report must contain the following information: the name of species; date found; location; a picture to confirm species identity (if possible); and any other relevant information. Carcasses with federal or research bands must be reported to the U.S. Geological Survey's Bird Band Laboratory.

BMP-6: Fisheries Communication Plan

The Lessee must develop and submit a Fisheries Communication Plan (FCP) for Preliminary Activities to the Lessor (through BOEM) at least 90 days prior to conducting any Preliminary Activities under this lease. The Lessee must consult with NMFS (Pacific Islands Regional Office), the Western Pacific Regional Fishery Management Council, and the CNMI Division of Fish and Wildlife during its development of the FCP. These consultations are for informational purposes only and do not create any substantive or procedural rights enforceable by private parties with regard to the FCP.

The Lessee must include the following components in its FCP: (1) identification of potentially affected fisheries; (2) procedures for early and ongoing communication and training among fishing communities, the Lessee(s), operators, and contractors; and (3) a conflict-avoidance strategy, including notification protocols and vessel routing measures to minimize interference with fishing operations. The Lessee must make the FCP publicly available, such as through their website.

The Lessee must document interactions with fishing vessels and/or gear when conducting Preliminary Activities in the Lease Area, including summarizing written letters, meetings, and gear or boat damage, and provide a fishery interaction report according to the Lease Stipulations . BOEM may share these reports with NMFS, as appropriate, under any relevant interagency agreements. The Lessee must include locations of the interactions and any avoidance or remedial actions. If the Lessor determines, based on documented interactions or stakeholder complaints, that substantial and repeated interference with fishing operations is occurring, the Lessor may require the Lessee to modify operations, implement additional measures, or participate in a fisheries liaison program consistent with applicable federal law.

BMP-7: Marine Archaeology Requirements for Preliminary Activities

- In no case may the Lessee knowingly impact a potential archaeological resource without the Lessor's prior consent, following appropriate compliance with the National Historic Preservation Act.
- The Lessee must ensure that its Qualified Marine Archaeologists (QMAs) meet the Secretary of the Interior's Professional Qualifications Standards listed in 48 Federal Register 44738–44739.
- The Lessee must ensure a QMA visually examines retrieved box core and free-fall grab samples for potential cultural material and artifacts and photo-documents cores and samples prior to sub-sampling. The Lessee, if technically feasible, will acquire bottom imagery from seabed disturbance or sampling activities. The Lessee will ensure the QMA reviews all imagery to identify if any potential archaeological resources are present in the sampled areas.
- The QMA must monitor the video feed in real time if a remotely operated vehicle (ROV) survey is conducted near a potential or newly discovered archaeological resource.
- Review and monitoring by the QMA may be conducted remotely only if images and video feed are of sufficient quality.
- If during examination of the retrieved seabed samples and/or during visual imaging\ the Lessee determines that a potential marine cultural resource may have been located or affected, the Lessee will initiate the steps outlined in the Unanticipated Discovery requirements in Lease Stipulations.

BMP-8: Unanticipated Discovery Requirements

While conducting activities, if the Lessee discovers an unanticipated potential archaeological resource, such as the presence of a shipwreck site (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock) or evidence of a pre-contact archaeological site (e.g. stone tools, pottery or other pre-contact artifacts) within the Lease Area, the Lessee must:

- Immediately halt seafloor-disturbing activities in the area of a distance of 1,000 feet (305 meters) from the discernible extent of the target;
- Submit to the Lessor a written report on details of the discovery within 72 hours of its discovery written by a Qualified Marine Archaeologist (QMA) that meets the Secretary of the Interior's Professional Qualifications Standards listed in 48 FR 44738–44739;
- Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the Lessor has made an evaluation based on analysis and recommendations from the QMA and instructs the Lessee on how to proceed; and
- If (1) the site was impacted by the Lessee's project activities; or (2) impacts to the site or to the area of potential effects cannot be avoided, the Lessee must conduct additional investigations overseen by a QMA, as directed by the Lessor, to determine if the resource is eligible for listing in the National Register of Historic Places (30 CFR 585.802[b]).

If the Lessee's investigations indicate that the resource is potentially eligible for listing in the National Register of Historic Places, the Lessor will inform the Lessee how to protect the resource or how to mitigate adverse effects to the site. If the Lessor incurs costs in protecting the resource, then, under section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the Outer Continental Shelf Lands Act.

BMP-9: Confidential Information

BOEM will protect privileged or confidential information that the Lessee submits, as authorized by the Freedom of Information Act (FOIA), 30 CFR 582.5, or other applicable law and regulations. If the Lessee wishes to protect the confidentiality of any lease related information, the Lessee must clearly mark it "Contains Privileged or Confidential Information" and consider submitting such information as a separate attachment. BOEM will not disclose such information, except as required by FOIA, other applicable law, or court order. If your submission is requested under FOIA, your information will only be withheld if a determination is made that one of FOIA's exemptions to disclosure applies. Such a determination will be made in accordance with the Department's FOIA regulations and applicable law. BOEM will not treat as confidential aggregate summaries of nonconfidential information.

C.2 Protected Species and Habitats Best Management Practices Associated with Lease Issuance

C.2.1 Communicating Protected Species Requirements

The Lessee, operators, personnel, and contractors must comply with the approved measures to safeguard ESA-listed species and designated critical habitat included in the proposed action for the ESA LOC and Magnuson-Stevens Fishery Conservation and Management Act (MSA) EFH Response pursuant to section 305 (b) of the MSA (2026 ESA LOC and EFH Response) for the Bureau of Ocean Energy Management's Commercial Leasing for Minerals Offshore American Samoa issued by the NMFS on February 17, 2026, and any Incidental Take Authorization (ITA) issued by NMFS under the MMPA (if applicable) in place at the time. The 2026 ESA LOC and the EFH letter may be found on the BOEM website.

The Lessee, operators, personnel, and contractors must ensure that applicable sections of the 2026 ESA LOC, EFH Response, and MMPA ITA (if applicable) are made available during operations on all project-related vessels. The Lessee, operators, and contractors must ensure that these documents are reviewed by all appropriate personnel aboard every project-related vessel. Preliminary activities must be within the scope of activities described in the above-referenced ESA LOC, EFH Response, and MMPA ITA (if issued) or the Lessee will be required to consult further with BOEM and NMFS, as appropriate.

The Lessee, operators, personnel, and contractors will be required to comply with the most current ESA consultation, EFH consultation, and MMPA ITAs (if any) in place at the time of the submission, review, and approval of any Delineation, Testing, and/or Mining Plan(s) or other authorization related to activities on the lease. The ESA, EFH, and MMPA requirements may be included as conditions of approval for these plans or other authorizations.

C.2.2 Vessel Strike Avoidance

All vessels associated with Lessee activity must have a Protected Species Observer (PSO) or trained observer always monitoring the vessel strike avoidance zones for ESA-listed and MMPA species. When piloting vessels, vessel operators shall alter course to remain at least 500 meters from whales, and at least 100 meters from other marine mammals and sea turtles, excluding pinnipeds or small delphinids that voluntarily approach vessels, examples include the following genera: *Delphinus*, *Lagenorhynchus*, *Tursiops*, and *Phocoenoides*. If marine mammals and sea turtles are within 100 meters of the vessel, vessel speeds must be reduced to 10 knots or less, whether in a Lease Area or traveling between a port to the lease areas. Operators shall be particularly vigilant to watch for sea turtles at or near the surface. If a sea turtle is sighted within the operating vessel's forward path, the vessel operator must slow down to 5 knots and steer away when possible.

These requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply.

C.2.3 Protected Species Observers (PSOs)

A minimum of one qualified third-party PSO is required on each vessel while in the Lease Area for the purpose of Preliminary Activities. The number of required PSOs per vessel must be sufficient to provide complete viewing coverage of the surrounding marine environment. The Lessee must ensure that PSOs have adequate safety and monitoring equipment to conduct their activities (including night-vision equipment for nighttime survey operations). All third-party PSOs must have completed an NMFS-approved commercial PSO training course.

The Lessee must ensure that the PSOs have the authority to stop any transit or activity that could result in harm to an ESA-protected or marine mammal species, except when the stopping of the activity would put the safety of the vessel or crew at risk. If an ESA-listed species or marine mammal is struck by a vessel or survey equipment or becomes entangled in any cable or lines, the PSO must immediately notify NMFS so that appropriate response measures can be implemented. Similarly, the PSO must immediately notify NMFS if the vessel, Preliminary Activities, or crew causes any harassment or incidental take of an ESA-protected or marine mammal species.

C.2.4 Moon Pools

During all times a vessel related to Preliminary Activities is equipped with a moon pool, there must be a hull door that can be kept closed, to the maximum extent practical, and monitored prior to and after closure to prevent ESA-protected and marine mammal species from entering during Preliminary Activities or related transit. If an ESA-protected or marine mammal species is detected in the moon pool, the Lessee, operators, and contractors must ensure that the animal(s) leave the moon pool prior to closing the doors. Any observed ESA-protected or marine mammal species observed in the moon pool must be reported as outlined below under the protected species reporting requirements in paragraph (f), including how long the animal was observed and whether it was able to leave the moon pool without assistance.

C.2.5 Equipment Deployment and Retrieval

The Lessee must have a deployment plan for autonomous underwater vehicle and/or remotely operated vehicles (AUV/ROV) and configure all Preliminary Activities to reduce the risk of potential entanglement of ESA-protected and marine mammal species. Within the Lease Area, PSOs meeting the requirements of paragraph (e) must observe a 500 m exclusion zone around the vessel for at least 30 minutes prior to and during deployment and retrieval of AUV/ROV, and buoys. If there are no sightings of ESA-protected and marine mammal species, the equipment deployment or retrieval can proceed. If there are sightings of ESA-protected and marine mammal species, the Lessee, operators, and contractors must wait until the PSO determines that the animals have cleared the area for at least 30 minutes before retrieval or deployment can commence. In the unlikely event that entanglement does occur, the Lessee, operators, or contractors must undertake reasonable efforts to free the animal and ensure proper reporting of entanglement events according to the protected species reporting requirements specified below in paragraph (f).

C.2.6 Protected Species Reporting

The Lessee must immediately report to both NMFS and the Lessor (through BOEM) any incident of serious harm, injury, or death to an ESA-protected or marine mammal species observed during Preliminary Activities. In addition, should there be any incidental take of ESA-protected species (e.g., through harassment), the Lessee will immediately notify BOEM and NMFS to determine if additional ESA consultation is required. If an incident of serious harm, injury, or death occurs, the Lessee will ensure activities in the area are halted or modified as necessary to protect the animal and other species until such time as NMFS and BOEM determine the Preliminary Activities may proceed.

The Lessee must submit a final report summarizing the results of monitoring activities to BOEM and other appropriate agencies no more than 90 days following the completion of Preliminary Activities. Preliminary activity completion dates must be defined in the associated Preliminary Activities notice described in Lease Stipulations. If there are delays or changes to the completion dates, the Lessee must notify the Lessor as soon as practical. The final report must, at a minimum, include: (a) an evaluation of the effectiveness of monitoring protocols and (b) reporting of: (i) marine mammal, sea turtle, and other ESA-protected species sightings (species and numbers); (ii) any behavioral changes of the species in these sightings; and (iii) any interactions or conflict with ESA-protected and marine mammal species, including reporting of any project delays or cessation of operations due to the presence in the project area of marine wildlife species subject to ESA and Marine Mammal Protection Act (MMPA) protection. More details are found in the current ESA Letter of Concurrence (LOC), Essential Fish Habitat (EFH) Response, and any issued MMPA Incidental Take Authorization (ITA).

C.2.7 Marine Trash and Debris Prevention

The Lessee, operators, and contractors must comply with the marine trash and debris awareness and elimination terms and conditions within the 2026 ESA LOC and EFH Response from NMFS.

C.2.8 Protection of Biological Resources

Lessee(s) must avoid unnecessary or substantial disturbance to sensitive seabed habitats and biodiversity hotspots, including areas of high biological productivity. If previously unidentified sensitive habitats or biological communities are discovered, the Lessee must notify the BOEM Pacific Regional Director within 48 hours. BOEM may require the Lessee to modify or suspend operations, implement additional mitigation measures, relocate activities, and/or require a buffer of up to 500 meters around designated sensitive features, unless otherwise justified by site-specific conditions or methodology. The Lessor may require additional documentation from the Lessee at any point based on the nature of the activity, the sensitivity of the environment, or the results of environmental monitoring reporting or incidents described in Lease Stipulations. Documentation requests could include additional protective measures, monitoring protocols, and/or adaptive management strategies as determined by BOEM, pursuant to its authority under 43 U.S.C. § 1334 and 30 CFR 582.1(a).

C.2.9 Fisheries and Wildlife Awareness Training

To reduce the potential conflicts with fishers and minimize adverse interactions with wildlife during lease activities, the Lessee must ensure that all personnel and contractors who will be present on vessels or platforms within the Lease Area complete a Fisheries and Wildlife Awareness Training prior to marine operations (e.g., transit, surveys, equipment deployments), consistent with vessel and worker safety. This training must address: (1) identification of common wildlife species; (2) best practices for avoiding vessel strikes and minimizing noise and light impacts; (3) protocols for reporting wildlife sightings and entanglements; and (4) cultural and economic importance of regional fisheries. Training must also include a briefing by the Lessee's environmental compliance officer or designated representative on the importance of minimizing conflicts with local fishers and adhering to all applicable environmental protection measures. The Lessee must ensure that a copy of the environmental lease stipulations and related ESA, EFH, and MMPA (if applicable) conditions of approvals are made available and reviewed with all appropriate personnel aboard every project-related vessel.

Appendix D: Noise-Related Impact-Producing Factors for Marine and Coastal Birds

This section discusses the potential impacts of noise from routine events associated with the Proposed Action on marine birds. Potential sources of impacts for marine birds include (1) HRG, (2) vessel and equipment noise and vessel traffic, (3) underwater noise, (4) disturbance to nesting or roosting, (5) disturbance to feeding or modified prey abundance, and (6) aircraft traffic and noise. Since all site assessment activities are performed using vessels, all activities have the potential to impact marine birds.

HRG. The primary potential for impact to marine birds from HRG is to marine birds that dive below the water surface and are exposed to underwater noise (Turnpenny and Nedwell 1994), including terns, tropicbirds, albatrosses, gadfly petrels, shearwaters, and boobies. The species of jaegers, gulls, albatrosses, gadfly petrels, and shearwaters that may occur in the area generally feed by snatching prey from the sea surface. Only those species that dive are at risk of exposure to HRG since pulses are directed downward and are highly attenuated near the surface. In addition, HRG, such as side-scan sonar and sub-bottom profilers, are highly directive (e.g., downward, towards the seafloor), with beam widths as narrow as a few degrees; this directivity and narrow beam width also diminishes the risk to bird species other than diving species. Because of these factors, other species of marine birds would not be affected by HRG and are not discussed further for this potential impact.

Birds have a relatively restricted hearing range for airborne noise, from a few hundred hertz to about 10 kHz (Dooling et al. 2000). Data regarding bird hearing range for underwater noise is limited; however, a study using psychophysics found that Great Cormorants (*Phalacrocorax carbo*) learned to detect the presence or absence of a tone while submerged (Hansen et al. 2017). The greatest sensitivity was found at 2 kHz, with an underwater hearing threshold of 71 dB re 1 μPa RMS. The hearing thresholds are comparable to seals and toothed whales in the frequency band 1–4 kHz, which suggests that cormorants and other aquatic birds make special adaptations for underwater hearing and make use of underwater acoustic cues (Hansen et al. 2017).

HRG usually have one or two (and sometimes three) main operating frequencies. The frequency ranges for representative sources are 100 and 400 kHz for the side-scan sonar; 3.5, 12, and 200 kHz for the CHIRP sub-bottom profiler; and 240 kHz for the multibeam depth sounder. The low-frequency underwater noise generated by several types of survey equipment (e.g., sub-bottom profilers) falls within the airborne hearing range of birds, whereas noise generated by other types of survey equipment (e.g., side-scan sonar, depth sounders) is outside of their airborne hearing range, which may be more limited underwater, and should be inaudible to birds.

Some marine birds (including jaegers, terns, gulls, tropicbirds, and boobies) either rest on the water surface or shallow-dive for only short durations. Most of these birds would be resting on the water surface in the area surrounding survey vessels or would be dispersed; therefore, they would not come into contact with the active acoustic sounds. However, birds that shallow-dive could come into contact with active acoustic sounds, with the majority of the sound energy directed towards the seafloor. Therefore, the energy level that these diving birds could be exposed to would be for such a short time and have a lower sound energy that it would result in a minimal impact.

Marine birds that dive for short durations (such as albatrosses, gadfly petrels, and shearwaters) could be susceptible to active acoustic sounds generated from survey equipment. However, seismic pulses are directed downward and highly attenuated near the surface; therefore, there is only limited potential for direct impact from the low-frequency noise associated with HRG to affect diving birds. In addition, HRG such as side-scan sonar and sub-bottom profilers are highly directive, with beam widths as narrow as a few degrees or narrower; the ramifications of this directionality include a lower risk of high-level exposure to diving birds that may forage close to (but lateral to) a survey vessel.

Investigations into the effects of acoustic sound sources on marine birds are extremely limited. However, studies performed by Stemp (1985) and Lacroix et al. (2003) did not observe any mortality to the several species of seabirds studied when exposed to seismic survey noise; further, they did not observe any differences in distribution or abundance of those same species as a result of seismic survey activity. Based on the directionality of the sound and the low-frequency equipment used for HRG surveys, it is expected that there would be no mortality or life-threatening injury, and little disruption of behavioral patterns or other non-injurious effects of any diving marine birds from this impact, resulting in a minimal impact.

Vessel and Equipment Noise and Vessel Traffic. The primary potential impacts to marine birds from vessel traffic and noise are from underwater vessel and equipment noise, attraction to vessels and subsequent collision or entanglement, disturbance to nesting or roosting, and disturbance to feeding or modified prey abundance (Schwemmer et al. 2011). All survey activities are performed from vessels, with the exception of those conducted via aircraft; therefore, most survey activities have the potential to impact marine birds from vessel traffic and the associated vessel and equipment noise, and artificial lights.

Underwater Noise. The sound generated from individual vessels can contribute to overall ambient noise levels in the marine environment on variable spatial scales. As stated above, birds have a relatively restricted hearing range, from a few hundred hertz to about 10 kHz (Dooling et al. 2000) for airborne noise, with few data available regarding bird hearing range for underwater noise. The survey vessels would contribute to the overall noise environment by transmitting noise through both air and water. Underwater noise produced by vessels is a combination of narrow-band (tonal) and broadband sound. Tones typically dominate up to about 50 Hz, whereas broadband sounds may extend to 100 kHz. According to Southall (2004) and Richardson et al. (1995), vessel noise typically falls within the range of 100–200 Hz. Noise levels dissipate quickly with distance from the vessel.

Some marine birds (including jaegers, terns, gulls, tropicbirds, albatrosses, storm-petrels, gadfly petrels, shearwaters, frigatebirds, and boobies) either rest on the water surface, skim the water surface, or shallow-dive for only short durations. Because of these behaviors, members of these families would not come in contact with underwater vessel and equipment noise generated from HRG survey vessels, or the contact would be for such a short time that it would result in little disruption of behavioral patterns or other non-injurious effects. Therefore, impacts to these marine birds from vessel and equipment noise would be minimal.

Marine birds that dive for short durations (including terns, albatrosses, gadfly petrels, shearwaters, and boobies) could be susceptible to underwater noise generated from HRG survey vessels and equipment. Site assessment-related surveys typically use a single vessel. This level of vessel activity per survey event is not a notable increase in the existing vessel and equipment noise, the vessels are typically moving at slow speeds, and noise levels dissipate quickly with distance from the vessel. Machinery noise can be continuous or transient, and variable in strength. Because of this noise dissipation, only a very small area would experience vessel and equipment noise and potential associated disruption. Therefore, impacts of underwater noise from survey vessels to diving marine birds are expected to be minimal.

Disturbance to Nesting or Roosting. There is the potential for impact to marine birds from the potential disturbance of breeding colonies by airborne noise from vessels and equipment (Turnpenny and Nedwell 1994). Most marine bird species nest and roost along the shore and on coastal islands. Survey vessels for the Proposed Action are expected to make regular trips to their shore base in Saipan or Guam.

Vessels could cause a disturbance to breeding birds, with the potential to adversely affect egg and nestling mortality, if a vessel approached too close to a breeding colony. Surveys would not occur close enough to land to affect marine bird breeding colonies during survey activities. However, survey vessels are anticipated to transit from a shore base to offshore on a frequent basis. The expectation is that this level of vessel transit would occur at one of the shore bases identified or at other established ports in Saipan or Guam, which have established transit routes for ingress and egress in the coastal areas and existing vessel traffic. Because of this existing vessel traffic, it is not anticipated that marine birds would roost in adjacent areas, or, if they did already roost nearby, the addition of survey vessels would not notably increase the existing vessel traffic. In addition, noise generated from the survey vessels and equipment typically would dissipate prior to reaching the coastline and the nesting habitats of marine birds. Impacts of airborne vessel and equipment noise to nesting or roosting marine birds are expected to be minimal.

Disturbance to Feeding or Modified Prey Abundance. Marine birds require specialized habitat requirements for feeding (Kushlan et al. 2002). Survey vessel and equipment noise could cause pelagic bird species (including terns, tropicbirds, albatrosses, storm-petrels, gadfly petrels, shearwaters, frigatebirds, and boobies) to be disturbed by the survey vessel and equipment noise and to relocate to alternative areas, which could result in a localized, temporary displacement and disruption of feeding. These alternative areas may not provide food sources (prey) or habitat requirements similar to that of the original (preferred) habitat and could result in additional energetic requirements expended by the birds and diminished foraging opportunity. However, it is expected that the temporary relocation would be limited to a very small portion of a bird's foraging range, and it would be unlikely that this temporary relocation would affect foraging success. Impacts to pelagic birds from disturbance associated with vessel and equipment noise are expected to be minimal.

The Proposed Action Area likely provides foraging resources for transient and resident marine birds. Possible influences to marine birds from vessel and equipment noise may include relocation of some prey species, which is primarily linked to seasonality. During their annual migrations, a number of marine birds have very specific stopover locations for species-specific foraging to accumulate fat reserves. Because of the noise produced from survey vessels, there is the potential for an influence of modified prey abundance and distribution that migrating birds rely on for the accumulation of fat reserves to fuel their migration, which could result in additional energetic requirements for the migrating birds. However, it is unlikely that bird prey species would be affected by survey vessels to a level that would affect foraging success. If prey species exhibit avoidance of the area in which a survey is performed, it is expected to be limited to a very small portion of a bird's foraging range and for a limited duration. Therefore, there is the potential for temporary displacement of species from a portion of preferred feeding grounds during migration and short-term displacement of marine bird species from non-critical activities during non-migration seasons.

Aircraft Traffic and Noise. Potential impacts to marine birds from aircraft traffic include noise disturbance and collision. Noises that are generated by project-related survey aircraft and that are relevant to birds (for both individual birds on the sea surface and birds in flight above the sea surface) include airborne sounds from passing aircraft. Both helicopters and fixed-wing aircraft generate noise from their engines, airframe, and propellers. The dominant tones for both types of aircraft are generally below 500 Hz (Richardson et al. 1995) and are within the airborne auditory range of birds. Because of the expected airspeed (135 kn), noise generated by survey aircraft is expected to be brief in duration, and birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder et al. 2003); however, birds can be disturbed up to 1 km away from an aircraft (Efroymson et al. 2000).

The physical presence of low-flying aircraft can disturb marine birds, including those on the sea surface as well as in flight. Behavioral responses to flying aircraft include flushing from the sea surface into flight or rapid changes in flight speed or direction. These behavioral responses can cause collision with the survey aircraft. However, Efroymson et al. (2000) reported that the potential for bird collision decreases for aircrafts flying at speed greater than 150 km/hr.

Marine birds are not expected to be notably disrupted, given the relatively low number of aerial surveys and the short duration of potential exposure to aircraft-related noise, physical disturbance, and collision risk.

Appendix E: Supporting Documentation and Analysis, and List of Preparers and Reviewers

E.1 Descriptions and Justification for the Potential Survey Methods Used as Part of the Proposed Action

Survey Methodology Descriptions

Autonomous underwater vehicle (AUV) survey. AUV surveys consist of an autonomous (non-tethered) submersible with its own power supply and basic navigation logic. An AUV can run many geophysical sensors at the same time and typically would consist of a multibeam echosounder (MBES) and side-scan sonar system. AUVs also have forward-looking sonar for terrain avoidance, a doppler velocity logger for velocity information, an internal navigation system for positioning, an ultra-short baseline (USBL) pinger for positioning, and an acoustic modem for communication with a surface survey vessel. For single AUV operations, the surface survey vessel follows the AUV, keeping in communication via the acoustic modem. When several AUVs are deployed at the same time, navigation updates and modem communication are provided by a network of underwater transponder positioning (UTP) devices. These transponders are deployed to the seabed in known locations. In both methods of operation, the survey vessel recovers, maintains, and launches the AUVs and UTPs. A survey vessel may deploy AUVs and UTPs through a moon pool, which is a large opening through the hull from the deck and to the bottom of a vessel for lowering tools and instruments into the sea.

Shallow multi-instrument towed surveys. A vessel tows side-scan sonar or gradiometers with winches to provide altitude adjustments. In addition, passive acoustic monitoring can be towed from hardpoints (e.g., cleats) on the vessel. Shallow survey vessel work using hull-mounted MBES and USBL systems is not relevant for seafloor survey at the depths of the area. However, water column and fish related surveys may use similar equipment.

Deep-tow survey. Deep-tow surveys use towed methodology in deep waters. The vessel uses a large winch with thousands of meters of cable to tow the survey instruments at seafloor depth. The survey instruments usually consist of a large weight (depressor), followed by a side-scan or potentially an MBES. The system is mounted in a survey vehicle. In deep waters, the survey vehicle might be 8–10 km behind the survey vessel, sometimes requiring the use of a chase vessel to provide USBL navigation for the survey vehicle. Vessels maintain speeds of 4.5 kn or slower when towing equipment.

Uncrewed surface vessel (USV) survey. USVs or autonomous surface vessels (ASVs) are remotely controlled vessels that are controlled by operators on shore or from another vessel. USVs can be simple (with a single instrument, designed for shallow waters, and controlled by an operator that maintains visual contact with the USV) or more complex (the size of a small survey vessel, able to tow instruments, and using radar and cameras to operate and monitor for protected species). USVs can be electrically powered with batteries, sail or solar powered, and/or use diesel motors and generators.

Table E-1. Comparison of the regulations from the International Seabed Authority (ISA) and relevant federal agencies

Entity	Topic Regarding Bottom Disturbance	Regulations
NOAA	Not significant actions include collecting box core samples	Appendix E of the NOAA Administrative Order 216-6A Companion Manual Categorical Exclusion E3: Activities to collect aquatic, terrestrial, and atmospheric data in a nondestructive manner
USGS	Nondestructive marine projects	43 CFR 46.210 (e): Nondestructive data collection, inventory including field, aerial, and satellite surveying and mapping, research, and monitoring activities Extraordinary Circumstances Review (43 CFR 46.215, Categorical Exclusions: Extraordinary circumstances)
ISA	Exploration regulations	Polymetallic nodules (ISBA/19/C/17) Polymetallic sulphides (ISBA/16/A/12/Rev.1) Cobalt-rich ferromanganese crusts (ISBA/18/A/11)
BOEM	Other than preliminary activities discussed above, regulations describe 10 activities for categorical exclusion related to prospecting activities, including sub-bottom acoustic profiling, box core or grab sampler	BOEM 30 CFR 580.30 (Prospecting, subpart C)

Self-Determination

There is social science literature devoted to the value of self-determination as a cornerstone of the culture of Indigenous peoples living in the U.S. territories in the Pacific. Self-determination, as it applies to this Proposed Action, can be defined as the ability to influence how a territory's EEZ is managed. Grounded in political science, law, anthropology, sociology, and human geography, this interdisciplinary literature notes Indigenous values potentially impacted by federal decision-making processes in Pacific Islands nations and territories (Kelly 2023; Singh and Jaeckel 2024; Villagomez and Johnson 2025).

There is increasing international momentum in the region for requiring free, prior, and informed consent (FPIC) from local populations for any and all mining actions taken in the oceans that have been navigated by Indigenous peoples for centuries (Lily 2012). Tilot et al. (2021) document how several Pacific island nations have already developed polices requiring FPIC before mineral mining is permitted.

As part of the Request for Information and Interest comment process, BOEM received 65,585 comments, of which 89% (58,592) were form letter campaigns expressing opposition to mineral leasing. The majority of comments in opposition to the leasing were based on the perception that deep-sea mining will cause substantial and irreparable environmental, economic, and cultural impacts.

E.2 List of Preparers and Reviewers

Contribution	Contributor(s)
Chapter 1 Introductions	Linette Makua
Chapter 2 Purpose and Need	Linette Makua, Lisa Gilbane, Jen Le
Chapter 3 Environmental Analysis and Potential Impacts	Linette Makua, Lisa Gilbane
Air Quality	Eric Wolvovski
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Geology	Erick Huchzermeyer
Offshore Habitats	Donna Schroeder, Jennifer Le
Nearshore Habitats	Jennifer Le
Protected Habitats	Donna Schroeder, Jennifer Le
Marine Mammals	Chiharu Mori, Desray Reeb
Sea Turtles	Chiharu Mori, Desray Reeb
Marine and Coastal Birds	David Pereksta
Threatened and Endangered Species	Chiharu Mori, Donna Schroeder
Commercial and Non-commercial Fisheries	Donna Schroeder
Transportation/Navigation - Ocean Traffic	Jo'Anne Lewis, Lola Ajilore
Societal Factors	Donna Schroeder
Marine Cultural Resources	Franklin H. Price, Sarah Stokely, Jeremy Ripin, Kelsey Myers
Appendix A – Area Identification and Survey Assumption Memorandums	Jen Miller, Erick Huchzermeyer
Appendix B – Protected Species Lists	Chiharu Mori, David Pereksta, Desray Reeb
Appendix C – Best Management Practices	Chiharu Mori, Desray Reeb, David Pereksta, Donna Schroeder, Jennifer Le, Lisa Gilbane
Appendix D – Noise-Related Impact-Producing Factors	David Pereksta
Appendix E – Supporting Documentation and Analysis	Linette Makua, Lisa Gilbane
Appendix F – Section 106 Findings of No Historic Properties Affected	Franklin H. Price, Sarah Stokely, Jeremy Ripin, Kelsey Myers
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Appendix F: Section 106 Finding of No Historic Properties Affected for the Commercial Leasing for Minerals Offshore the Commonwealth of Northern Mariana Islands Environmental Assessment

Finding of No Historic Properties Affected
for the
Issuance of Marine Mineral Leases on the Outer Continental Shelf
Offshore the Commonwealth of the Northern Mariana Islands

Finding

The Bureau of Ocean Energy Management (BOEM) made a Finding of No Historic Properties Affected (Finding) for this undertaking, pursuant to Section 106 of the National Historic Preservation Act (NHPA) (54 United States Code [U.S.C.] 306108) and 36 Code of Federal Regulations (CFR) § 800.4(d)(l) of the Section 106 implementing regulations, "Protection of Historic Places." Should a mineral lease sale be held, BOEM expects the Finding will be met through inclusion of requirements in leasing documents. These requirements include avoiding known or potential historic properties and ensuring a Qualified Marine Archaeologist (QMA) is allowed to monitor or review live-stream video or recordings and/or samples during certain seafloor-disturbing activities. In the event of a discovery or inadvertent effect, the lessee(s) will follow the established unanticipated discovery protocols.

Documentation in Support of the Finding

I. Description of the Undertaking

Summary

This document describes BOEM's compliance with Section 106 NHPA and documents the agency's Finding for the undertaking of issuing up to six marine minerals leases and authorizing associated preliminary activities in the Commonwealth of the Northern Mariana Islands (CNMI) Outer Continental Shelf (OCS). BOEM has prepared this documentation in support of the Finding, following the standards outlined in 36 CFR § 800.11(d) (Documentation Standards). This Finding and supporting documentation has been provided to the consulting parties for the undertaking (see the Consultation with Consulting Parties and Public Involvement section below). This Finding and supporting documentation were made available for public inspection by placement on BOEM's public website prior to approving the undertaking.

Federal Involvement

The Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1331 *et seq.*) mandates the preparation of the OCS mineral leasing program pursuant to 30 CFR Chapter V, Subchapter B. OCSLA and its implementing regulations pertaining to commercial mineral sales and development (30 CFR parts 580-582) encourage orderly, safe, and environmentally responsible development of mineral resources on the OCS. OCSLA was amended (codified at 43 U.S.C. 1331) in the Inflation Reduction Act of 2022 (Pub. L. 117-169) when the definition of "State" was revised to include the Commonwealth of Puerto Rico, Guam, American Samoa, U.S. Virgin Islands, and CNMI.

BOEM is the only federal agency with the authority to lease marine minerals from the OCS. BOEM's regulatory authority is limited to the OCS, and the bureau cannot approve activities in waters of a U.S. state or territory (from the coastline to the state submerged lands boundary, typically 3 miles offshore), or onshore areas. On March 16, 2026, BOEM's Acting Director signed the Area Identification Memorandum (Area ID) delineating two areas for potentially up to six potential leases. The Area ID does not indicate a final decision on whether, where, or under what circumstances to hold a lease sale; the Area ID delineates potential lease areas for additional analyses as the proposed lease sale process continues. Additional information is provided below (Description of the Proposed Lease Areas) regarding the lease areas.

BOEM prepared an Environmental Assessment (EA) for issuing up to six leases for marine mineral exploration and authorizing associated preliminary activities in the OCS around CNMI, pursuant to 30 CFR 581.14. BOEM has determined that the issuance of these commercial leases and resulting preliminary activities in the lease areas constitute an undertaking subject to Section 106 of the NHPA (54 U.S.C. 306108) (Section 106 NHPA) and its implementing regulations (36 CFR 800). BOEM will serve as the lead federal agency for the Section 106 NHPA review.

Description of the Proposed Lease Areas

The proposed leases would be within two areas—an eastern area and a western area (see Table 1), encompassing abyssal plains; abyssal hills; active, inactive, and extinct hydrothermal vents; seamounts; and guyots; and partially bordering the Mariana Trench Marine National Monument.

The eastern area covers approximately 35,483,044 acres (143,595 km^2), with water depths of 3,700–25,100 ft (1,130–7,650 m). It lies about 128 miles (206 km) east of Saipan and 127 mi (205 km) east of Guam.

The western area covers approximately 33,618,369 acres (136,049 km^2), with water depths of 2,820–18,670 ft (860–5,690 m). It lies about 57 miles (91 km) west of Saipan and 46 miles (74 km) northwest of Guam.

Table 1. Area, depth range, and distance of the two potential lease areas

Area	Acres	Square Kilometers	Depth Range	Nearest Saipan Shore Distance	Nearest Guam Shore Distance
Eastern Area	35,483,044	143,595	3,700–25,100 ft. (1,130–7,650 m)	128 miles (206 km)	127 mi (205 km)
Western Area	33,618,369	136,049	2,820–18,670 ft. (860–5,690 m)	57 miles (91 km)	46 miles (74 km)

The Undertaking

The undertaking is the potential issuance of up to six marine minerals mining leases within the lease areas. The issuance of a lease allows a lessee to conduct preliminary activities. "Preliminary activities" are defined as "bathymetric, geological, geophysical, mapping, and other surveys necessary to develop a comprehensive Delineation, Testing, or Mining Plan. Such activities are those which have no significant adverse impact on the natural resources of the OCS (30 CFR 582.21([d])." The commercial lease(s) would not authorize any mining activities on the OCS but could result in preliminary activities.

The EA evaluated the following specific preliminary activities allowed with lease issuance and associated with this undertaking: use of dynamically positioned vessels, autonomous underwater vehicles (AUVs), and remotely operated vehicles (ROVs); high-resolution geophysical (HRG) surveys; high-resolution video or acoustic cameras; sampling sediments, water, and species from an ROV; anchors on the seafloor for buoys and physical or biological data collection; scientific physical and biological monitoring from a ship or moored anchor, including box core sampling and use of landers; expendable equipment such as weights; acoustic doppler current profilers (ADCPs); underwater transponder positioning (UTP) units; and focused biological surveys from the air, ship, or in-water that can utilize aerial digital imaging, visual observation, radar, thermal or acoustic monitoring.

Preliminary activities that could potentially impact the seafloor include geotechnical investigations (box coring and free-fall grab samples), ROV push cores, oceanographic moorings, and deploying scientific equipment on the seabed. Lost equipment is another potential effect that could impact the seafloor because of these preliminary activities.

A lessee must submit the results of preliminary activities with their plans (Delineation, Testing, and/or Mining Plan) (e.g., 30 CFR 582.22, 30 CFR 582.23, and 30 CFR 582.24). The lessee shall give written notice to BOEM at least 30 days prior to initiating preliminary activities on the lease. Each written notice must include details of preliminary activities (e.g., bathymetric, geological, geophysical, mapping, and other surveys) to be conducted and timelines of effort.

The following sections provide additional details regarding specific preliminary activities that may be carried out on a lease:

High-Resolution Geophysical Surveys
The purpose of HRG surveys is to acquire seafloor hazards data, characterize seafloor conditions, and conduct bathymetric charting. BOEM anticipates that the HRG surveys would be conducted using the following equipment: bathymetry sounder, multibeam echosounder (MBES), side scan sonar, magnetometer/gradiometer, and possibly sub-bottom profiler, synthetic aperture sonar (SAS), and ultra high-resolution seismic imaging systems. This equipment usually does not contact the seafloor and is typically towed from a moving survey vessel that does not require anchoring. BOEM does not consider HRG surveys to be an activity that has the potential to affect historic properties. Thus, this activity is not considered as having a potential impact on historic properties and therefore is not considered further in this Finding.

Geotechnical Investigations

The purpose of geological sampling during preliminary activities is multifold: to validate (ground truth) HRG surveys, to conduct environmental characterization, to better identify site-specific exploration targets, and to collect information for developing a Delineation, Testing, and/or Mining Plan. Geological and geotechnical surveys include a variety of seabed sampling equipment that cause a range of impacts to the seafloor.

Within the scope of preliminary activities, ROVs provide the most precise method for data and sample collection. ROVs can collect grab and push core samples within centimeters and provide real-time visual control. Instruments that measure conductivity, temperature, and depth; ultra-short baseline pingers; cameras; and other equipment can also be mounted on an ROV for additional environmental observations. BOEM plans to include as a lease stipulation that a QMA be available to monitor sediment sampling activities conducted via ROV.

Box core and free-fall sampling are considered preliminary activities only on the eastern side of CNMI. A box core is lowered from a surface vessel to the seabed by winch and penetrates the seabed; when tension is applied, the box core jaws close, sealing the sample inside. Once on deck, various sub-sampling (e.g. grab or scoop) and tests can be performed. A free-fall grab is similar except that it is released unconnected to the vessel, descends to the seafloor, samples the seabed, releases ballast weights, and comes back to the surface via a float. A box core or free-fall grab retrieves a greater sample volume of sediment than an ROV, but preclearance is typically not possible. Additional sensors can also be mounted on a box core or free-fall sampler for additional environmental observations.

To the extent historic properties may exist but have not yet been identified or discovered, BOEM is planning to ensure that a QMA visually examines retrieved box core and free-fall grab samples for potential cultural material and artifacts, and the cores and samples are photo-documented prior to sub-sampling. Bottom imagery (e.g., video or still systems with lights) may also be acquired as technically feasible for seabed disturbance or sampling activities. All imagery will be retained and provided for review by a QMA to determine if any potential archaeological resources were present in the sampled areas.

On the eastern side of CNMI, BOEM assumes up to three seafloor sampling efforts per lease using box cores or free-fall grabs. The initial effort would include sampling and mapping at a coarse scale covering a larger area and then two subsequent sampling surveys would focus on increasingly smaller areas of interest. This assumed approach maximizes the number of surveys and samples; therefore, the document analyses the maximum anticipated environmental impact. The number of surveys and samples, and area are estimated from research-based activities, U.S. agency research, and 2023 International Seabed Authority (ISA) guidance with details available in Appendices A and E of the EA. The ISA's deep data website (International Seabed Authority 2025) shows that sampling grids sometimes are not constant throughout a lease. However, the values in Table 2 assume a consistent survey density and a greater-than-average number of samples for ISA exploration contracts. Under the Proposed Action, up to six sampling surveys would be completed on the eastern side, collecting approximately 2,550 samples (Table 2). Each sample could disturb an area of 0.5 to 1.5 m^2 of the seafloor. Together, these six surveys could disturb 2,265 m^2 of the seafloor and represent less than 0.0000016% of the total eastern area (Table 3).

Table 2. Estimated range of number of seabed box core and free-fall grab sample stations on the eastern side of CNMI

Survey	Number of Stations per Lease Alternative A	Number of Stations per Lease Alternative B	Total Number of Stations in Eastern Area
Course survey using free-fall grab (15-km grid)	283.9 (128.8 to 519.1)	189.3 (85.8 to 346.1)	567.9 (257.5 to 1,038.2)
Coarse survey using box core (50-km grid)	31 (16.1 to 58.1)	20.7 (10.7 to 38.7)	62.1 (32.1 to 116.2)
Lease area box core survey (10-km grid)	676.8 (209.5 to 1,618.6)	451.2 (139.7 to 1,079.1)	1,353.5 (419 to 3,237.2)
Area of interest box core survey (7-km grid)	282.8 (156.3 to 457.9)	188.6 (104.3 to 305.9)	565.9 (279.1 to 982.1)
Total	1,274.5 (510.7 to 2,653.7)	849.8 (340.5 to 1,769.8)	2,549.4 (987.7 to 5,373.7)

Note: Counts of samples or stations contacting the seafloor are 50% values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in Appendix A of the EA.

Table 3. Estimated area of disturbance to the seafloor caused by box core and free-fall grab surveys on the eastern side of CNMI

Survey	Disturbance per Lease Alternative A (m^2)	Disturbance per Lease Alternative B (m^2)	Total Disturbance in Eastern Area (m^2)
Course survey using free-fall grab (15-km grid)	142 (58.6 to 273.5)	94.6 (39.1 to 181.5)	283.9 (117.4 to 544.5)
Coarse survey using box core (50-km grid)	31 (14.3 to 60.4)	20.7 (9.5 to 40.4)	62.1 (28.4 to 121.3)
Lease area box core survey (10-km grid)	676.5 (193.9 to 1,650.8)	451 (130.1 to 1,101.9)	1,353 (390.2 to 3,305.7)
Area of interest box core survey (7-km grid)	282.8 (139.1 to 489.6)	188.6 (93 to 327.4)	565.9 (279.1 to 982.1)
Total	1,132.3 (405.9 to 2,474.3)	754.9 (271.7 to 1,651.2)	2,264.9 (815.1 to 4,953.6)

Note: Area of disturbance to the seafloor are 50% values with a range in parenthesis of 5% to 95% the value. Totals are derived from running simulations, and not additive, from the four surveys and explained further in Appendix A of the EA.

On the western side of CNMI, BOEM assumes one dense seafloor sampling effort by ROV. This assumed approach maximizes the number of sampling sites (i.e. potential deposits) and samples; therefore, the document analyses the maximum anticipated environmental impact. The number of sites and samples are estimated from research-based activities, U.S. agency research, and 2023 ISA guidance, with details available in Appendices A and E of the EA. BOEM estimates there may be up to 241 deposits in the western area. One ROV survey per lease would be completed under the Proposed Action, collecting approximately 30 samples per deposit (Table 4). Together, these surveys could disturb 13,586 m^2 of the seafloor and represent approximately 0.000010% of the total western area (Table 4).

Table 4. Estimated range of number of seabed ROV samples and area of seafloor disturbance on the western side of CNMI

ROV Sampling Method	Number of Samples per Deposit	Disturbance per Lease Alternative A (m^2)	Disturbance per Lease Alternative B (m^2)	Total Disturbance in Western Area (m^2)
Push core	10 (5 to 15)	2,264.7 (694.5 to 5,567.8)	1,535.2 (472.3 to 3,807.6)	4,529.4 (13,89.1 to 11,135.5)
Grab	20 (10 to 30)	4,528.3 (1,385.9 to 11,064.6)	3,074.1 (940.1 to 7,611)	9,056.6 (2,771.8 to 22,129.1)
Total	30 (15 to 45)	6,793 (2,080.4 to 16,632.4)	4,609.3 (1,412.4 to 11,418.6)	13,586 (4,160.9 to 33,264.6)

UTP Units, Buoys, Moorings, and Landers

Ocean environmental characterization surveys utilize anchors, clump or ballast weights, and placement of scientific equipment on the seafloor. Weights and some equipment are considered expendable and left on the seafloor, while the connected equipment is released and retrieved. Sediment plumes are a known concern from commercial-scale mining, and a common way to understand ocean sedimentation and currents is to anchor sampling devices on or near the seafloor. AUVs may also require the use of multiple navigation devices positioned on the seafloor. During preliminary activities, a lessee would likely include placement of sampling devices and associated anchors to position those devices on the seafloor.

In western CNMI waters, preliminary activities that contact the seafloor, such as placing anchors, require prior visual clearance and controlled placement of equipment. Sediments and substrates on the western side are expected to be more variable and contain hard-bottom or consolidated sediments, which may be sensitive to disturbance. Therefore, any equipment on the seafloor must be placed precisely where imagery, or other clearance methods, has determined there would be no notable adverse impact. Due to expansive soft sediments expected in the eastern lease areas, the same procedures are not required, although recommended where feasible.

Surface buoys are anchored at fixed locations for monitoring and evaluating water column and air conditions. In deeper waters, lessees are more likely to set moorings for collecting oceanographic data without a surface buoy (AMC Consultants Pty Ltd et al. 2021). However, BOEM estimates two large surface ocean buoys would be placed per lease; the Proposed Action would have a maximum of eight buoys. Likely buoy types for deep water include discus-shaped, boat-shaped, and spar buoys; a large discus-shaped hull buoy has a circular hull of 10–12 m in diameter. Meteorological buoys are the most common type of larger ocean buoy deployed. Meteorological buoy anchors deployed in approximately 1,000 m created a buoy watch circle (i.e., excursion radius) of approximately 1,250 m and almost 3,000 m of line (Pacific Northwest National Laboratory 2019). Onboard power supply sources for buoys could include solar arrays, lithium or lead-acid batteries, and diesel generators, which require an onboard fuel storage container with appropriate spill protection and environmentally sound methods for refueling activities. Buoys will be lit in accordance with the U.S. Coast Guard private aid to navigation (PATON) requirement. Decommissioning is assumed to be essentially the reverse of the installation process, removing approved equipment. Installation and decommissioning of buoys are expected to be completed within one day per buoy and would be performed with the support of a vessel(s) equivalent in size and capability to that used for installation.

A buoy would be anchored to the seafloor at two or three locations that would be made from materials such as solid cast iron, cement, or chain. The line connecting the buoy to the anchor consists of chain, jacketed wire, nylon rope, polypropylene rope, and subsurface floats, which keep the mooring line taut to semi-taut, reduce slack, and eliminate looping (National Data Buoy Center 2025). The chain at bottom of the mooring line could sweep and disturb the seafloor. A meteorological buoy anchor deployed at approximately 1,000 m used a solid cast iron anchor weighing approximately 11,000 lbs and had a footprint of approximately 2.3 m^2 (Pacific Northwest National Laboratory 2019). Moorings for collecting oceanographic data without a metocean surface buoy are more common internationally at depths of 4,500–5,200 m. Anchors range from 3,700–6,800 lbs, with similar types of mooring lines extending approximately 500 m below the surface to avoid interference with other marine activities (AMC Consultants Pty Ltd et al. 2021; China Minmetals Corporation 2024; National Data Buoy Center 2025; Sharma and Nath 2020). BOEM estimates that mooring installation could disturb approximately 28 m^2 of seafloor per mooring (Appendix A of the EA). After installation, the transport vessel likely would remain in the area for several hours while technicians configure systems.

The speed and direction of ocean currents would likely be assessed with ADCPs. An ADCP is a remote sensing technology that transmits sound waves at a constant frequency and measures their reflection as the waves ricochet off fine particles or zooplankton suspended in the water column. ADCPs could be mounted independently on the seafloor, attached to a buoy, or have multiple instruments deployed as a subsea current mooring. A seafloor ADCP likely would be mounted in a tripod or a trawl resistant mount. One subsea current mooring might have 8–10 ADCPs vertically suspended from an anchor, combined with several floats made of syntactic foam. These moorings do not breach the surface. A typical ADCP is about 1–2 ft tall and 1–2 ft wide. Its mooring, base, or cage (surrounding frame) would be several feet wider. BOEM estimates that eight moorings per lease could be installed across all lease areas, with seafloor disturbance likely around 28 (12.6 to 78.5) m^2 per mooring.

Preliminary activities in eastern CNMI waters may include a seafloor lander. This stationary scientific monitoring device ‘lands’ on the seafloor and ranges in size. BOEM assumes approximately 22 landers could be deployed across the total area but not at the same time. Most landers would displace about 2 m^2 of seafloor, though the footprint of a newer device rated to ocean depths of 6,000 m is approximately 4 m^2 (Guo et al. 2023).

As a part of the Proposed Action, the EA also assumes AUV-based surveys would use multiple AUVs and require placement of UTP units on the seafloor. Each UTP could displace 1 m^2 of area, with up to 405 UTPs placed across the eastern area (Table 5) and 1,472 UTPs in the western area (Table 6). In the eastern lease areas, there would likely be one HRG AUV survey. In the western lease areas, there would likely be an additional denser AUV survey.

Table 5. Estimated area of disturbance to the seafloor caused by placing UTP units to support AUV navigation and deploying moorings and landers for physical and biological data collections for the eastern leases

Survey	Disturbance per Lease Alternative A (m^2)	Disturbance per Lease Alternative B (m^2)	Total Disturbance for Eastern Lease Areas (m^2)
UTP deployment for AUV survey	202.1 (101.8 to 359.2)	134.9 (67.4 to 239.4)	404.7 (202.2 to 718.2)
Moorings for equipment	280 (142.5 to 455.6)	186.7 (95 to 303.8))	560 (285 to 911.3)
Landers	11 (7.6 to 14.4)	7.3 (5 to 9.6)	21.9 (15.1 to 28.8)
Total seafloor disturbance	493.1 (251.9 to 829.2)	328.9 (167.4 to 552.8)	986.6 (502.3 to 1658.3)

Note: Any value that has a range is described as 50% value (5% to 95%) value. Totals are derived from running simulations, and not additive, from the three efforts and explained further in Appendix A of the EA.

Table 6. Estimated area of disturbance to the seafloor caused by placing UTP units to support AUV navigation and deploying moorings and landers for physical and biological data collections for the western leases

Survey	Disturbance per Lease Alternative A (m^2)	Disturbance per Lease Alternative B (m^2)	Total Disturbance for Western Lease Areas (m^2)
UTP deployment for AUV survey	735.8 (397.4 to 1,115)	498.8 (269.8 to 757.8)	1471.6 (794.9 to 2,229.9)
Moorings for equipment	274.5 (139.7 to 446.7)	183 (93.1 to 297.8)	549 (279.4 to 893.3)
Landers	10.8 (7.4 to 14.1)	7.2 (4.9 to 9.4)	21.5 (14.8 to 28.2)
Total seafloor disturbance	1,021.1 (544.5 to 1,575.8)	689 (367.8 to 1,065)	2,041.5 (1,044.1 to 3,151.4)

Note: Any value that has a range is described as 50% value (5% to 95%) value. Totals are derived from running simulations, and not additive, from the three efforts and explained further in Appendix A of the EA.

Remotely Operated Vehicles

The most precise method to collect seafloor sediments or species is by ROV, which can target samples to within a centimeter and provides real-time operational and visual control. BOEM plans to require as a lease stipulation that a QMA must monitor the video feed in real time if an ROV survey is conducted near a potential or newly discovered archaeological resource.

Area of Potential Effects

As defined in 36 CFR § 800.16[d], the Area of Potential Effects (APE) is the geographic area, or areas, within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The dimensions of the APE are influenced by the scale and nature of an undertaking and may differ for various kinds of effects caused by the undertaking.

The APE for this undertaking encompasses the full horizontal and vertical extant of the seafloor that could be affected by seafloor- or bottom-disturbing preliminary activities. It includes all portions of the seafloor where such activities may affect historic properties, should they be present. Accordingly, the APE is defined as the entirety of the lease areas (Figure 1).

BOEM has not included any onshore areas within the APE for potential visual effects. Although preliminary activities may include the temporary placement of surface buoys within lease areas, these buoys are not expected to be visible from shore or result in effects to onshore historic properties.

Any increased lighted vessel traffic associated with preliminary activities would be temporary and indistinguishable from existing vessel traffic. The minor and short-term increase would not alter existing visual conditions nor is there any indication that this undertaking would involve expansion of existing port infrastructure. Accordingly, the APE for this undertaking does not include onshore areas.

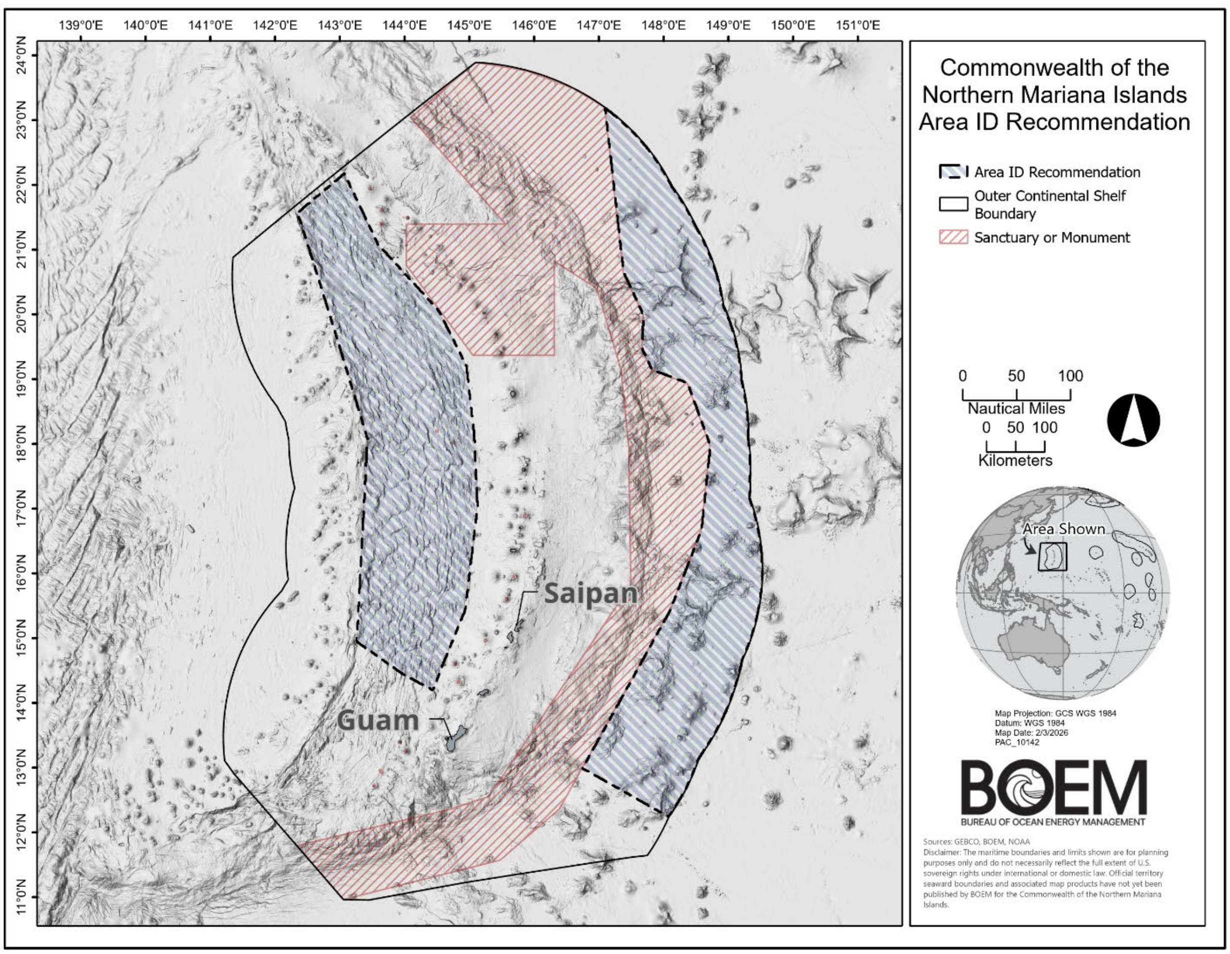

Figure 1. Commonwealth of Northern Mariana Islands Commercial Lease Section 106 NHPA Area of Potential Effects Map

Consultation with Consulting Parties and Public Involvement

On November 12, 2025, BOEM published a request for information and interest to hold a commercial lease sale for marine minerals within the OCS east of the CNMI (Federal Register Doc. BOEM-2025-0351) for a 30-calendar day public comment period. On Friday, December 12, BOEM extended the comment period until January 12, 2026, in response to a request from the Governors of the CNMI and Guam. Subsequently, the lease area was expanded to include an area west of CNMI. On March 16, 2026, BOEM's Acting Director signed the Area Identification Memorandum (Area ID) delineating an eastern area and a western area totaling approximately 69,101,413 acres (279,643 km^2) with water depths ranging from 2,820–25,100 ft (860–7,650 m).

BOEM initiated consultation through letters, sent via email, with the CNMI Historic Preservation Officer, Guam Historic Preservation Officer, Mariana Islands National Wildlife Refuge and Mariana Trench Marine National Monument (U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration [NOAA]), War in the Pacific National Historical Park (Guam) and American Memorial Park (Saipan) (National Park Service), and additional consulting parties, including the University of Guam, Northern Marianas College, and Matua Council for Native Chamorro Advancement (Attachment A, attached hereto). Consulting parties were invited to provide comments and information to assist in identifying historic properties and in evaluating the potential effects of the undertaking on those properties.

BOEM shared this draft Finding with all the consulting parties listed in Attachment A for a 30-calender day review period. BOEM requested concurrence on the draft Finding from the CNMI Historic Preservation Officer and Guam State Historic Preservation Officer, and invited comments from all consulting parties. Further, BOEM posted this draft Finding on BOEM's webpage to seek public comment.

II. Description of the Steps Taken to Identify Historic Properties

BOEM has determined that separate Section 106 consultations, including the identification and evaluation of historic properties, assessment of effects, and, if necessary, the resolution of adverse effects will be conducted at different stages of this leasing. This Section 106 consultation addresses potential effects associated with the issuance of leases, including implementation of allowable preliminary activities after lease issuance. Should one or more leases be issued and activities be proposed beyond preliminary activities, BOEM will conduct separate Section 106 consultations, as appropriate, prior to approval/approval with conditions or disapproval of Delineation, Testing, and/or Mining Plans.

Based on the nature and scale of this undertaking (issuing commercial leases and subsequent preliminary activities) with no or minimal potential to affect historic properties, BOEM determined that the agency meets the reasonable and good faith effort requirements for the identification and evaluation of historic properties through the evaluation of existing databases, reports, and regional studies identifying potential or nonpotential historic properties and

consultation with the CNMI Historic Preservation Officer, the Guam Historic Preservation Officer, and other consulting parties. BOEM reviewed existing and available information regarding historic properties that may be present within the APE, including data concerning possible historic properties not yet identified.
BOEM reviewed the most recently updated, publicly available National Register of Historic Places (NRHP) database information. As of June 24, 2025, CNMI contains 39 listed historic properties and Guam contains 135. Of these, three properties in CNMI and one property in Guam are designated National Historic Landmarks. None of these historic properties are located within the APE for this undertaking.

BOEM conducted a review of reported shipwrecks in BOEM's Pacific OCS Shipwreck Database. BOEM's Pacific OCS Shipwreck Database does not represent a complete listing of all potential shipwrecks on the Pacific OCS but, rather, serves as a baseline source of existing and available information for the purposes of corroborating and supporting identification efforts. Analysis of this BOEM database and other shipwreck databases reviewed is discussed later in this report, specifically the Post-Contact Period Cultural Resources subsection below.

A BOEM and NOAA sponsored May 2025 research cruise, the Mattingan Marianas Arc Volcanic Exploration, acquired survey, ROV, and AUV data from within the eastern and western lease areas. BOEM determined available multibeam data collected in the lease areas have been acquired using hull-mounted multibeam sources. However, object detection at the seafloor remains a technical challenge given the extreme water depth and precision/accuracy inherent in using surface acoustic data. Even though there is multibeam data of certain sections of the proposed lease areas, the horizontal and vertical resolution of the available multibeam data is not suitable for the purpose of historic property-specific identification.

To date, the APE has not been subject to a complete and comprehensive archaeological identification survey. Contributions from regional and area cultural and archaeological studies are included in this report (Carrell et al. 1991, BOEM 2017 and 2024, Van Tilburg 2007), as are cultural resource studies or surveys specific to CNMI (Carrell 2009a, McKinnon et al. 2015, McKinnon and Carrell 2015, and others). However, there has not been an archaeological survey of the eastern or western lease areas. The following sections outline the history of human habitation in CNMI through several time periods and discuss the potential cultural resources that may be discovered within the lease areas.

<u>Pre-Contact Period (Approximately 1500 Before Common Era [BCE] to 1521 Common Era [CE])</u>

Based on the present understanding of the archaeological record, human populations ~~-~~settled in the CNMI by 1500 years BCE, after completing the world's longest open-ocean voyage in human history at its time, more than 2,000 km from any contemporary populated area (Carson 2014). At this time, sea levels were significantly higher (up to 2 m above current levels), with drawdown not occurring until approximately 1100 BCE. Habitation sites and permanent settlements related to the earliest occupation by the *CHamoru* (Chamorro) people were limited to few locations and included post-raised houses with heated-rock ovens or hearths, located directly at the ancient shoreline and partially extending into the inter-tidal zone. Faunal remains from the earliest settlement sites indicate a diet including shellfish (such as clam, chiton, limpets, and sea urchins), fish, birds, and turtles. Plant-based foods such as coconut, native breadfruit, cycads, and others were obtained through low-impact modifications of the natural forest habitat and small-scale farming. The earliest settlers produced abundant red earthenware pottery, consisting of small, thin-walled vessels (up to 20 cm in diameter) decorated with black burnishing and occasional use of impressed designs on the exteriors, as well as stamped and incised designs. Personal ornaments were made of shells, as were fishing gear such as hooks, net weights, and lures. Stone tools consisted of both ground and flaked implements made of limestone, chert, and porous volcanic stone (Carson & Hung 2021). This period from 1500 BCE to 1000 CE is referred to as the Pre-Latte Period (Carson 2012).

As sea levels dropped and the *CHamoru* diversified and modified their material cultural and subsistence practices, settlement locations shifted to follow the shoreline and adjusted use of the broadening beaches and interior locations. Some of the largest and most complex were once found in inland areas rather than along coasts (Osborne n.d. in Carson 2012, p.321), suited to farming plants such as yams, taro, bananas, breadfruit, sugar cane, and rice. By 1000 CE the *CHamoru* were building structures supported by upright stone pillars known as *latte*, often consisting of eight pillars in two rows situated with the long axis paralleling a nearby shoreline or stream (Hornbostel n.d. in Carson 2012, p. 317). Most of the archaeological study in the CNMI to date has focused on this period of their history, referred to as the Latte Period (1000–1700 CE), and latte stones remain standing across the islands today as symbols of the deep history of the *CHamoru* culture. The most impressive of these monumental sites, the House of Taga (built circa 1600), represents the largest ever standing structure of traditional stonework in the Mariana Islands, and has been identified as a multi-component site with the oldest occupational layers beneath and surrounding the pillars dating to the earliest occupation period circa 1500-1300 BCE (Carson & Hung 2021).

<u>Pre-Contact Period Cultural Resources</u>

The APE has no potential for the presence of inundated pre-contact terrestrial sites because the water depths (2,820–25,100 ft [860–7,650 m]) are well below the lowest sea levels during human habitation of CNMI. Micronesian watercraft and/or associated artifacts from the Pre-Contact Period or later could, however improbably, exist within the APE. Evidence of pelagic species in the archaeological record indicates that communities in CNMI fished the open ocean throughout the Pre-Contact Period (Amesbury 2013). However, Micronesian shipwrecks are extremely unlikely to be encountered mostly because of their inherent buoyancy. The Pacific voyaging canoe may have originated in the deep past in Indonesia or the Philippines and spread through the Pacific (Horridge 1995:135–142). Pacific voyaging canoes used a double-hull design to achieve stability, instead of the use of ballast (Haddon and Hornell 1936). As a result, "Submerged wreck sites (unintentional or accidental losses while in-use) for voyaging canoes may therefore be very rare, if they exist at all, in the Pacific" (BOEM 2017). *CHamoru* sailing canoes have yet to be discovered in the archaeological record (Russell 2009:61). So far, the only in-situ voyaging canoes have been discovered at nearshore terrestrial wet sites, instead of oceanic contexts (Sinoto 1983; Johns and Sung 2014; BOEM 2017; BOEM 2024). The likelihood of discovering or encountering artifacts from lost Micronesian watercraft is likewise remote.

Post-Contact Period (1521 CE to Present)

The Post-Contact Period in CNMI can be divided into six sub-periods: Early European Exploration and Spanish Period (1521–1898), German Period (1899–1914), Japanese Mandate (1914-1941), World War II (1941–1945), and postwar (1945–present) (Carrell 2009a). The Post-Contact Period began when Europeans arrived on voyages of exploration, starting with Magellan in 1521. The Spanish Period resulted in significant social change in CNMI, especially with the late seventeenth century Spanish removal of all *CHamorus* from the northern islands to Saipan, Guam, and Rota. This forced relocation caused a shift of lifeways, resulting in a loss of *CHamoru* maritime knowledge, including the use of indigenous sailing watercraft (Brunal-Perry et al. 2009). The population of CNMI declined during this period because of disease and forced relocation (de la Rosa 2019). After more than three centuries of Spanish rule, the United States acquired control of Guam in 1898 during the Spanish-American War, and Germany purchased the CNMI from Spain in 1899 (Spennemann 2007:7–8) The German colonial period lasted until 1914, when the Japanese seized the islands during World War I. Under the Japanese Mandate trade increased, sugar production and fishing expanded, and CNMI experienced an influx of Japanese, Okinawan, and Korean immigrants (Peattie 1988; Ombrello 2009). Although tensions between the United States and Japan over Micronesia were largely resolved in the interwar period, World War II brought both nations into direct conflict in the Pacific. Japan seized Guam at the onset of hostilities. As the war progressed, U.S. military strategists recognized the capture of CNMI as key to cut off Japanese shipping, reinforcement, and supply routes as well as to secure strategic air bases for campaigns against the Japanese mainland (Morison 1963:325; Farrell 2009:297). The U.S. invasion of CNMI, especially the battles for Saipan and Tinian, caused massive loss of life on the islands, both military and civilian (Sheeks 1945). After capture, the airstrips on Tinian served as the staging area for bombing runs to Japan, culminating in the use of atomic weapons on Hiroshima and Nagasaki in 1945 (Clapson 2019). After World War II, CNMI remained a United States trust territory after World War II and is now a United States unincorporated territory and commonwealth.

Post-Contact Period Cultural Resources

Similar to Van Tilburg's assessment of American Samoa, the cultural resources of CNMI can be divided into five aspects: historic shipwrecks; lost World War II aircraft; World War II fortifications; terrestrial archaeological sites; and "marine/coastal natural resources associated with the legends and folklore" (Van Tilburg 2007). Based on the information available at this stage of early leasing, BOEM has determined that shipwrecks and downed aircraft are the most likely types of cultural resources to be encountered in the APE, given its water depth and distance from land. BOEM understands that Pacific Islanders place a deep cultural significance to the ocean itself and through consultation may determine if these lease areas or certain portions are culturally significant to specific communities. There are three Traditional Cultural Places (TCPs) on Tinian (U.S. Department of the Navy 2026), and none in the APE.

Seafaring has characterized CNMI for millennia. Consequently, shipwrecks could be found within the APE and could reflect a variety of vessel types and time periods. Research suggests at least 147 reported vessel losses in CNMI and Guam, with locations for at least 72 vessels, several of which have been found (Carrell 2009b:353). Although no submerged archaeological sites are currently confirmed in the APE, historical records report vessels as having been lost within the lease areas, especially the western lease area. Twelve Japanese vessels were reported lost during World War II within the APE, including merchant marine transports, submarines, a gunboat, a repair ship, and a fleet tanker (Carrell 2009b). Military vessels and aircraft, whether American or Japanese, are protected under the Sunken Military Craft Act (SMCA 2004) and also may be submerged grave sites. The potential presence, and potential dangers, of unexploded ordinance should also be considered at submerged World War II-era archaeological sites (Raupp et al. 2015:45)

In consultation with other federal partners, BOEM marine archaeologists searched multiple databases and contacted other federal agencies (Automated Wreck and Obstruction Information System, BOEM's Pacific OCS Shipwreck Database, United States Naval History and Heritage Command [USNHHC], and Defense POW/MIA Accounting Agency) and received reports of missing vessels and aircraft. The USNHHC reported three US Navy shipwrecks and four US Navy aircraft wrecks in the APE.

Although no identified historic properties have been investigated in the APE at this time, BOEM considered details particular to deepwater environments that could affect the preservation of potential archaeological sites. These conditions are described in the following information, excerpted from BOEM (2017) and BOEM (2024): "In extreme water depths, burial, survival, and preservation of a wreck warrants close consideration. Burial is extremely unlikely at the water depths in the APE owing to very low sedimentation rates and quiescent bottom conditions typically found in open-ocean, deepwater settings. Despite low sedimentation, conditions may also be anoxic or feature low oxygen levels that could enable preservation of wooden shipwrecks. In comparison, if there are sufficient oxygen levels (or dark oxygen), organisms that depend on organic material may destroy wooden hulls. Preservation of non-wooden shipwrecks would similarly depend on conditions at the site. However, if a wreck is found with sufficient diagnostic artifacts in concentration, the older wooden shipwreck site may possibly be eligible for NRHP inclusion as an archaeological site (artifact concentration) rather than relatively intact wreck or discrete object (NHPA 1966)."

Aviation losses around CNMI during WWII were substantial. Numerous aircraft have been documented in both the historic and archaeological records, especially nearshore (McKinnon 2015). Although archaeological research has been conducted in the waters off CNMI to depts of 370 m (Lickliter-Mundon 2018), no aircraft have been investigated within the lease areas to date. As with military watercraft, military aircraft are protected by the Sunken Military Craft Act of 2004.

Due to the lack of survey information in this area of the Pacific Ocean, the potential for the presence of submerged historic sites, consisting of shipwrecks, downed aircraft, or other cultural resources remains largely unknown. Leasing stipulations and best management practices will require the lessee to avoid any known historic properties if present, to ensure a QMA is involved in specific surveys and inspections of samples, to conduct visual examination with video recording of box core and free-fall grab samples collected during preliminary activities, to implement specific HRG survey methodology and reporting of survey results, and to conduct unanticipated discovery protocols in the event of a discovery or unanticipated effect.

III. Leasing Requirements

Where practicable, BOEM expects to require avoidance of potential historic properties through lease stipulations, resulting in BOEM recording a Finding of No Historic Properties Affected, consistent with 36 CFR § 800.4(d)(1). Inclusion of the elements outlined below in the lease would help ensure the identification and avoidance of historic properties; their inclusion is a requirement of this Finding.

The following elements, designed to avoid impacts to offshore historic properties from bottom-disturbing activities associated with preliminary activities, are proposed to be included in the commercial leases associated with the OCS offshore CNMI:

- <u>No Impact without Approval:</u>

  In no case may the Lessee knowingly impact a potential archaeological resource without the Lessor's prior consent, following appropriate compliance with the National Historic Preservation Act.

- <u>Qualified Marine Archaeologist:</u>

  The Lessee must ensure that its Qualified Marine Archaeologists (QMAs) meet the Secretary of the Interior's Professional Qualifications Standards listed in 48 *Federal Register* 44738–44739.

- <u>Preliminary Activities – Archaeology Requirements:</u>

  The Lessee must ensure a QMA visually examines retrieved box core and free fall grab samples for potential cultural material and artifacts and photo-documents cores and samples prior to sub-sampling. The Lessee, if technically feasible, will acquire bottom imagery from seabed disturbance or sampling activities. The Lessee will ensure the QMA reviews all imagery to identify if any potential archaeological resources are present in the sampled areas.

  - The QMA must monitor the video feed in real time if a remotely operated vehicle (ROV) survey is conducted near a potential or newly discovered archaeological resource.
  - Review and monitoring by the QMA may be conducted remotely only if images and video feed are of sufficient quality.
  - If during examination of the retrieved seabed samples and/or during visual imaging the Lessee determines that a potential marine cultural resource may have been located or affected, the Lessee will initiate the steps outlined in the Unanticipated Discovery requirements.

In addition, BOEM is expected to require that the Lessee observe the "unanticipated discovery" requirements in the Section 106 NHPA regulations (36 CFR 800.13[a]). The following elements are being proposed for inclusion in the commercial leases that may be issued within the OCS offshore CNMI:

Unanticipated Discovery Clauses:
While conducting activities, if the Lessee discovers an unanticipated potential archaeological resource, such as the presence of a shipwreck site (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of historic objects, piles of ballast rock) or evidence of a pre-contact archaeological site (e.g. stone tools, pottery or other pre-contact artifacts) within the Lease Area, the Lessee must:

- Immediately halt seafloor-disturbing activities in the area of a distance of 1,000 feet (305 meters) from the discernible extent of the target;
- Notify the Lessor within 24 hours of discovery;
- Submit to the Lessor a written report on details of the discovery within 72 hours of its discovery written by a Qualified Marine Archaeologist (QMA) that meets the Secretary of the Secretary of the Interior's Professional Qualifications Standards listed in 48 *Federal Register* 44738–44739;
- Keep the location of the discovery confidential and take no action that may adversely affect the archaeological resource until the Lessor has made an evaluation based on analysis and recommendations from the QMA and instructs the Lessee on how to proceed; and
- If (1) the site was impacted by the Lessee's project activities; or (2) impacts to the site or to the area of potential effects cannot be avoided, the Lessee must conduct additional investigations overseen by a QMA, as directed by the Lessor, to determine if the resource is eligible for listing in the National Register of Historic Places (30 CFR 585.802[b]). If the Lessee's investigations indicate that the resource is potentially eligible for listing in the National Register of Historic Places, the Lessor will inform the Lessee how to protect the resource or how to mitigate adverse effects to the site. If the Lessor incurs costs in protecting the resource, then, under section 110(g) of the National Historic Preservation Act, the Lessor may charge the Lessee reasonable costs for carrying out preservation responsibilities under the Outer Continental Shelf Lands Act.

Marine Archaeological Survey Protocols and Details

These survey protocols and details are included in the CNMI Information to Lessees document.

- Archaeological Survey Required for Delineation, Testing and Mining Phases: The Lessee must conduct and provide the results of an archaeological survey with submission of any of its plans (Delineation, Testing, and/or Mining Plan). The archaeological survey report must include a description of the methods used to conduct the archaeological surveys in support of the submitted plan or plans (i.e., Delineation, Testing, and/or Mining Plan). The Lessee must follow these marine archaeology survey requirements prior to, during, and after submittal of the archaeological survey results to BOEM.
    - The Lessee will have to complete a marine archaeology survey plan and conduct a pre-survey meeting. The Lessee will coordinate with BOEM before conducting survey activities through both the preparation and submission of a survey plan and participation in a pre-survey meeting with BOEM. The Lessee should include

appropriate historic preservation staff and marine archaeologist(s) both in the preparation of the survey plan and as participants in the pre-survey meeting.

- The Lessee will provide a detailed description of the activities proposed in their plans (Delineation, Testing, and/or Mining Plan) including a description of the potential Area of Potential Effects (APE). The geographic area, or areas, in which these proposed activities take place is the APE. The scope of these geographic areas should include the depth and breadth of the seabed potentially impacted by any bottom-disturbing activities.
- The Lessee will conduct the archaeological survey of the lease area(s) by employing high-resolution geophysical (HRG) survey techniques prior to conducting seafloor disturbing activities not assessed in BOEM's Finding of No Historic Properties Affected for the Issuance of Minerals Leases on the Outer Continental Shelf Offshore CNMI.
- High-resolution Geophysical Survey Techniques: The areas surveyed for archaeological identification purposes must be large enough to cover all portions of the project area affected by the activities proposed, including all seafloor-disturbing activities, whether temporary or permanent. The survey will include 100% seafloor coverage using side scan sonar (SSS), and/or multibeam echo sounder (MBES), prior to bottom disturbing activities in the Testing and Mining phases. The SSS instrument range must be set to provide at least 100 percent overlapping coverage (i.e., 200% seafloor coverage). This coverage must ensure 0.5 m resolution or better of the seafloor.
- The Lessee will be required to submit the results of the archaeological survey(s) in a final report. The report will be a stand-alone document submitted with the Lessee's Delineation, Testing, and/or Mining Plan. The report must provide an evaluation and synthesis of the data (including desktop research and HRG survey) for the purpose of identifying potential archaeological resources in the lease areas. The report and analyses presented therein must be prepared by a Qualified Marine Archaeologist. The report will describe the activities proposed in the plan, the area(s) that may be affected by the proposed activities, the methods of identifying archaeological resources within those areas, and the results of those identification efforts.
- The Lessee will be required to submit digital data including the following:
  - Navigation Data: The navigation post-plot of the surveyed area(s) including survey lines, line numbers or other designations, navigational shot points or event markers, and other relevant attributes should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf), or Shapefile (.shp).
  - Proposed Project: The location of the proposed project elements, including relevant attributes, should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf), or Shapefile (.shp).
  - Side scan sonar: The information used to create the table of side scan sonar contacts and charting of sonar contacts should be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated

value (.csv), Text file (.txt), Database (.dbf), or Shapefile (.shp). The following attributes should be included: Side scan sonar contact ID; Lease block; Survey line number; Target length (m); Target width (m); Target height (m); Target shadow (m); Target description; Associated magnetic anomalies (if any); coordinates of the target in decimal degrees to 5 decimal places; Original source file name; and recommended avoidance distance, if applicable. Applicants must provide both raw and renavigated (if available) files for the survey in the side scan manufacturer's native format, at the side scan's native sample rate (not resampled). Side scan sonar mosaics of the survey area must be prepared as a geo-referenced Tagged Image Format (.tif) and output as 0.5 m resolution or better.

- Multibeam Echosounder (MBES): The information used to create the table of MBES contacts and charting of sonar contacts may be submitted in an ArcGIS readable format (e.g., Microsoft Excel (.xls), Comma separated value (.csv), Text file (.txt), Database (.dbf), or Shapefile (.shp). The following attributes must be included: MBES contact ID; Lease block; Survey line number; Target length (m); Target width (m); Target height (m); Target description; Associated magnetic anomalies (if any); coordinates of the target in decimal degrees to 5 decimal places; Original source file name; and recommended avoidance distance, if applicable. Applicants must provide both raw and renavigated (if available) files for the survey in the MBES manufacturer's native format. MBES bathymetry and backscatter grids of the survey area must be prepared as a geo-referenced Tagged Image Format (.tif) and output as 0.5 m resolution or better.
- Bathymetry Data: The Lessee may provide bathymetric data in one of the following formats with appropriate metadata detailing processing parameters, illumination angles and coordinate systems: XYZ data; ARC ASCII Grid and layer files; Contours (ESRI compatible); and Geo-referenced image files.

o Pre-Survey Meeting: The Lessee must coordinate a pre-survey meeting associated with archaeological surveys conducted to support plan (Delineation, Testing, and/or Mining Plan) submittal by sending an email, and following up with email or phone calls as necessary, to the following parties: BOEM, CNMI and Guam Historic Preservation Officers, and Underwater Archaeology Branch - Naval History and Heritage Command.

  o The purpose of this meeting will be for the Lessee, the Lessee's Qualified Marine Archaeologist, and other pertinent personnel to discuss the Lessee's Survey Plan and consider requests by the party attendees to monitor portions of the archaeological survey and the geotechnical exploration activities, including the visual logging and analysis of geotechnical samples (e.g., cores). Notification of the pre-survey meeting must be sent at least 15 calendar days prior to the date of the proposed pre-survey meeting. The meeting must be scheduled for a date at least 30 calendar days prior to commencement of survey activities performed in support of plan submittal and at a time that affords the participants a reasonable opportunity to participate. The anticipated date for the meeting must be identified in the timeline of activities described in the applicable marine archaeology survey plan. The Lessee must provide the Lessor with documentation of compliance with this stipulation prior to commencement of surveys.

- Geotechnical Exploration: The Lessee must adhere to the preliminary activities archaeology requirements. With the exception of box core and free fall grab samplers, the Lessee may only conduct geotechnical exploration activities performed in support of its plan(s) submittal (i.e., Delineation, Testing, and/or Mining Plan) in locations where an analysis of the results of geophysical surveys has been completed. This analysis must include a determination by a Qualified Marine Archaeologist as to whether any potential archaeological resources are present in the area. The geotechnical exploration activities must avoid potential archaeological resources by a minimum of 1000 feet (305 meters), and the avoidance distance must be calculated from the maximum discernible extent of the archaeological resource. A Qualified Marine Archaeologist must certify, in the Lessee's archaeological survey report, that geotechnical exploration activities did not impact potential historic properties identified as a result of the HRG surveys performed in support of plan submittal. In the event that the geotechnical exploration activities are found to have impacted potential historic properties, the Lessee must follow the Unanticipated Discovery lease stipulation.

  Monitoring and Avoidance: The Lessee must ensure a Qualified Marine Archaeologist is present (this can be conducted virtually if the information is conveyed in sufficient quality and in real time to give their professional guidance) during bottom-disturbing activities performed during preliminary activities and in support of plan submittal (i.e., Delineation, Testing, and/or Mining Plan) that occur in areas near a potential archaeological resource or occurring in areas that have not been sufficiently surveyed with high-resolution surveys to ensure avoidance of potential archaeological resources.

IV. The Basis for the Determination of No Historic Properties Affected

This Finding is based on a review of existing and available information conducted by BOEM, consultation with interested and affected parties, stipulations outlined in the required elements of a lease, and conclusions drawn from this information. The proposed undertaking includes the issuance of up to six commercial leases within the OCS offshore CNMI and takes into account the execution of associated preliminary activities. The proposed bottom-disturbing activities located in the APE are in extremely deep water (> 2,820 feet, 860-m water depth) in a remote location where BOEM has not found any information to suggest that historic properties exist. Additionally, the preliminary activities allowed with lease issuance (i.e., the collection of box core and free fall grab samples and the deployment of UTPs, moorings, landers, and scientific equipment) have minimal potential to adversely affect a historic property if present. To the extent historic properties exist but have not yet been identified or discovered, then the unanticipated discovery protocol will be followed. Therefore, no historic properties will be affected for the undertaking of issuing up to six commercial leases within the OCS offshore CNMI, consistent with 36 CFR 800.4(d).

V. References

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Attachment A: Section 106 National Historic Preservation Act Consulting Parties List

Agency/Organization	Point of Contact
Federal Government Agencies	
Bureau of Safety and Environmental Enforcement (BSEE)	Doug Jones Barry Bleichner
National Oceanographic and Atmospheric Administration (NOAA) Maritime Heritage Program	William Hoffman Jessica Kondel
National Park Service (NPS) War in the Pacific National Historical Park (Guam) and American Memorial Park (Saipan)	Barbara Alberti
U.S. Coast Guard Oceania District	Sean P. Regan
U.S. Army Corps of Engineers Honolulu District	Jennifer Martin
U.S. Department of the Navy Naval History and Heritage Command, Underwater Archaeology Branch	Bradley Krueger Alexis Catsambis
U.S. Department of War Defense POW/MIA Accounting Agency	Kelley Esh Kyle Bracken
U.S. Fish and Wildlife Service (USFWS) Maraina Trench Marine National Monument and Mariana Islands National Wildlife Refuge	Sean MacDuff
Commonwealth of the Northern Mariana Islands Government Agencies	
Historic Preservation Office	Mertie Kani
Guam Government Agencies	
Guam Historic Preservation Office	Patrick Q. Lujan

Other Potentially Interested Parties

University of Guam	William Jeffery, PhD.
Northern Marianas College	Deleon Guerrero, EdD
***Matua Council for Native Chamorro Advancement**	**Liana M.S. Hofschneider** **Richard Untalan Hofschneider**

* Accepting parties are indicated in bold with an asterisk.
** Additional consulting parties may be added to list.