Santos

June 12, 2026

U.S. Army Corps of Engineers
Alaska District Regulatory Division
CEPOA-RD
P.O. Box 6898
JBER, AK 99506-0898
Email: regpagemaster@usace.army.mil

Re: Quokka Development Project – Department of the Army Individual Permit Application Submittal

Dear Mr Drew Sliger:

Oil Search (Alaska), LLC, a subsidiary of Santos Limited (Santos) is pleased to submit the enclosed Department of the Army (DA) application package to construct the Quokka Development Project (Project). The proposed Project would conduct work within wetlands and other waters of the U.S. subject to jurisdiction of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act of 1972 (as amended) and Section 10 of the Rivers and Harbors Act of 1899. Wetlands memos from the Nanushuk Project and Quokka Project are attached for your convenience.

The Project is located within the Quokka Unit leasehold on the North Slope of Alaska, approximately 50 miles west of Deadhorse, 15 miles east of the community of Nuiqsut, and 8 miles east of the East Channel of the Colville River. The proposed Project would include two drill sites, a central processing facility, access roads, and infield and import/export pipelines. The Project would also involve construction activities for supporting infrastructure, such as power lines and fiber optic lines. Though Santos has designed the Project to avoid impacts to wetlands and waterbodies to the maximum extent practicable, the Project would result in unavoidable impacts. The proposed activities would include discharging fill material over 129.2 acres of wetlands and waterbodies potentially subject to USACE jurisdiction.

Please find enclosed the permit application with the following components:

- DA Permit Application Form (ENG Form 4345)
- Supplement to the DA Permit Application
- Project Drawings, 47 Sheets, dated April 2026
- Quokka Project – Office-based Wetland and Waterbody Mapping, 2026
- Nanushuk Development Project – Vegetation, Wetland and Waterbody Mapping Summary Report, 2017

If you have any questions or need additional information, please contact me via phone at 1-907-375-4661 or email at Hannah.Griego@santos.com. We look forward to working with you on this project.

Sincerely,

Signed by:
Hannah Griego
CA0B05654542486...

Hannah Griego

Environmental and Permitting Manager

U.S. Army Corps of Engineers (USACE)

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

For use of this form, see 33 CFR 325. The proponent agency is CECW-COR.

Form Approved - OMB No. 0710-0003 Expires: 2027-10-31

The public reporting burden for this collection of information, OMB Control Number 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR APPLICATION TO THE ABOVE EMAIL.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned. System of Record Notice (SORN). The information received is entered into our permit tracking database and a SORN has been completed (SORN #A1145b) and may be accessed at the following website: http://dpcld.defense.gov/Privacy/SORNsIndex/DOD-wide-SORN-Article-View/Article/570115/a1145b-ce.aspx

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME
First - Alan Middle - Last - Johnson
Company - Oil Search (Alaska), LLC, a subsidiary of Santos Limited
E-mail Address - Alan.Johnson@santos.com

8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Sofia Middle - Last - Laughland
Company - Oil Search (Alaska), LLC, a subsidiary of Santos Limited
E-mail Address - Sonia.Laughland@santos.com

6. APPLICANT'S ADDRESS:
Address - 601 West 5th Avenue
City - Anchorage State - AK Zip - 99501 Country - USA

9. AGENT'S ADDRESS:
Address - 601 West 5th Avenue
City - Anchorage State - AK Zip - 99501 Country - USA

7. APPLICANT'S PHONE NOs. w/AREA CODE
a. Residence b. Business 907-375-4600 c. Fax

10. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business 907-268-0788 c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Sofia Laughland to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

Signed by: Alan Johnson 728E48A39AF489... 12 June 2026

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)
Quokka Development Project

13. NAME OF WATERBODY, IF KNOWN (if applicable)
Miluveach River

14. PROJECT STREET ADDRESS (if applicable)
Address N/A
City - N/A State - AK Zip -

15. LOCATION OF PROJECT See Attached Application Supplement
Latitude: ◦N 70.295233 Longitude: ◦W -150.372677

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) See Attached Application Supplement
State Tax Parcel ID Municipality North Slope Borough
Section - Township - Range -

17. DIRECTIONS TO THE SITE

Santos proposes to develop hydrocarbon deposits from its Quokka Unit oil and gas leaseholds that are east of the Pikka Unit and west of the Kuparuk River Unit on the North Slope of Alaska. Surface features of the Project would be located approximately 50 miles (80.5 km) west of Deadhorse, 15 miles (24.1 km) east of the community of Nuiqsut, and 8 miles (12.9 km) east of the East Channel of the Colville River.

See Attached Application Supplement

18. Nature of Activity (Description of project, include all features)

The Quokka Project as proposed by Santos would include two drill sites, a central processing facility, access roads and infield and import/export pipelines. The Project would also involve construction activities for supporting infrastructure, such as power lines and fiber optic lines.

Please see the attached Application Supplement (Project Description) for additional information.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of the proposed Project is to enable Santos to safely and economically produce commercial quantities of liquid hydrocarbons from its Quokka Unit leasehold on the North Slope of Alaska. This includes developing infrastructure to access and extract hydrocarbons, processing them near the production areas, and transporting sales-quality oil by pipeline to the Trans-Alaska Pipeline System (TAPS). A secondary purpose is to facilitate further delineation of hydrocarbon-bearing formations within the leasehold using infrastructure developed to support the Project. The Project is needed to allow Santos to exercise its lease rights to develop subsurface resources.
The Project would support the economic interests of the lessee and the State of Alaska, while also contributing to regional and national energy supply. Additionally, the Project is expected to generate workforce and business development opportunities at local, state, national and international levels.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

The discharge of gravel fill material is necessary to construct the drill site pads, processing facility pad, tie-in pad, and access roads. The discharge of sand slurry is necessary to construct the vertical support members (VSMs) for the foundations of the pipeline/utility line horizontal support support structures. The discharge of redeposited seafloor substrate is necessary for screeding at Oliktok Point to enable barge landing to transport construction related modules.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards: See Attached Application Supplement

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
1,620,100 CY of gravel fill	57,430 CY of sand slurry	

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions) See Attached Application Supplement

Acres 129.2

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See Attached Application Supplement

24. Is Any Portion of the Work Already Complete? ☐ Yes ☑ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- Kuukpik Village Corporation, PO Box 89187

City - Nuiqsut State - AK Zip - 99789

b. Address- North Slope Borough, Land Services Division, PO Box 69

City - Utqiagvik State - AK Zip - 99723

c. Address- Alaska Department of Natural Resources, Division of Oil and Gas, 550 W. 7th Avenue

City - Anchorage State - AK Zip - 99501

d. Address- Department of the Army, Division of Real Estate, US Army Engineer District, Alaska. PO Box 6898

City - JBER State - AK Zip - 99506

e. Address- Arctic Slope Regional Corporation, PO Box 129

City - Utqiagvik State - AK Zip - 99723

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
See Attached Application Supplement					

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Signed by: Allan Johnson 728FE48A30AE480... — 12 June 2026

SIGNATURE OF APPLICANT — DATE

Signed by: Sonia Laughland 13EEC8825174A7... — 12 June 2026

SIGNATURE OF AGENT — DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

QUOKKA DEVELOPMENT PROJECT

Supplement to the Department of the Army Permit Application

Developed for:
Oil Search (Alaska), LLC, a subsidiary of Santos Limited
601 West 5th Avenue
Anchorage, Alaska 99501

Prepared by:
HDR Engineering, Inc.

June 2, 2026

Santos

Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

Abbreviation	Definition
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AHPA	Alaska Historic Preservation Act
AOGCC	Alaska Oil and Gas Conservation Commission
APE	Area of potential effects
AS	Alaska Statute
ASRC	Arctic Slope Regional Corporation
AWC	Anadromous Waters Catalog
BMP	Best management practice
CFR	Code of Federal Regulations
CWA	Clean Water Act
cy	Cubic yard
DOG	Department of Oil and Gas
DOT	Department of Transportation
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FRP	Facility Response Plan
HSM	Horizontal support member
HUC	Hydrologic unit code
IPaC	Information for Planning and Consultation
MCY	Million cubic yards
MLLW	Mean lower low water
MSA	Magnuson-Stevens Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOP	Nanushuk Operating Pad
NPF	Nanushuk Processing Facility
NSB	North Slope Borough
NWI	National Wetlands Inventory

Abbreviation	Definition
ODPCP	Oil Discharge Prevention and Contingency Plan
OHW	Ordinary high water
Project	Quokka Project
QDA	Quokka drill site A
QDB	Quokka drill site B
QPF	Quokka processing facility
QTP	Quokka tie-in pad
RCRA	Resource Conservation and Recovery Act
Santos	Oil Search (Alaska), LLC, a subsidiary of Santos Limited
SPCC	Spill Prevention, Control and Countermeasure
STP	Seawater treatment plant
SWPPP	Stormwater pollution prevention plan
TAPS	Trans-Alaska Pipeline System
TLUI	Traditional Land Use Inventory
UIC	Underground injection control
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VSM	Vertical support member
WOTUS	Waters of the United States

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1. Introduction

Oil Search (Alaska), LLC, a subsidiary of Santos Limited (Santos) is proposing development of hydrocarbon deposits from its oil and gas leaseholds on the North Slope of Alaska. The Quokka Project (Project) targets oil deposits in the Quokka reservoir. Santos would drill wells and construct and operate infrastructure and facilities to produce and transport sale-quality oil to the Trans-Alaska Pipeline System (TAPS).

2. Location and Land Ownership (Block 15 and 16)

The Project would be located on the North Slope of Alaska east of the Colville River. Surface features of the Project would be located approximately 50 miles west of Deadhorse and 15 miles east of the community of Nuiqsut on Santos-operated State of Alaska oil and gas leases (Figure 1). The Project would be located east of the existing Pikka development and west of the Kuparuk River Unit. The Project would be located in the North Slope Borough (NSB). The State of Alaska, through the Department of Natural Resources (ADNR), manages the surface lands at the proposed drill sites and processing facility and lands that would be traversed by the infield roads and pipelines. The Project would access subsurface mineral resources that are owned by the State of Alaska. None of the project facilities would be located on or near Alaska Native allotments. Table 1 details the locations of major project components and Table 2 details the USGS sections, townships and ranges the Project would intersect.

Table 1. Location of major project components (Block 15).

Component		Latitude	Longitude
QDA		70.331	-150.346
QDB		70.250	-150.469
QPF		70.259	-150.434
QTP		70.266	-150.397
Valve pads	--	70.308	-150.365
	With tundra access	70.303	-150.379
Subsistence access ramps	QDA north	70.313	-150.359
	QDA south	70.292	-150.381
	QDB	70.253	-150.443
Miluveach River bridge		70.305	-150.371
Trouble Creek bridge		70.326	-150.347
Existing pipeline overpass		70.264	-150.382
Oliktok Dock screeding area		70.513	-149.864

Table 2. USGS townships, ranges and sections intersected by the Project (Block 16).

Township	Range	Section(s)
10 North	7 East	5, 6
11 North	6 East	14, 23, 24
11 North	7 East	3, 4, 9, 10, 16, 19, 21, 28, 29, 30, 32, 33
13 North	9 East	5

*All Townships are within the Umiat meridian

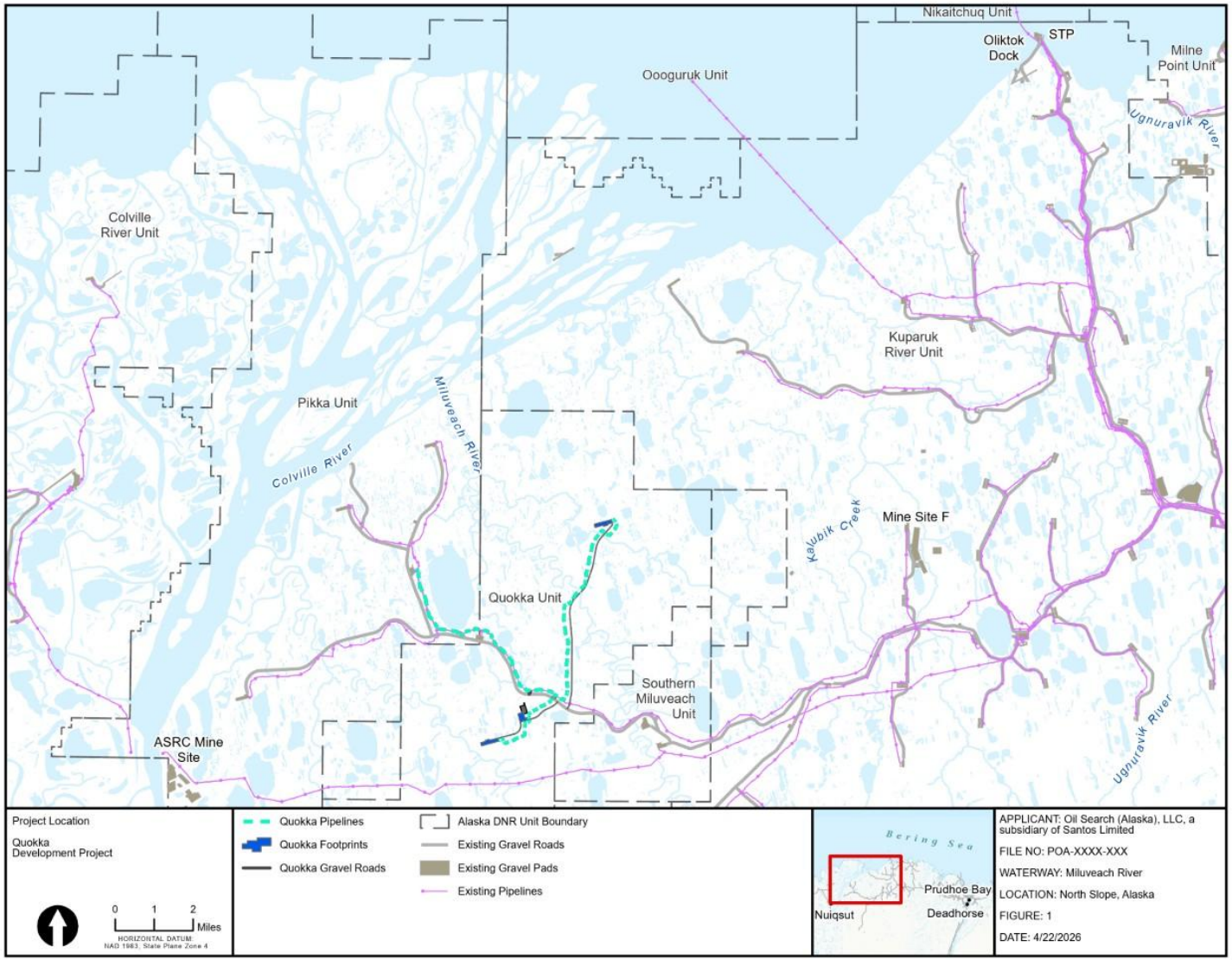
3. Project Description (Block 18)

3.1. Proposed Project

The Quokka Project would include two drill sites, a central processing facility, infield and import/export pipelines, infield roads and screeding at Oliktok Dock. The Project would also involve construction activities for supporting infrastructure, such as powerlines and fiber optic lines.

The Project would be located east of the Pikka development and west of the Kuparuk River Unit (Figure 1). Sheet 5 shows an overview map of the Project.

Figure 1. Project location.



3.1.1. Gravel Pads

Santos would construct gravel pads with a minimum gravel thickness of 6 feet and 2H:1V side slopes. None of the pads would be within a mapped floodplain.

3.1.1.1. Quokka Drill Site A (QDA) and Quokka Drill Site B (QDB)

The QDA drill site (Sheets 10 and 11) and the QDB drill site (Sheets 12 and 13) would each accommodate up to 50 production and injection wells with 20-foot spacing between wellheads. Each drill site would also accommodate drilling equipment and drilling support facilities including hydraulic fracturing equipment, drilling mud and cement tanks, gathering facilities, diesel storage tanks, pipeline pigging and metering facilities, a communication tower, cold storage, emergency response equipment and drilling laydown areas. A service road at least 30 feet wide would be constructed around the perimeter of each pad to facilitate safe and efficient access to pad infrastructure. Routine well testing and process fluid heating would occur at the drill sites, with the majority of processing equipment located at the QPF.

3.1.1.2. Quokka Processing Facility (QPF)

The QPF pad, located near QDB, would accommodate the processing and utilities modules that would process multiphase product (mixture of crude oil, natural gas and water) from the two drill sites (Sheets 8 and 9). Water separated from the oil would be re-injected back into the subsurface formation to help maintain pressure or disposed of via underground injection. Separated gas would be transported back to the drill sites via pipelines for gas lift and gas injection into the subsurface formation to help maintain pressure. Sales-quality oil would be transported via pipeline from the QPF to a tie-in with the existing Pikka sales oil pipeline. The QPF would be sized to process approximately 80,000 barrels of oil per day.

Processing facilities at the QPF would be comprised of a combination of truckable and sealift modules. These include equipment designed for phase separation, heating and cooling, pumping, gas treatment and compression for gas lift, gas injection and water treatment for water injection. The QPF would also include metering and pigging facilities; a communication tower; generating facilities; a tank farm consisting of crude oil, produced water, production chemical and methanol storage tanks; two underground injection control (UIC) wells for disposal of Resource Conservation and Recovery Act (RCRA)-exempt and nonhazardous waste, such as produced water; construction material and equipment staging areas; and a high pressure/low pressure flare stack.

3.1.1.3. Quokka Tie-in Pad (QTP)

The tie-in pad, QTP, would provide space for tie-in of the Quokka import/export pipelines (sales-oil, fuel gas, and seawater pipelines) to the Pikka import/export pipelines (Sheets 14 and 15). QTP infrastructure would include a pig launcher and receiver, a metering skid, pipe rack, power generation module, laydown area and a communications tower. The pad would be connected to the existing Pikka road by a gravel access road.

3.1.1.4. Valve Pads

Two valve pads would be built on the QDA road, one on each side of the Miluveach River crossing (Sheets 25 and 26). Valve pads provide space for the inclusion of shut off valves on either side of the river crossing. The valve pad to the south of the Miluveach River would include a tundra access ramp for maintenance, spill response or other purposes (Sheet 26).

3.1.2. Access

3.1.2.1. New Gravel Roads

Santos would construct two infield roads to connect the Project with the existing Pikka road system:

- A road from the existing Pikka road system south to the QPF that would then continue to drill site QDB (Sheets 20 and 21).
- A road from the existing Pikka road system north to drill site QDA (Sheets 17-20).

Infield roads would be a minimum of 32 feet wide at the crown (minimum 52 feet at the base) to accommodate drill rig movement (Sheet 23). The roads would have a gravel thickness of at least 5 feet and 2H:1V side slopes. The road from the QPF to QDB would have one subsistence access ramp (Sheet 21) and the road to QDA would have two subsistence access ramps (Sheets 17 and 18) to facilitate access and road crossings for off-road travelers. Each ramp would have a slope of approximately 15 percent (Sheet 24).

Santos would site and design (both size and number) culverts at streams and other primary conveyance paths. Santos would also install cross-drainage culverts based upon local drainage patterns and field observations to accommodate meltwater during spring breakup (Sheets 27 and 28). An engineer would field-verify final culvert locations to confirm that natural drainage patterns are maintained. Culverts at fish-bearing streams would be built to accommodate fish passage (Sheet 29).

In addition to culverts, the QDA access road would include three bridge crossings: two at waterways and one over the Pikka import/export pipelines. There would be a multi-span bridge across the Miluveach River consisting of steel girders with precast concrete decks and a 32-foot clear width between the faces of removable steel railings (Sheet 31). The bridge would include 42-inch diameter pipe pile foundations and sheet pile abutments. Twelve piles would be placed below ordinary high water (OHW) and would have a footprint of 115 square feet.

There would be a single-span crossing of Trouble Creek just south of the QDA pad. The bridge would include 42-inch diameter pipe pile foundations; placement of piles will be avoided within the active channel to the extent practicable (Sheet 30).

Additionally, a existing pipeline overpass would be required where the QDA access road crosses over the existing Pikka import/export pipelines. The existing pipeline overpass would use 42-inch diameter pipe pile foundations and would be designed to allow a drill rig to access QDA (Sheet 33).

3.1.2.2. Air Transport

During construction, drilling and operations, the commercial airport in Deadhorse, located approximately 50 miles away, would support air transport of project personnel and small supplies to the North Slope. Personnel and materials flown into Deadhorse would be driven to the project sites via the existing road system and the proposed infield gravel access roads. Santos will avoid routine use of helicopters during drilling and operation. Helicopters may be used in the event of health and safety emergencies.

3.1.2.3. Module Delivery and Transport

Permanent facilities would consist of a combination of truckable and sealift modules. Truckable modules would be delivered by truck via the Dalton Highway. Sealift modules, typically larger facilities that exceed size and weight requirements of the public road system, to the extent they are used, would be delivered by barge and offloaded at the existing dock at Oliktok Point. At the beginning of the barge season, sediments in front of the dock would be redistributed (referred to as “screeding”) to create a smooth surface for barge access. Santos estimates that a 500-foot by 470-foot area (5.4 acres) of seabed would be subject to screeding to provide a navigational draft depth of -7.5 to -8 feet mean lower low water. All screeding would occur below the mean high water elevation. Screeding at Oliktok Dock near the STP is

also covered under permit number POA-2015-00025-M6. From Oliktok Dock, the sealift modules would be transported along existing roads to the project area.

3.1.3. Pipelines

The Project would include construction of import/export and interconnecting (infield) pipelines (Table 3). All pipelines would rest on pipeline supports. Each pipeline support would be made up of a horizontal support member (HSM) supported by vertical support members (VSMs) constructed from one or two 8- to 24-inch-diameter pipe piles (with an up to 36-inch diameter casing) spaced approximately 55 to 65 feet apart. These pipeline supports (referred to as pipe racks) would also carry power and fiber optic cables, as discussed further in Section 3.2.2.2. Where feasible, pipelines would be located parallel to gravel roads at a distance between 500 and 1,000 feet to minimize caribou disturbance and excessive snow drift accumulation while facilitating access for pipeline inspection, monitoring, repairs, modifications and testing. All pipelines and suspended cables would be a minimum of 7 feet above the summer ground surface except where pipelines intersect a road or pad. Where pipelines cross road embankments, pipelines would be encased in structural steel casings buried within the roadway section (Sheets 43 and 44).

Table 3. Quokka Project pipelines.

Pipeline(s)	Start/end points	Length (miles)	Notes
Infield pipelines	QPF to QDA QPF to QDB	6.1 1.4	Multiphase product, gas lift, gas injection, seawater, produced water lines
Utility pipeline	QPF to Nanushuk Processing Facility (NPF)	7.0	Utility tie-back
Import/export pipelines	QPF to QTP	1.1	Sales-quality oil, seawater and fuel gas

Santos would coat the external surface of insulated pipelines with fusion bonded epoxy to prevent under-insulation corrosion. Pipelines containing temperature-controlled fluids and multiphase product would include an insulation system consisting of polyurethane foam insulation covered with an interlocked sheet metal jacket having a nonreflective finish. Santos would hydrostatically test the integrity of the pipelines prior to operation.

3.1.3.1. Infield Pipelines

Infield pipelines would connect the drill sites to the QPF (Sheets 38 through 41). The infield pipe rack would include:

- A 24-inch-diameter pipeline to transport multiphase product from each drill site to the QPF,
- An 8-inch-diameter gas-lift pipeline to transport treated gas from the QPF to the drill sites,
- A 6-inch diameter gas injection pipeline to transport treated gas from the QPF to the drill sites,
- A 10-inch diameter pipeline to transport seawater from the QPF to the drill sites for injection,
- A 10-inch-diameter pipeline to transport produced water from the QPF to the drill sites for reinjection.

The QDA infield pipeline would include pipeline crossings of the Miluveach River and Trouble Creek. The Miluveach River pipeline crossing would include 36-inch diameter pipe pile foundations of which two would be located below OHW for a footprint of 14 square feet (Sheet 46). The Trouble Creek pipeline

crossing would include 36-inch diameter pipe pile foundations; the VSMs for the pipeline crossing would span Trouble Creek and no piles would be located below OHW (Sheet 46). Two valve pads would be built on the QDA road, one on each side of the Miluveach River crossing (Sheets 25 and 26).

3.1.3.2. Import/Export Pipelines

Import/export pipelines would connect the QPF to the QTP (see Figure 1; Sheets 34 and 35) and would include:

- a 16-inch-diameter pipeline to transport sales-oil export to the tie-in with the Pikka sales oil pipeline north of the QPF,
- a 16-inch pipeline to transport seawater from the existing Pikka pipelines at the QTP to the QPF,
- an 8-inch pipeline to transport fuel gas from the existing Pikka pipelines at the QTP to the QPF.

The import/export pipelines would be built on the same pipe racks as the infield pipelines to QDA from the QPF to QTP.

Santos would also construct a utility pipeline to move fluids between the QPF and NPF (Sheets 20, 22, 36 and 37). The utility pipeline would be on the same pipe rack as the Quokka QDA infield pipelines from the QPF north to the point at which the utility pipeline would turn northwest towards the NPF. The utility pipeline would then be constructed on new pipeline supports that parallel the existing Pikka pipelines to the NPF.

3.1.4. Summary of Temporary and Permanent Discharge to Wetlands and Other Waters (Block 21 and 22)

In total, the Project would result in unavoidable temporary and permanent discharges into wetlands and other waters located within the project area. Wetlands and other waters within the Project area are shown in Figure 1 through Figure 15 in Appendix B. Permanent discharges would affect a total of 129.2 acres of wetlands and other waters, including 128.9 acres of gravel infrastructure and 0.3 acre of pipeline VSMs (Table 4, Table 5). Project development would require 1.62 million cubic yards (MCY) of clean gravel fill and 57,430 cy of sand slurry (Sheets 6 and 7). The Project would also affect a total of 0.2 acre of uplands (Table 6).

Table 4. Footprint of project components and fill requirements in wetlands and other waters.

Project component	Fill type	Approximate footprint in wetlands and other waters (acres) (Block 22)	Fill quantity (cy) (Block 21)	Approximate dimensions
Gravel Pads				
QPF pad	Gravel	22.3	272,000	Approximately 765 feet by 1,165 feet; minimum 6-foot thickness.
QDA pad	Gravel	26.6	506,000	Approximately 460 feet by 2,450 feet; minimum 6-foot thickness.
QDB pad	Gravel	25.7	350,000	Approximately 430 feet by 2,435 feet; minimum 6-foot thickness.
Valve pads	Gravel	1.1	12,000	Approximately 130 feet by 120 feet; minimum 6-foot thickness.
QTP	Gravel	1.4	13,000	Approximately 155 feet by 280 feet; minimum 6-foot thickness.
Subsistence access ramps	Gravel	0.5	3,000	Approximately 50 feet by 80 feet; minimum 6-foot thickness.
Gravel Roads				
QPF road	Gravel	7.8	68,000	Approximately 1.1 miles long; minimum 5-foot thickness.
QDB road	Gravel	6.0	51,000	Approximately 0.8 mile long; minimum 5-foot thickness.
QDA road*	Gravel	37.4	344,000	Approximately 5.1 miles long; minimum 5-foot thickness. Includes the fill required for the existing pipeline overpass.
Existing road pipeline crossing**	Gravel	0.03	1,100	Approximately 0.2-mile approach of road widened; minimum 5-foot gravel thickness.

Project component	Fill type	Approximate footprint in wetlands and other waters (acres) (Block 22)	Fill quantity (cy) (Block 21)	Approximate dimensions
Gravel Total		**128.9**	**1,620,100**	
Pipelines				
Pipelines	Sand slurry	0.3	57,430	Includes all infield pipelines and utility pipeline.
Pipelines Total		**0.3**	**57,430**	
Total		**129.2**	**1,679,530**	

*An additional 0.2 acres of uplands would be impacted by the QDA road.
**A road pipeline crossing for the new QPF pipeline on the existing Nanushuk Access Road.

Table 5. Project water body crossing dimensions and footprints below OHW.

Feature	Length (ft)	Pile/casing diameter (in)	# Piles below OHW	Footprint below OHW (sqft)
Trouble Creek bridge	50	42	0	0
Miluveach River bridge	220	42	12	115
Trouble Creek pipeline crossing	--	36	0	0
Miluveach River pipeline crossing	--	36	2	14

Table 6. Wetland types impacted by the Project gravel footprint*.

NWI code	NWI description	Acres impacted
PEM1/SS1B	Palustrine emergent persistent/scrub-shrub broad-leaved deciduous saturated	60.2
PEM1/SS1B, PEM1/SS3B	Palustrine emergent persistent/scrub-shrub broad-leaved deciduous saturated, Palustrine emergent persistent/scrub-shrub broad-leaved evergreen saturated	13.3
PEM1/SS1C	Palustrine emergent persistent/scrub-shrub broad-leaved deciduous seasonally flooded	1.2
PEM1/SS1E	Palustrine emergent persistent/scrub-shrub broad-leaved deciduous seasonally flooded/saturated	32.7
PEM1/SS1F	Palustrine emergent persistent/scrub-shrub broad-leaved deciduous semi-permanently flooded	4.5
PEM1F	Palustrine emergent persistent semi-permanently flooded	3.8
PSS1/EM1B	Palustrine scrub-shrub persistent/emergent persistent saturated	0.4
PSS1/EM1C	Palustrine scrub-shrub persistent/emergent persistent seasonally flooded	0.9
PSS1/EM1E	Palustrine scrub-shrub persistent/emergent persistent seasonally flooded/saturated	7.2
PSS1/EM1F	Palustrine scrub-shrub persistent/emergent persistent semi-permanently flooded	0.1
PUBH	Palustrine unconsolidated bottom permanently flooded	4.5

* VSM wetland impacts are not included in this table as specific VSM locations are not known.

The Project would also include temporary discharges in 5.4 acres of marine waters from the proposed screeding at Oliktok Dock (Table 7).

Table 7. Temporary discharges in navigable waters (Section 10).

Project component	NWI code	Footprint in navigable waters (acres)	Dredge material quantity (cy)	Approximate dimensions
Screeding footprint	M1UBL	5.4	Unknown	500-foot by 470-foot screeding area to naturally redistribute sediment
Total		**5.4**		

Note: M1UBL= Marine subtidal unconsolidated bottom subtidal.

The total Project footprint would be 134.8 acres, with 134.6 acres in wetlands or other waters, for both permanent and temporary discharges.

3.2. Support Infrastructure

3.2.1. Gravel Source and Quantity

Santos estimates 1.62 MCY of clean gravel fill and 57,430 cy of sand slurry would be required for the Project (Sheet 6). Gravel material would be sourced from one or more existing gravel mine sites, such as the NSB Mine Site F located 7.5 miles east of QDA or the Arctic Slope Regional Corporation (ASRC) Mine Site, located 7.9 miles west of QDB. The mine site owners are responsible for permitting and operation of the mines.

3.2.2. Other Infrastructure and Utilities

3.2.2.1. Camps

Several temporary camps would be established to support construction and drilling activities. Locations and details have yet to be determined. The Pikka Operations Camp would be used for Quokka operations.

3.2.2.2. Power and Communications

Power for the Project would be generated at the QPF and supplied to each drill site through a power cable. Communications between facilities would occur via fiber optic cables. Santos would either attach the power and fiber optic cables to infield and import/export pipeline HSMs using messenger cables or by strapping cables to pipelines (Sheet 42). Cables could also be buried in road sections. The cables would be trenched or strapped to the pipeline at pipeline crossings, road crossings and approaches to a pad.

Self-supporting communication towers would be constructed at the drill sites and the QPF. Communication tower height and design would be determined as part of final engineering. The towers, which could be as high as 150 feet, would be equipped with Federal Aviation Administration (FAA)-compliant lighting, if required.

3.2.2.3. Waste Management and Disposal

Two new UIC wells at the QPF would be used to dispose of RCRA-exempt and non-hazardous waste, such as produced water. Domestic wastewater would be hauled to the NSB wastewater treatment facility in Deadhorse. Non-hazardous solid waste would be disposed of at the NSB landfill. To avoid potential

wildlife interactions, Santos would manage any waste receptacles stored outside using methods such as waste segregation and the covering of dumpsters, as outlined in its Wildlife Interaction Plan.

Santos would manage hazardous and universal waste, as defined by RCRA, on-site in appropriate locations and containers prior to off-site transport for disposal or recycling. All hazardous waste generated by project operations would be handled by qualified personnel and disposed of in accordance with regulations. Santos will have a Waste Management Plan in place. Santos would also use other resources, such as the Alaska Waste Disposal and Reuse Guide (commonly known as the Redbook), to guide waste management decisions.

3.2.2.4. Fuel and Chemical Storage

The existing Pikka fuel depot at the Pikka Operations Camp at NOP would be used to support the Quokka Project to minimize the amount of fuel storage needed at the QPF. The only fuel stored at the QPF would be diesel for a backup generator. The primary storage location for production chemicals would be at the QPF with smaller quantities at the drill sites.

Fuel and hazardous substance storage would comply with state and federal oil pollution prevention and contingency requirements including a project-specific Oil Discharge Prevention and Contingency Plan (ODPCP) and Spill Prevention, Control and Countermeasure (SPCC) Plan. The ODPCP would comply with State of Alaska requirements in Alaska Statute (AS) 46.03.020(10)(A) and 18 AAC 75 and U.S. Department of Transportation (DOT) requirements in 49 CFR 195. The SPCC Plan would comply with U.S. Environmental Protection Agency (EPA) regulations in 40 CFR 112. If required, Santos would prepare an EPA Facility Response Plan (FRP) and a DOT FRP. The DOT FRP would address federal regulations of the export pipeline under 49 CFR 195. Refer to Section 3.7 for additional details on spill prevention and response measures.

3.2.3. Water Sources and Uses

Non-potable fresh water would be needed during construction for seasonal ice roads and pads and during drilling for rig use. During summers, non-potable fresh water would be used for dust suppression on gravel roads and pads from construction through operation. Santos would obtain this water from locally permitted surface water sources, as defined in the Temporary Water Use Authorization from ADNR. Make-up water for hydraulic fracturing during drilling and maintaining reservoir pressures during operations would be sourced from the existing seawater treatment plant (STP) at Oliktok Dock.

Freshwater for all phases of the Project would likely come from lakes near the Project. Potable water for camps would be trucked from the NSB water plant in Deadhorse.

3.2.4. Ice Infrastructure

3.2.4.1. Ice Pads

Seasonal ice pads would be used during construction for material and equipment staging. Each construction-support ice pad would be a minimum of 6 inches thick.

3.2.4.2. Ice Roads

Ice roads would be used to facilitate construction of pipelines and gravel roads and would extend to the mine site gravel source. The ice road route would parallel the pipeline and gravel road alignments and connect to the existing Pikka gravel road system. The ice road season varies from year to year but generally lasts from January to April. Each season upon completion of use, ice road crossings of designated streams and rivers would be slotted, breached or weakened in accordance with permits.

3.3. Schedule

Santos estimates project construction would take approximately four years. At this time, Santos anticipates it would construct the QPF pad, drill site pads, and associated access roads during the winter construction season of Year 1 (fourth quarter of project Year 1 through second quarter of Year 2). The bridge across the Miluveach River would be constructed during the winter construction season of Year 2. Starting in Year 3, modules would be transported to site by barge to Oliktok Point in the open water season and by truck up the haul road. Processing facility installation and pipeline construction would be completed in Years 2, 3 and 4. Drilling activities would begin in Year 2 and continue at the two drill sites for 5 to 10 years. Santos anticipates production would begin in Year 4 and continue through the design life of the Project, which would be at least 30 years.

3.4. Avoidance and Minimization Measures

Santos has incorporated, and continues to incorporate, avoidance and minimization measures into the engineering design and initial operational planning where practicable. Santos would follow standard North Slope industry best management practices (BMPs) as outlined in the Alaska Safety Handbook, North Slope Environmental Field Handbook and Alaska Department of Natural Resources (ADNR) Division of Oil and Gas (DOG) standard North Slope Areawide Mitigation Measures (2018). Additional site specific BMPs would be developed as required for specific activities, such as for Stormwater Pollution Prevention Plan (SWPPP) related discharges or where permit requirements or site conditions require a variance from standard North Slope BMPs.

A comprehensive table of avoidance and minimization measures is provided in Appendix A.

3.5. Local Hire and Workforce Development

Santos would prepare an Economic Development Plan (as required for NSB rezoning, Title 19, NSB Form 300) that would include information on strategies to promote local employment and local business development. Additionally, Santos would incorporate local hiring and contracting strategies as typically required by DOG North Slope Areawide Mitigation Measures.

3.6. Training

Personnel would be trained on Quokka Operational Plans including snow removal, spill prevention and wildlife interaction, which would minimize the potential for impacts during daily operations.

3.7. Spill Prevention and Response

Santos has internal standards in place that provide guidance for spill prevention measures, and Santos would design and develop the Project to avoid and minimize the possibility of spills. These, in combination with compliance with all state, federal and local regulations (see Section 3.2.2.4 and 5), would reduce the likelihood of a spill occurring. Spill prevention measures considered throughout the design and engineering phase include a maintenance and inspection program as well as an employee spill prevention training program. Hydrostatic testing would validate the integrity of the pipelines prior to operation. Secondary containment for storage tanks would be a minimum of 100 percent of the volume of the largest tank plus additional volume for precipitation, as required by regulations specific to secondary containment in 18 AAC 75 and 40 CFR 112.

3.8. Site Closure

The life of the Project is anticipated to be at least 30 years. At the conclusion of production, drill sites, roads, and facilities would be removed or modified and the site restored in accordance with all permit and lease requirements.

4. Avoidance, Minimization, and Compensation (Block 23)

4.1. Avoidance of Impacts to Aquatic Resources, including Wetlands and Other Waters

The geographic range for reasonable and/or practicable locations for the project are limited to Santos's Quokka Unit leaseholds and the boundaries of the hydrocarbon resources that Santos intends to safely and economically produce. The Project location, east of the Pikka Unit and the Colville River and west of the Kuparuk River Unit on the North Slope of Alaska, is predominately occupied by wetlands and other waters. Complete avoidance is not practicable considering the infrastructure requirements of the proposed project. Therefore, planning efforts focused on avoiding higher-functioning or valued aquatic resources, followed by actions to minimize impacts.

When designing the project, Santos avoided fish bearing waters, navigable waters, relatively permanent waters, open water bodies, riverine crossings, emergent wetlands and other permanently or semi-permanently flooded wetlands to the maximum extent practicable. The siting of gravel infrastructure on higher topographic elevations where practicable reduced the volume and area quantities of fill in aquatic resources.

The following avoidance measures would be taken to avoid impacts to the greatest extent practicable:

- The Quokka Project would use existing infrastructure to the maximum extent practicable, thereby avoiding impacts to wetlands and other waters caused by the construction of additional, duplicative facilities. For example: Existing water and gas pipelines would be used to minimize footprints.
- The proposed project facilities have been sited adjacent to existing infrastructure on the North Slope, where practicable.
- The processing of production fluids from all drill sites will primarily occur at the QPF, eliminating the need for additional on-pad facilities and larger pad footprint at the drill sites.
- Seasonal ice pads and roads would be used to support winter pipeline and gravel infrastructure construction, avoiding the need for additional fill and other temporary impacts to support construction.
- Drilling for vertical support members (VSMs) would occur from an ice road, and drill cuttings would be sidecast onto the ice around each VSM and the drill cuttings will be removed once VSM installation is complete, avoiding unnecessary discharges into wetlands and other waters. The sidecasting would not change the bottom elevation of wetlands or other waters or replace any portion with dry ground.
- Where pipelines cross road embankments, pipelines would be encased in structural steel pipe casings buried within the roadway section. Casings for pipeline-road crossings would extend beyond the road embankment toe. The power and fiber optic cables would cross under the road prism via a trench located parallel to each pipeline-road crossing or would be strapped to the

pipeline. Trenching would occur during winter to the extent practicable. Trenched materials would be temporarily sidecast onto an ice pad adjacent to the trench. This would avoid a discharge of fill material into wetlands or other waters since the sidecasting would not change the bottom elevation or replace any portion with dry ground. Trenched materials would be taken off the ice pad and backfilled into the excavation once trenching is complete.

- No gravel would be stockpiled in wetlands or other waters outside of the permitted footprint boundary. Gravel may be stockpiled in upland portions or on existing pads prior to placement within the permitted footprint boundary.
- External corrosion inspections of pipelines would be conducted during winter to the extent feasible and would be supported by approved tundra travel vehicles to avoid impacts associated with summer tundra travel.
- Power cables and fiber optic cables would be installed on the HSMs using messenger cables, avoiding the need for power poles and associated fill.
- At pipeline-river crossings, all pipelines and suspended cables would be elevated to maintain adequate freeboard.

Please see Appendix A. Avoidance and Minimization Measures for a list of all proposed avoidance and minimization measures.

4.2. Minimization of Unavoidable Impacts to Aquatic Resources

Following the incorporation of all practicable measures to avoid aquatic resource losses, Santos made design considerations to minimize losses, primarily by limiting the amount (area) of discharges of fill material to the maximum extent practicable while meeting the purpose and need of the project. Additionally, all roads and pads would have a sufficient depth to insulate underlying permafrost and were located to minimize alterations of landscape hydrology patterns and floodplain capacity.

Gravel pads: Santos has limited the number of new drill sites to two locations, the minimum number of drill pads necessary to safely and economically recover hydrocarbon resources. To minimize drill site pad size, Santos condensed infrastructure to the maximum extent practicable while allowing for efficient and safe operations. Directional drilling further minimizes losses by limiting access road lengths.

Gravel Roads: The drill site and processing facility access roads were located to minimize the overall lengths to minimize fill placement to the maximum extent practicable. The roads would be culverted and/or bridged as necessary to maintain natural drainage patterns and fish passage.

Minimization measures would include:

- All drill sites are sized to minimize overall gravel requirements while maintaining space for a sufficient number of well heads to meet the overall project purpose.
- Gravel roads would be constructed to be 32 feet wide at the surface but may be wider at curves to accommodate larger module transport. Gravel road footprints are further minimized by using 2H:1V side slopes to the extent practicable.
- Existing water access points would be used to the extent practicable, no additional gravel roads for water access would be constructed.
- Gravel infrastructure would be constructed during the winter months, when possible. All authorized fill area boundaries shall be surveyed and be clearly delineated (staked, flagged, or posted) prior to the discharge. After the gravel footprint is surveyed and staked, all snow and ice in excess of 4 inches would be removed from the tundra surface in the work area; the tundra surface would not be otherwise disturbed. Pit-run gravel would be placed in lifts using large-

capacity dump trucks and would be spread out with bulldozers or similar heavy earthmoving equipment. Each lift would be compacted by a heavy roller. During summer months, ice that is present in the gravel would melt, leading to further consolidation and settlement. To enhance this process, the gravel would be farmed and re-compacted during the summer months. No infrastructure would be placed on gravel pads and roads until re-grading and compaction is completed.

- To reduce impacts from equipment, Quokka Project construction methods would use machinery and techniques to minimize wetland impacts. This includes using machines with specially designed wheels or tracks and placing mats under heavy machines to reduce surface compaction and rutting for tundra travel. All required permits would be obtained for ice road/pad construction and operation.
- If placement of the access road fill material is not completed within any winter season, sufficient openings shall be provided in the roadbed to maintain natural drainage flows and overland cross drainage at areas where overland flow is expected. Road opening widths shall be of sufficient size to prevent scour of the adjacent tundra wetlands.
- All disturbed, stockpile and fill areas shall be immediately stabilized to prevent erosion and sediment transport outside project footprint. Active sloughing of fill material, increased water turbidity, accumulation of sediment in waters and wetlands and erosion on slopes or around culverts shall be indicators fill slope stabilization is not adequate.
- Snow removal management measures would be implemented to reduce the potential for gravel fill or other contaminants to be pushed off pads during snow removal.
- Dust control measures would be implemented to reduce the incidence of dust on vegetation and snow, protect insulating vegetation and minimize dust settlement on vegetation or snow, which could increase thermal conductivity and promote earlier spring thaw in affected areas.
- Ice road and pad construction would begin after ADNR approves tundra travel and soil is considered sufficiently frozen to support the weight of equipment without damaging the underlying tundra. The ice roads would be a minimum of 6 inches thick and average approximately 12 inches thick due to terrain features. The ice roads would be constructed to support expected loads and protect the vegetation and organic soil beneath. The ice roads would be constructed to avoid sensitive vegetation, such as willows, that extend above the snow level, to the extent practicable. Ice roads would be wide enough (minimum of 20 feet) to safely accommodate two-way vehicular traffic and other traffic, as required.
- Gravel roads provide all-season access to parallel pipelines for visual inspection and for routine and emergency maintenance and repairs. This also reduces the need for tundra travel associated with these activities. Roads and pipelines would be located within 1,000 feet of each other where feasible.
- All on- and off-pad pipelines would be elevated above grade on VSMs to reduce impacts to permafrost.
- Bridge abutments would be designed using sheet piles to minimize the gravel fill footprint, road embankment erosion, and stream scour.

Please see Appendix A. Avoidance and Minimization Measures for a list of all proposed avoidance and minimization measures.

4.3. Compensatory Mitigation

The 2008 Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Part 332) guides compensatory mitigation considerations, where appropriate, to be practicable and capable of replacing the aquatic resource functions lost as a result of the permitted activity. In addition, 33 CFR

320.4(r)(2) states that compensatory mitigation is required only for resource losses that are significant, specifically identifiable, reasonably likely to occur and important to the human or aquatic environment. Mitigation measures must be directly related to the impacts of the proposal, commensurate with the scope and degree of those impacts and reasonably enforceable.

In Alaska, implementation of compensatory mitigation is further guided by *Compensatory Mitigation Considerations for the U.S. Army Corps of Engineers, Alaska District Regulatory Program* and the 2018 *Memorandum of Agreement (MOA) Between the Department of the Army and the Environmental Protection Agency Concerning Mitigation Sequence for Wetlands in Alaska Under Section 404 of the Clean Water Act*.

The EPA's Section 404(b)(1) Guidelines (40 CFR Part 230), together with the USACE Mitigation Rule and regional guidance, establish a mitigation sequence of avoidance, minimization and compensatory mitigation, with compensatory mitigation evaluated within a watershed context. These regulations explicitly recognize that compensatory mitigation must be practicable, available and capable of providing meaningful replacement of aquatic resource functions. Where compensatory mitigation would not meaningfully offset project impacts, or where practicable mitigation options do not exist, the regulations and Alaska-specific procedures allow for alternative approaches consistent with the mitigation sequence.

The Quokka Project has been designed to avoid impacts to wetlands and other waters wherever practicable and to minimize impacts where avoidance is not achievable, consistent with the mitigation sequencing requirements. Due to the abundance and landscape position of wetlands and other waters in the Project area, complete avoidance of all aquatic resources is not practicable.

The Project would result in permanent discharges to approximately 129.2 acres of wetlands and other waters across three hydrologic unit code (HUC) 10 watersheds. Table 8 provides the pre- and post-project total impervious surfaces and other disturbed areas at a watershed scale. These watersheds are predominantly wetland and open water dominated systems with extensive hydrologic connectivity and minimal existing anthropogenic disturbance.

Table 8. Watersheds impacted by the Project.

Watershed name (HUC 10 #)	Total watershed (acres)	Impervious and other disturbed surfaces (acres)	Percent disturbed pre-Project	Project gravel footprint (acres)	Percent disturbed post-Project
Kachemach River (1906030411)	152,388	370.7	0.24%	19.8	0.26%
Miluveach River (1906030412)	111,092	258.5	0.23%	80.6	0.31%
Colville River Delta-Frontal Harrison Bay (1906030413)	295,914	457.7	0.15%	28.7	0.16%
Total Area	**559,394**	**1,086.9**	**0.19%**	**129.1**	**0.22%**

Note: Watershed impacts do not include VSM impacts or temporary impacts from screeding at Oliktok Point. Watershed impacts include impacts to both wetlands and other waters and uplands.

At the watershed scale, Project-related disturbance represents an extremely small proportion of total watershed area. In all three watersheds, greater than 99 percent of the landscape is and would remain undisturbed and continue to function as intact aquatic systems. Hydrologic connectivity, flood storage capacity, sediment transport, nutrient cycling and habitat availability would be maintained at both the watershed and sub-watershed scales.

The aquatic resources affected by the Project are part of large, contiguous wetland complexes typical of the North Slope, characterized by high functional redundancy, extensive connectivity and minimal prior disturbance. While localized functions would be affected at individual fill locations, these functions would continue to be provided by the surrounding undisturbed wetlands and waters at both the local and watershed levels. Given the intact condition of these watersheds, the abundance of similar functioning wetlands and the absence of functionally unique aquatic features within the Project footprint, Project impacts would not result in a significant loss of aquatic resource functions as identified under 33 CFR 320.4(r)(2). Given the limited areal extent, dispersed nature of impacts, and retention of landscape level connectivity, Project impacts would not result in a measurable watershed scale functional deficit. The affected watersheds would continue to exhibit near natural hydrologic and ecological conditions following Project construction.

The Project is located in a remote region of Alaska where meaningful compensatory mitigation opportunities are fundamentally limited or absent. Compensatory mitigation presupposes the existence of degraded aquatic resources suitable for restoration or enhancement, or other opportunities where lost functions can be meaningfully replaced. Within the affected watersheds, aquatic systems are already functioning at or near natural condition, and there are no impaired wetlands or streams where restoration or enhancement would result in measurable functional lift.

Within the three affected watersheds, restoration or enhancement would be speculative and unlikely to produce commensurate, in-kind functional replacement. Creation or establishment of new aquatic resources is similarly not practicable and could introduce unnecessary disturbance into otherwise intact systems. As such, compensatory mitigation in this context would not offset Project impacts and could result in ecological disturbance for the sole purpose of mitigation. Additionally, preservation within the affected watersheds would not provide eventual realized functional lift, or prevention of functional loss, as there are no demonstrable threats to aquatic resources that significantly contribute to the ecological sustainability of the watersheds (33 CFR 332.3(h)).

The 2018 USACE/EPA Alaska MOA explicitly recognizes that compensatory mitigation is not always appropriate or practicable in remote regions of Alaska due to limited site availability and technical or logistical constraints. Where compensatory mitigation is not practicable within the watershed, the MOA emphasizes avoidance and minimization as the primary means of satisfying compliance with the Section 404(b)(1) Guidelines.

The extremely low proportional disturbance (≤0.31 percent within any watershed), the retention of intact watershed scale functions and the absence of practicable and ecologically meaningful compensatory mitigation opportunities within the watersheds indicate that compensatory mitigation would not provide environmental benefit for the Project. Consistent with the 2018 USACE/EPA Alaska MOA and the Section 404(b)(1) Guidelines, compensatory mitigation is not anticipated to be required for this Project. Avoidance and minimization measures incorporated into Project design are sufficient to satisfy mitigation sequencing requirements under the Clean Water Act.

5. Other Required Permits, Authorizations and Consultations (Block 26)

Table 9 summarizes the major permits, regulatory approvals and agency consultations required to construct and operate the Quokka Project.

Table 9. Major Permits, Approvals and Consultations.

Agency	Permit/Approval/Consultation	Description
Federal		
USACE	Individual Permit, Department of the Army Clean Water Act (CWA) Section 404 / Rivers and Harbors Act Section 10	Discharge of fill into waters of the U.S., including wetlands / Structures or work in navigable waters
EPA	Class I UIC permit	Construction of disposal wells for Resource Conservation and Recovery Act (RCRA) exempt and nonhazardous waste and/or construction of injection wells for the disposal of brines and other fluids associated with oil and natural gas production, or for enhanced recovery of oil and natural gas
EPA	Spill Prevention, Control and Countermeasure Plan	For any facility with storage of more than 1,320 gallons of petroleum hydrocarbons
EPA	Facility Response Plan under 40 CFR 112	For facilities that could reasonably be expected to cause "substantial harm" to the environment by discharging oil into or on navigable waters; Substantial Harm Determination is completed to determine scope
USDOT	Facility Response Plan under 49 CFR 194	For oil export pipeline
USFWS	Marine Mammal Protection Act Letter of Authorization/Incidental Take	For activities occurring within polar bear habitat
USFWS, NMFS	Endangered Species Act (ESA) Section 7 consultation	For threatened or endangered species under USFWS and NMFS jurisdiction
NMFS	Essential Fish Habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSA).	For fish species managed under the MSA
State		
ADNR	Temporary Water Use Authorization	Approval to withdraw water from surface waterbodies
ADNR, Office of History and Archaeology	Alaska Historic Preservation Act (AHPA) and National Historic Preservation Act (NHPA) Section 106 consultation	Review project effects and determinations of NRHP eligibility for cultural, historic, and archaeological resources
ADF&G	Title 16 Fish Habitat Permit	Activities within or across streams used by fish
ADF&G	Public safety permit	5 AAC 92.033 allows the take or control of wildlife when a documented threat to human public safety exists.
ADEC	Minor Air Permits	Air quality permits for emissions of regulated air pollutants from oil and gas drill rigs, diesel generating facilities or rock crushers.
ADEC	Solid Waste General Permit	Temporary storage of Resource Conservation and Recovery Act (RCRA)-exempt oil and gas related waste and RCRA non-exempt, non-hazardous waste

Agency	Permit/Approval/Consultation	Description
ADEC	Alaska Pollutant Discharge Elimination System North Slope General Permit	General permit for specific discharges
ADEC	Oil Discharge Prevention and Contingency Plan	Spill response planning
ADEC	CWA Section 401 Water Quality Certificate	Water quality concurrence/waiver needed for USACE 404 permit.
ADNR	Land Use Permit	Authorizes temporary use of state lands, including for ice roads.
ANDR	Lease Plan of Operations Authorization	Approval of activities (portions of pipeline and road) on state oil and gas lease outside of the Quokka Unit
ADNR	Unit Plan of Operations Authorization	Approval of activities within the Quokka Unit
ADNR	Pipeline Right-of-Way Lease AS 38.35	Easement for the Quokka pipelines across state lands outside the Quokka Unit
ADNR	Tidelands Permit (Temporary Land Use Permit)	Screeding in state waters at Oliktok Dock
AOGCC	Class II UIC Enhanced Oil Recovery Well Area Injection Order	Approval of fluid injection for the purpose of enhanced oil recovery
AOGCC	Permit to drill	Approval for each well to be drilled or redrilled
Local		
NSB	Rezone and Master Plan Authorization	Approval to zone specific area for resource development and conduct activities described in Master Plan
NSB	Certificate of Traditional Land Use Inventory (TLUI) Clearance	Confirmation that project area does not impact TLUI sites/establishments
NSB	Development Permit; Administrative Approval	Authorization for projects that have not been previously approved in a Master Plan or within a conservation district or not meeting the definition of minor alteration

5.1. Section 106 of the NHPA

Section 106 of the National Historic Preservation Act of 1996 (NHPA), as amended, and its implementing regulations found in 36 CFR 800, requires federal agencies to consider the effects of the federal undertaking on historic properties (36 CFR 800.1(a)). Historic properties are any prehistoric or historic district, site, building, structure, object or traditional cultural property included in or eligible for inclusion in the National Register of Historic Places (36 CFR 800.16(l)(1)).

No listed, eligible or potentially eligible historic properties are known to be present within one mile of the Project footprint. Additional cultural resource surveys within a determined area of potential effects (APE) planned for 2026 would determine if any potential unrecorded historic properties are located in the APE to inform consultation under Section 106 of the NHPA.

5.2. Section 7 of the ESA

The USFWS and the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) administer and enforce the Endangered Species Act (ESA) of 1973 (16 USC

1531 et seq.), as amended (50 CFR 402). ESA species distribution and the potential for other species occurrence within or near the project area is based on the USFWS Information for Planning and Consultation (IPaC) program and the NOAA Fisheries Alaska ESA and Critical Habitat Web Mapper.

Results from an April 2026 query generated in IPaC suggest that polar bear, spectacled eider and Steller's eider are present in the project area (USFWS 2026). Screeding at Oliktok Dock would occur in polar bear critical habitat (NOAA Fisheries 2026a).

With the inclusion of avoidance and minimization measures, seasonal restrictions and conservation design features, Santos has preliminarily determined that the Project may affect but is unlikely to adversely affect ESA listed species or designated critical habitat.

5.3. EFH Assessment under the MSA

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), projects must prepare an Essential Fish Habitat (EFH) Assessment to determine whether the project would adversely affect the amount or quality of EFH, with EFH defined as the "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity".

Several rivers, streams and lakes within the vicinity of the Project are nominated in the Anadromous Waters Catalog (AWC; Geifer and Evers 2025). The Miluveach River (AWC 330-00-10700-2050) would have a road and pipeline crossing at a location where it is nominated for Bering cisco presence, Dolly Varden rearing and whitefish (general) presence. The QDB pad would be located in the Kachemach River watershed. The Kachemach River (AWC 330-00-10700-2090) is nominated for Bering cisco presence, humpback whitefish presence, least cisco presence and whitefish (general) presence and rearing. The utility pipeline tying back to the NPF would run along the south and west shore of Lake MC7903 (AWC 330-00-10700-2050-3030-0010) which is nominated for Bering cisco presence and whitefish (general) presence.

Screeding at Oliktok Dock would occur in nearshore marine waters of the Beaufort Sea, where screeding has previously occurred. EFH is described for three species at this location: Arctic cod, saffron cod and snow crab (NOAA Fisheries 2026b). No Habitat Areas of Particular Concern are identified at this location.

With the inclusion of appropriate conservation measures, Santos has preliminarily determined that the Project may affect, but would not adversely affect, EFH.

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Appendix A. Avoidance and Minimization Measures

Appendix A Avoidance and Minimization Measures				
No.	**Type**	**Commitment**	**Source**	**Category**
Wetlands and Hydrology Impact Minimization				
1	Avoidance	Where pipelines cross road embankments, pipelines would be encased in structural steel pipe casings buried within the roadway section. Casings for pipeline-road crossings would extend beyond the road embankment toe. The power and fiber optic cables would cross under the road prism via a trench located parallel to each pipeline-road crossing or would be strapped to the pipeline. Trenching would occur during winter to the extent practicable. Trenched materials would be temporarily sidecast onto an ice pad adjacent to the trench. This would avoid a discharge of fill material into wetlands or other waters since the sidecasting would not change the bottom elevation or replace any portion with dry ground. Trenched materials would be taken off the ice pad and backfilled into the excavation once trenching is complete.	Quokka Project Design	Wetlands
2	Avoidance	No gravel would be stockpiled in wetlands or other waters outside of the permitted footprint boundary. Gravel may be stockpiled in upland portions or on existing pads prior to placement within the permitted footprint boundary.	Santos Best Practices	Wetlands
3	Avoidance	External corrosion inspections of pipelines will be conducted during winter to the extent feasible and will be supported by approved tundra travel vehicles to avoid impacts associated with summer tundra travel.	Quokka Project Design	Wetlands
4	Avoidance	Drilling for vertical support members (VSMs) would occur from an ice road, and drill cuttings would be sidecast onto the ice around each VSM and the drill cuttings will be removed once VSM installation is complete, avoiding unnecessary discharges into wetlands and other waters. The sidecasting would not change the bottom elevation of wetlands or other waters or replace any portion with dry ground.	Quokka Project Design	Wetlands
5	Avoidance	The proposed project facilities have been sited adjacent to existing infrastructure on the North Slope, where practicable.	Quokka Project Design	Wetlands
6	Avoidance	The Quokka Project would use existing infrastructure to the maximum extent practicable, thereby avoiding impacts to wetlands and other waters caused by the construction of additional, duplicative facilities. For example: Existing water and gas pipelines would be used to minimize footprints.	Quokka Project Design	Wetlands
7	Avoidance	Power cables and fiber optic cables will be installed on horizontal support members or pipelines avoiding the need for power poles and associated fill.	Quokka Project Design	Wetlands

No.	Type	Commitment	Source	Category
8	Avoidance	The processing of production fluids from all drill sites will primarily occur at the QPF, eliminating the need for additional on-pad facilities and larger pad footprint at the drill sites.	Quokka Project Design	Wetlands
9	Avoidance	At pipeline-river crossings, all pipelines and suspended cables will be elevated to maintain adequate freeboard.	Quokka Project Design	Hydrology and Floodplains
10	Minimization	Santos shall use only clean fill material for this project. The fill material shall be free from items such as trash, debris, automotive parts, asphalt, construction materials, concrete blocks with exposed reinforcement bars, and soils contaminated with any toxic substance, in toxic amounts in accordance with Section 307 of the Clean Water Act.	Santos Best Practices; CWA Section 307	Wetlands
11	Minimization	Excavated material temporarily sidecast into wetlands shall be underlain with geotextile, ice pads, or similar material, to allow for removal of the temporary material to the maximum extent practicable. Except for material placed as minor trench over-fill or surcharge necessary to offset subsidence or compaction, all excess materials shall be removed to a non-wetland location. This will avoid a discharge of fill material into waters of the U.S. since sidecasting of soils will not change the bottom elevation of a water of the U.S., convert a water of the U.S. to upland, or result in the loss of wetland function.	Santos Best Practices	Wetlands
12	Minimization	Trenches would not be constructed or backfilled in such a manner as to drain waters of the U.S. (e.g., backfilling with extensive gravel layers, creating a French drain effect). Ditch plugs or other methods will be used to prevent this situation.	Quokka Project Design	Wetlands
13	Minimization	Ice road and pad construction would begin after ADNR approves tundra travel when and the soil is considered sufficiently frozen to support the weight of equipment without damaging the underlying tundra. The ice roads would be a minimum of 6 inches thick and average approximately 12 inches thick due to terrain features. The ice roads would be constructed to support expected loads and protect the vegetation and organic soil beneath. The ice roads would be constructed to avoid sensitive vegetation, such as willows, that extend above the snow level, to the extent practicable. Ice roads would be wide enough (minimum of 20 feet) to safely accommodate two-way vehicular traffic and other traffic, as required.	ADNR Tundra Travel Permit; NSBMC §19.50.030 (J) and (O); ADF&G Title 16 Fish Habitat Permit; ADNR Temporary Water Use Authorization	Wetlands
14	Minimization	Best Management Practices for preventing the introduction of invasive weeds shall be implemented, including but not limited to ensuring equipment is clean and free from weeds before onsite deployment.	Santos Best Practices	Wetlands

No.	Type	Commitment	Source	Category
15	Minimization	If placement of the access road fill material is not completed within any winter season, sufficient openings shall be provided in the roadbed to maintain natural drainage flows and overland cross drainage at areas where overland flow is expected. Road opening widths shall be of sufficient size to prevent scour of the adjacent tundra wetlands.	Santos Best Practices	Wetlands
16	Minimization	In areas where ponding next to a pad cannot be avoided during flood events or where flowing water may occur adjacent to the gravel embankment, erosion potential will be determined, and erosion control will be provided as needed.	Quokka Project Design	Wetlands
17	Minimization	All drill sites are sized to minimize overall gravel requirements while maintaining space for a sufficient number of well heads to meet the overall project purpose.	Quokka Project Design	Wetlands
18	Minimization	Snow removal management measures will be implemented to reduce the potential for gravel fill or other contaminants to be pushed off pads during snow removal.	Santos Best Practices	Wetlands
19	Minimization	Dust control measures will be implemented to reduce the incidence of dust on vegetation and snow, protect insulating vegetation and minimize dust settlement on vegetation or snow, which could increase thermal conductivity and promote earlier spring thaw in affected areas.	Santos Best Practices	Wetlands
20	Minimization	Gravel infrastructure would be constructed during the winter months, when possible. All authorized fill area boundaries shall be surveyed and be clearly delineated (staked, flagged, or posted) prior to the discharge. After the gravel footprint is surveyed and staked, all snow and ice in excess of 4 inches would be removed from the tundra surface in the work area; the tundra surface would not be otherwise disturbed. Pit-run gravel would be placed in lifts using large-capacity dump trucks and would be spread out with bulldozers or similar heavy earthmoving equipment. Each lift would be compacted by a heavy roller. During summer months, ice that is present in the gravel would melt, leading to further consolidation and settlement. To enhance this process, the gravel would be farmed and re-compacted during the summer months. No infrastructure would be placed on gravel pads and roads until re-grading and compaction is completed.	Quokka Project Design	Wetlands
21	Minimization	Gravel roads would be constructed to be 32 feet wide at the surface but may be wider at curves to accommodate larger module transport. Gravel road footprints are further minimized by using 2H:1V side slopes to the extent practicable.	Quokka Project Design	Wetlands
22	Minimization	Existing water access points will be used to the extent practicable, no additional gravel roads for water access are proposed.	Quokka Project Design	Wetlands

No.	Type	Commitment	Source	Category
23	Minimization	All disturbed, stockpile, and fill areas shall be immediately stabilized to prevent erosion and sediment transport outside project footprint. Active sloughing of fill material, increased water turbidity, accumulation of sediment in waters and wetlands, and erosion on slopes or around culverts shall be indicators fill slope stabilization is not adequate.	Santos Best Practices	Wetlands
24	Minimization	To reduce impacts from equipment, Quokka Project construction methods would use machinery and techniques to minimize wetland impacts. This includes using machines with specially designed wheels or tracks and placing mats under heavy machines to reduce surface compaction and rutting for tundra travel. All required permits would be obtained for ice road/pad construction and operation.	Santos Best Practices	Wetlands
25	Minimization	Gravel roads provide all-season access to parallel import/export and infield pipelines for visual inspection and for routine emergency maintenance and repairs. This also reduces the need for tundra travel associated with these activities. Roads and pipelines will be located within 1,000 feet of each other where feasible.	Quokka Project Design; ADNR North Slope Mitigation Measures	Wetlands
26	Minimization	Flow velocities at culvert outlets will be monitored, and outlet erosion control measures will be designed as necessary to prevent channel degradation. Culverts shall be marked to facilitate snow removal operations to prevent excessive deposition of snow into creeks and drainage areas. Culverts shall be maintained to adequately convey surface waters throughout the life of the project (access road use). Culvert/drainage corrective work shall be completed prior to the next spring breakup after the drainage problems are identified.	Quokka Project Design	Hydrology and Floodplains
27	Minimization	Existing (natural) drainage patterns and floodplain integrity and connectivity shall be maintained throughout all construction and operation periods by the installation of culverts in all authorized fill areas in sufficient number and size to prevent ponding, dewatering, water diversion between watersheds, or concentrating runoff flows. Field surveying, planning, and design will ensure that the placement of culverts along the access road are not effected by hydrologic changes due to project construction. As a general guideline, cross-drainage culverts will be sited approximately every 500 feet along the alignment during initial design efforts, although exact placement of culverts will depend on actual in-field local drainage patterns.	Quokka Project Design	Hydrology and Floodplains

No.	Type	Commitment	Source	Category
28	Minimization	Where natural drainage patterns are crossed, roads will be designed perpendicular to the general flow direction to the extent practicable. Placement of the roads and pads will be optimized to minimize ponding to the extent practical, and road and pad elevations will be designed as appropriate to prevent overtopping.	Quokka Project Design	Hydrology and Floodplains
29	Minimization	Trenches will be monitored frequently during the snow free season until stabilized to ensure each trench does not capture or cause redirection of surface water. Any subsidence within the trench will be mitigated by the additional placement of fill as soon as subsidence is observed.	Quokka Project Design	Hydrology and Floodplains
30	Minimization	Infrastructure and drill sites are oriented with the long axis parallel to the prevailing northeast/southwest wind direction to minimize snow drift and related maintenance activities, resulting in a minimization of potential effects on hydrology during spring breakup.	Quokka Project Design	Hydrology and Floodplains
31	Minimization	Drill site locations are designed to minimize lengths of infield roads and pipelines, with considerations for hydrology, wetlands, fish, wildlife, and subsistence use.	Quokka Project Design	Hydrology and Floodplains
32	Minimization	Bridge abutments will be designed using sheet piles to minimize the gravel fill footprint, road embankment erosion, and stream scour.	Quokka Project Design	Hydrology and Floodplains
33	Minimization	Construction of single-season ice roads and pads for winter construction will minimize the need for additional fill to support construction and drilling. In accordance with permits, ice road crossings of designated streams and rivers will be slotted, breached, or weakened upon completion of use to minimize flooding and associated scour upon the return of flowing waters in spring. Water withdrawal for ice pad and ice road construction would be conducted in compliance with water withdrawal authorizations and fish habitat permit stipulations to maintain adequate lake volumes in fish-bearing lakes.	ADNR Tundra Travel Permit NSBMC §19.50.030 (J) and (O) ADF&G Title 16 Fish Habitat Permit ADNR Temporary Water Use Authorization	Hydrology and Floodplains
General Environmental Impact Minimization				
34	Avoidance	Santos will not install a waste incinerator on site, thereby reducing overall project air emissions.	Quokka Project Design	Air Quality
35	Minimization	Power generated at the Quokka Processing Facility will be supplied to each drill site through a power cable, rather than have multiple generation locations, to reduce noise and air quality impacts at each of the drill sites.	Quokka Project Design	Air Quality

No.	Type	Commitment	Source	Category
36	Minimization	Combustion turbines will be equipped with appropriate technologies to ensure efficient combustion, increased fuel efficiency, and reduced greenhouse gas (GHG) emissions rates. Santos will implement good combustion practices for all fuel-fired equipment, including regular maintenance according to manufacturer's recommendation, to reduce potential GHG emissions.	Quokka Project Design; Santos Best Practices	Air Quality
37	Minimization	Santos will use a safety flare for emergency control of excess gas at the process facility and drillsites, instead of venting the excess gas, to reduce GHG emissions.	Quokka Project Design	Air Quality
38	Avoidance	Santos would avoid routine use of helicopters, reducing noise/disturbance impacts to local residents, subsistence users, and wildlife, as well as air quality impacts.	Quokka Project Design	Noise
39	Minimization	The pipelines will be designed, sited, and constructed to allow for the free movement of wildlife and to avoid significant alteration of caribou and other large ungulate movement and migration patterns. At a minimum, the pipelines will be elevated seven feet, as measured from the ground to the bottom of the pipeline or messenger cable, except where the pipeline intersects a road or pad to minimize impacts to permafrost and flow patterns of surface waters. Pipelines and gravel pads shall facilitate the containment and cleanup of spilled fluids.	2018 ADNR North Slope Areawide Mitigation Measures (A.1.j, i-iii)	Permafrost
40	Minimization	All on- and off-pad pipelines will be elevated above grade on VSMs to reduce impacts to permafrost.	Quokka Project Design	Permafrost
41	Minimization	The following engineering methods will be employed to minimize heat transfer from infrastructure on pads to the underlying permafrost: -In well conductors, the gap between the well conductor and inner pipe will be filled with polyurethane foam. -Engineering studies will be conducted to assess the need for thermosyphons or rigid insulation for structures placed at-grade. -Flare stack height will be selected to reduce ground-level radiant heat intensity to levels that will protect personnel, structures, and equipment as well as to avoid permafrost degradation (typically 1,500 btu/hr/ft2).	Quokka Project Design	Permafrost
42	Minimization	Gravel pads will have a minimum gravel thickness of 6 feet and gravel roads will have a minimum gravel thickness of 5 feet. Minimum thicknesses are designed to protect underlying permafrost by insulating and maintaining stable permafrost conditions. Pads are at least 1 foot thicker than roads due to higher thermal loads associated with pads. Minimum gravel thickness will be maintained throughout the life of the Project.	Quokka Project Design	Permafrost

No.	Type	Commitment	Source	Category
43	Minimization	Personnel will be required to stay on gravel or ice surfaces to minimize impacts to the tundra unless their specific job duties require them to be on the tundra and that activity is properly permitted.	Santos Best Practices	Permafrost, Soils
44	Minimization	Pads and roads will be designed to limit point sources of runoff to the surrounding tundra.	Quokka Project Design	Water Quality
45	Minimization	Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions. As a result, a number of impacts would be minimized, including the potential for soil erosion from water discharge and potential impacts to water quality, vegetation, birds, and wildlife.	Quokka Project Design	Water Quality
46	Minimization	Santos will reduce surface discharge of wastewaters through use of a disposal well, including zero discharge of produced water and drilling wastes to prevent soil surface erosion, changes in drainage patterns, and to not initiate thermokarst erosion. During drilling operations, the Pikka grind and inject facilities and associated UIC well(s) will be used for disposal of RCRA-exempt and non-hazardous waste. Use of existing facilities reduces the need for a new grind and inject facility for the Quokka Project.	Quokka Project Design	Water Quality
Spill Mitigation Measures				
47	Minimization	All fuel and hazardous substances would be handled and stored on site in compliance with state and federal regulatory guidance and the ODPCP and SPCC Plans. All fuels and chemicals would be stored in appropriate primary containment areas. Secondary containment areas would be designed in compliance with all applicable permits and regulations.	2018 ADNR North Slope Areawide Mitigation Measures (A.4.a)	Oil Spills
48	Minimization	Santos will ensure that secondary containment is provided for the storage of fuel or hazardous substances and is sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR 112. Containers with an aggregate storage capacity of greater than 55 gallons that contain fuel or hazardous substances will not be stored within 100 feet of a waterbody, or within 1,500 feet of a current surface drinking water source.	2018 ADNR North Slope Areawide Mitigation Measures (A.4.a)	Oil Spills
49	Minimization	During equipment storage or maintenance, the site will be protected from leaking or dripping fuel and hazardous substances by the placement of drip pans or other surface liners designed to catch and hold fluids under the equipment, or by creating an area for storage or maintenance using an impermeable liner or other suitable containment mechanism.	2018 ADNR North Slope Areawide Mitigation Measures (A.4.b)	Oil Spills

No.	Type	Commitment	Source	Category
50	Minimization	During fuel or hazardous substance transfer, secondary containment or a surface liner will be placed under all container or vehicle fuel tank inlet and outlet points, hose connections, and hose ends. Appropriate spill response equipment, sufficient to respond to a spill of up to five gallons, will be on hand during any transfer or handling of fuel or hazardous substances.	2018 ADNR North Slope Areawide Mitigation Measures (A.4.c)	Oil Spills
51	Minimization	Hydrostatic testing will validate the integrity of the pipelines prior to operation.	Santos Best Practices	Oil Spills
52	Minimization	Trained North Slope employees and contractors who are familiar with North Slope oilfields will be employed, providing personnel who are familiar with industry requirements regarding environmental and regulatory compliance standards. Personnel will be trained on Operational Plans, including oil handler training, waste management, snow removal, spill prevention, cultural awareness, and wildlife interaction, which will minimize the potential for impacts during daily operations.	2018 ADNR North Slope Areawide Mitigation Measures (A.7.d)	Oil Spills
53	Minimization	Santos will maintain its membership with Alaska Clean Seas and the Mutual Aid Agreement with other operators on the North Slope to provide resources to respond to spills, which may require resources other than those readily staged on pads.	Santos Best Practices	Oil Spills
54	Minimization	All pipelines will be designed above ground and will be located in the vicinity of proposed roads, allowing for better access for leak detection, maintenance, and potential spill response.	Quokka Project Design	Oil Spills
55	Minimization	Pipelines containing temperature-controlled fluids and multiphase product will include external fusion bonded epoxy coating and an insulation system consisting of polyurethane foam insulation covered with an interlocked sheet metal jacket.	Quokka Project Design	Oil Spills
56	Minimization	Pipeline facilities will include pig launchers and receivers capable of handling inline inspection tools, and maintenance and cleaning tools.	Quokka Project Design	Oil Spills
57	Minimization	Periodic surveillance of the pipelines will be conducted in accordance with federal regulatory and American Society of Mechanical Engineers (ASME) B31.4 requirements and in accordance with ADEC regulations (18 Alaska Administrative Code 75). Leak detection systems and surveillance will be compliant with ASME codes and state and federal standards, including the use of valves or vertical loops for pipeline river crossings.	18 AAC 75; ASME B31.4	Oil Spills
58	Minimization	Santos will develop and have in place appropriate spill prevention and response plans. Santos's practice is to immediately and completely clean up spills. Dedicated spill response equipment will be positioned throughout the field to minimize spill response time.	Quokka Project Design	Oil Spills

No.	Type	Commitment	Source	Category
59	Minimization	Fuels and other products will be transported to the Project area using a licensed, commercial transporter following U.S. Department of Transportation regulations for safe transport of materials to minimize spill risk.	Quokka Project Design	Oil Spills
Minimizing Cultural and Subsistence Impacts				
60	Minimization	Santos will work with the Kuukpik Corporation, the City of Nuiqsut, and the NSB to ensure that Nuiqsut and NSB residents have opportunities to apply for work on the Project and will provide local North Slope companies with opportunities to compete for contract work associated with the Project. Santos will also work with contractors, trade associations, Alaska Process Careers Consortium, and Iḷisaġvik College to develop training programs for North Slope residents, if needed.	2018 ADNR North Slope Areawide Mitigation Measures (A.7.a)	Socioeconomics
61	Minimization	Santos will work with the Kuukpik Corporation on design elements of project infrastructure to increase potential access routes for subsistence activities.	Quokka Project Design; USACE Public Interest Review	Subsistence
62	Minimization	Santos will interface with the Kuukpik Subsistence Oversight Panel to minimize conflict with subsistence users.	USACE Public Interest Review	Subsistence
63	Minimization	Three subsistence access ramps will be constructed on infield roads to facilitate access for off-road travelers.	Quokka Project Design; USACE Public Interest Review	Subsistence
64	Minimization	Gravel roads will maintain a separation distance from pipelines of 500 feet or more, where practicable, but of no more than 1,000 feet in order to reduce risk of vehicle impacts, ensure access during a spill or fire, and expedite snow removal. All gravel roads will also include 4-foot high flexible reflective markers along the sides, spaced approximately 50 to 75 feet apart along the road shoulder. Where pipelines cross gravel roads, they will be encased with structural pipe sized appropriately for required loads.	Quokka Project Design	Health and Human Safety
65	Minimization	Santos will provide regular project updates to the community and leadership in Nuiqsut during project development, and will incorporate measures to address concerns into project designs, where practicable. Additionally, Santos will continue to communicate regularly with the community and leadership in Nuiqsut throughout construction and operations.	2018 ADNR North Slope Areawide Mitigation Measures (A.3.b)	Health and Human Safety
Minimization of Widlife Impacts				

No.	Type	Commitment	Source	Category
66	Avoidance	Project facilities are designed to eliminate or discourage wildlife encounters in order to ensure wildlife and human safety at all times by providing designated walkways, secure doors, proper lighting, snow buildup management, waste management and disposal facilities, and traffic control.	Quokka Project Design	Terrestrial Mammals
67	Avoidance	Cables will be installed on the HSMs using messenger cables or affixed to the pipeline, avoiding the need for power poles and associated fill. All pipelines and suspended cables will be a minimum of 7 feet above the tundra surface, except where pipelines intersect a road or pad.	Quokka Project Design	Terrestrial Mammals
68	Avoidance	A Waste Management Plan would be developed to address the types and quantities, regulatory controls, and management options for solid and liquid wastes. Any waste receptacles stored outdoors will be managed to avoid potential wildlife interactions, via methods such as waste segregation, using closed containers, and the covering of dumpsters containing food waste.	Quokka Project Design	Terrestrial Mammals
69	Avoidance	Where new pipelines are co-located with existing pipelines, the new VSMs will be paired with the existing VSMs to avoid a “picket fence” effect to the extent practicable.	Quokka Project Design	Terrestrial Mammals
70	Avoidance	Santos will consult with ADF&G before commencing any activities to identify the locations of known brown bear den sites that are occupied in the season of proposed activities. Production activities will not be conducted within one-half mile of occupied brown bear dens unless alternative mitigation measures are approved by ADF&G. If Santos encounters an occupied brown bear den not previously identified by ADF&G, Santos will report it to the Division of Wildlife Conservation, ADF&G, within 24 hours.	2018 ADNR North Slope Areawide Mitigation Measures (A.2.d.i)	Terrestrial Mammals
71	Minimization	Pipelines will have a non-reflective finish to reduce reflectivity and potential impacts to wildlife from visual disturbances.	Quokka Project Design	Terrestrial Mammals
72	Minimization	Avoiding attraction of predatory birds and mammals to food and waste associated with project facilities through implementation of a Wildlife Interaction Plan and by training all employees and contractors in effective food- and waste-handling procedures.	Quokka Project Design	Terrestrial Mammals
73	Minimization	All pipelines will rest on horizontal support members (HSMs) supported by one or two (such as at anchor supports) 8- to 24-inch-diameter pipe pile vertical support members (VSMs) spaced approximately 55 to 60 feet apart. Where feasible, pipelines will be located parallel to gravel roads at a distance of between 500 and 1,000 feet to minimize caribou disturbance and excessive snow drift, reduce risk of vehicle impacts to the pipeline, and facilitate access for visual pipeline inspection, monitoring, repairs, modifications, and testing.	Quokka Project Design	Terrestrial Mammals

No.	Type	Commitment	Source	Category
74	Avoidance	Santos will implement a Wildlife Interaction Plan and Polar Bear Interaction Plan, as well as train all employees and contractors in effective food- and waste handling procedures. The Wildlife Interaction Plan would include measures, and employees and contractors would be trained, to avoid attraction of predatory birds and mammals to food and waste associated with project facilities through effective food- and waste-handling procedures. The Polar Bear Interaction Plan would be developed to provide personnel with guidance to minimize the possibility of wildlife interactions and impacts to bears and human safety. Guidance would include a prohibition on the intentional feeding of wildlife and ensure that activities have the least practicable adverse impact on polar bears.	2018 ADNR North Slope Areawide Mitigation Measures (A.2.d.ii., A.2.d.iii)	Threatened and Endangered Species
75	Minimization	Santos will consult with the US Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) prior to commencement of any activities as required by the Endangered Species Act. Santos will identify the locations of known polar bear den sites; operations will avoid known polar bear dens by at least one mile unless alternative mitigation measures are approved by USFWS. If Santos encounters an occupied polar bear den not previously identified by USFWS, Santos will report it to the USFWS within 24 hours to minimize disturbance. Santos will consult with NMFS prior to any potential screeding activities as required.	USFWS/NMFS-Endangered Species Act	Threatened and Endangered Species
76	Avoidance	To the extent practicable, construction activities would take place in winter in order to avoid disturbance impacts to listed eiders during the breeding season. Project components will be sited to avoid preferred habitats of listed eiders and to minimize the overall project footprint.	2018 ADNR North Slope Areawide Mitigation Measures (A.2.e)	Birds
77	Avoidance	Power and fiber optic cables will not be installed overhead using poles, eliminating the potential impact to vegetation, wetlands, and bird strikes.	Quokka Project Design	Birds
78	Avoidance	Communication towers will be located, to the extent practicable, as close as possible to buildings or other structures. Support wires associated with communication towers, radio antennas, and other similar facilities will be avoided. They would also be as low in height as possible.	Quokka Project Design	Birds

No.	Type	Commitment	Source	Category
79	Minimization	Santos will reduce ground-disturbing activities on the tundra, including travel on foot, helicopter take-offs and landings, and placement of new fill, between June 1 and July 31 each year to the largest extent practicable. When activities must be conducted on the tundra between June 1 and July 31, Santos will strive to schedule the activities as late as possible within this interval. Any required off-pad work during the bird nesting season would be coordinated with environmental personnel to ensure no impacts to nesting birds.	USFWS- Migratory Bird Treaty Act; USFWS Biological Opinion POA 2015-00025	Birds
80	Minimization	When human safety and other practicalities allow, Santos or their contractor would remove raven (Corvus corax) nests during the non-nesting season (i.e., when no eggs or young are present in nests) from infrastructure to the largest extent possible.	USFWS Biological Opinion POA 2015-00025	Birds
81	Minimization	Seasoning, farming, and re-compaction of the gravel roads and pads would occur during the summer months, after most breeding Arctic birds have hatched their young.	Quokka Project Design	Birds
82	Minimization	Facility lighting will be designed to minimize the impact of lighting on visual aesthetics and minimize the occurrence of bird disorientation and strikes. Santos will minimize light visible by using downward illumination such as downcast floodlights and excluding use of horizontally aimed floodlights; using lighting fixtures with lamps contained within the reflector; and shading externally facing windows on buildings. Illumination of all structures between August 1 and October 31 shall be designed to direct artificial exterior lighting inward and downward, rather than upward and outward, unless otherwise required by the Federal Aviation Administration.	Quokka Project Design	Birds
83	Avoidance	Where feasible and prudent, project facilities, including roads and pipelines, have been sited farther than one-half mile from the banks of rivers as measured from the ordinary high water mark and 500 feet from all fish bearing waterbodies.	2018 ADNR North Slope Areawide Mitigation Measures (A.1.e) Quokka Project Design	Fish and Invertebrates
84	Avoidance	Water intake structures in fish bearing waters will be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury, and will use fish screening devices that meet the criteria approved by the Alaska Department of Fish and Game (ADF&G).	ADF&G Title 16	Fish and Invertebrates