



**SAKHALIN-1 PROJECT
REPORT OF ENVIRONMENTAL PROTECTION ACTIVITIES**

EXXON NEFTEGAS LIMITED

2019

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Attachment: ENL's SSHE performance results in 2014-2019

1. HEALTH, SAFETY, AND ENVIRONMENTAL PROTECTION IN 2019

In 2019, Exxon Neftegas Limited (hereinafter – ENL) conducted the following major activities to develop a culture of safety, health, and environmental protection:

- ◆ Promotion of safety culture principles adopted by Exxon Mobil Corporation at ENL and among contractors;
- ◆ In 2019, the Company continued implementation of the *Safe Choice* project, embracing all those engaged in Sakhalin-1 activities, the Company employees and the contractors. The project focuses on the different aspects associated with personal decision-making and taking the necessary steps to recognize and make safer choices. A training course was developed, specifically tailored to reflect the project's requirements and the real-life situations experienced at production sites. The trainings were conducted both at the Yuzhno-Sakhalinsk office and at the production sites. During the program implementation, 59 sessions were conducted, and 1028 people were trained. In May 2019, ENL implemented a new *Safety Culture* Program comprising training courses for both new and experienced employees. The trainings are mandatory. During the year, 91 sessions were conducted and 1638 people were trained in this new program. The training activities will continue into 2020.
- ◆ The 16th annual SSHE Forum for contractors in Yuzhno-Sakhalinsk with participants representing more than 30 companies;
- ◆ Continued implementation of contractors' safety improvement process through best practices for contractor interface management;
- ◆ Assessment of the Operations Integrity Management System;
- ◆ Emergency response exercises at Company sites.

During 2019 at ENL facilities, no accidents or incidents, including oil and oil products spills affecting the population or the environment, were not recorded.

2. 2019 ENVIRONMENTAL PERFORMANCE

ENL pays special attention to environmental protection activities and monitors numerous environmental performance indicators and parameters on a daily, monthly, quarterly, and annual basis. This section presents the summary of environmental performance at Sakhalin-1.

2.1 Waste Management

The data presented herein are in compliance with State Statistic Report form 2-TP (wastes) by ENL, for 2019.

Diligent management of waste management system is considered by ENL as one of priority tasks in the frame of Sakhalin-1 project operation.

The waste management system is based on uniform standards and requirements for all Sakhalin-1 facilities, strategic planning, and centralized waste management, infrastructure and work methods improvements, analysis of key parameters activities as compared to best practical results in the sector at implementation of required remediation activities.

In order to ensure the specified method of implementation of the waste management system, ENL implements a waste management strategy based on ExxonMobil waste management standards, and the RF Law requirements, basing on the following principles arranged in the applicability sequence:

- ◆ Minimizing waste generation
- ◆ Waste recycling and reuse
- ◆ Application of 'best available' technologies in the field of waste neutralization and disposal
- ◆ Waste disposal in special landfills

Realization of Waste Management Strategy in 2019

Minimization of waste generation.

Waste minimization is the most important part of the Sakhalin-1 project waste management strategy due to the remote location of production facilities.

In the framework of prevention and reduction of waste generation volumes, ENL annually realizes a number of initiatives and activities aimed at the use of low-waste and resource-saving technologies, and at prevention of waste generation.

Specifically, in 2019, the replacement of lighting sources for energy-saving and LED luminaries continued at Sakhalin-1 project facilities. One of the results of this activity was the 4% reduction of mercury waste generation in 2019 vs 2018. The use of the recycling flush water treatment system when cleaning a tank at De-Kastri Oil Export Terminal (OET) resulted in a reduction of oily wastes. In 2019 ENL continued implementing initiatives aimed at reduction of office paper consumption, including introduction of an electronic document management system.

Recycling and reuse of waste

Main attention at waste collection, sorting, and recycling is focused on revealing of waste generation sources and separate collection of a waste which can be reused in the main manufacturing process or recycled as secondary raw materials.

Overall, the share of the wastes handed over for recycling and reuse grew from 68.7% in 2018 to 76.5% in the reporting year of 2019.

Application of 'best available' technologies (BAT) in the field of waste neutralization and disposal

ENL is using the following BATs in the field of its waste management:

- ITS 9-2015 "Waste Neutralization by Thermal Methods (Waste Incineration)",
- ITS 17-2016 "Disposal of production and consumption waste".

Waste disposal on special landfills

ENL's primary goals in the field of waste disposal are the effective use of available waste landfilling areas for waste disposal and the use of ecologically acceptable methods of waste disposal in order to minimize environment impact effects. To achieve these goals:

- ◆ ENL deposits its industrial and household waste in the Sakhalin Region at the Nogliki landfill, in Khabarovsk Krai at its own landfill in the area of De-Kastri OET.
- ◆ ENL is pumping drilling waste and produced water into isolated formations of licensed subsoil areas. This method is generally recognized as the most ecologically safe for drilling and oil extracting waste management.

- ◆ In accordance with the requirements of Russian laws, ENL concluded a contract in 2018 with the Regional Operator for the removal and burial of solid domestic wastes.

Monitoring of the Environmental Conditions in the Area of Waste Disposal Facilities

In 2019, ENL performed monitoring of the environmental conditions at the Sakhalin-1 Project waste disposal facilities and within their environmental impact areas in accordance with the developed programs.

The monitoring was performed at the De-Kastri waste landfill, the waste placement areas at Orlan and Berkut platforms, Chayvo OPF, Odoptu NWS, Olympia Residential Compound, De-Kastri OET, as well as at the subsoil plots of Arkutun-Dagi, Chayvo offshore, Chayvo onshore fields, Garomay License Subsoil Block and Odoptu-1 subsoil plot.

The monitoring included soil conditions in the area of the waste disposal facilities, groundwater quality, and storm water runoff quality. The volume of injected drilling waste and produced water as well as the injection technical parameters are monitored in accordance with the requirements of the authorized subsoil use agencies.

The results of monitoring at waste disposal sites in 2019 showed that controlled parameters met the required environmental quality standards and there were no violations of mandatory requirements.

Temporary Waste Storage Areas (TWSA)

In 2021, the Company is planning the temporary waste storage area repair at the Odoptu-2 NWS (Odoptu TWSA) and De-Kastri OET (De-Kastri TWSF).

At Chayvo TWSF, the oily waste containment pond repair was conducted in 2019.

Main Indicators in the Field of Waste Management in 2019

On facilities constructed and operated under the "Sakhalin-1" project in the Sakhalin Region and Khabarovsk Krai in 2019, 1,225,507.7 tonnes of produced water, and of drilling, industrial and household waste were generated.

Total amount of generated waste included:

- ◆ Produced water;
- ◆ Drilling waste (drill cuttings, drilling muds, drilling water);
- ◆ Sanitary wastewater from the Orlan Offshore Platform (OP);

Produced water, drilling waste and wastewater from the Orlan offshore platform were injected through a specialized well into deep formations of the license subsoil blocks:

- ◆ Garomay subsoil area;
- ◆ Chayvo onshore subsoil area;
- ◆ Chayvo offshore subsoil area;
- ◆ Arkutun-Dagi subsoil area;
- ◆ Odoptu-1 onshore subsoil area.

Part of drilling waste (drill cuttings) was handed over for recycling to the licensed enterprise "Terra-Torf" LLC.

Produced water, drilling waste and wastewater produced at the Orlan Offshore Platform amount to 99.23% of the total amount of waste generated in 2019. Further on, the combined amount of these types of waste is excluded from review in order to keep the data representative.

Industrial and household waste generated by ENL in 2019 amounted to 9 564.9 tons.

In 2019, 99.4% of the Hazard Class 1-5 waste generated and accumulated since 2018 was neutralized, buried and recycled (transferred for recycling and reuse) as described below.

Overall, in 2019, the level of recycling and reuse of industrial and household waste generated at the Company facilities reached 76.5%. This result has been achieved due to a high manufacturing culture, early and full waste segregation, and also due to professional waste management organization, excluding a possibility of disposal and/or secondary pollution of potentially processed waste

At ENL production facilities, oily wastewater is sent to separators to extract oil and return it to the production process and to treat the wastewater in compliance with the laws of the Russian Federation. The company uses highly efficient technologies and equipment for treatment of oily industrial wastewater, water used for washing and testing production equipment, and storm water that may be contaminated with oil and oil products.

9.3% of the waste generated was processed by thermal treatment in the company's own and contractors' incinerators. The mercury-containing waste in the amount of 0.02% was transferred to subcontractor organizations for disposal by means of specialized equipment.

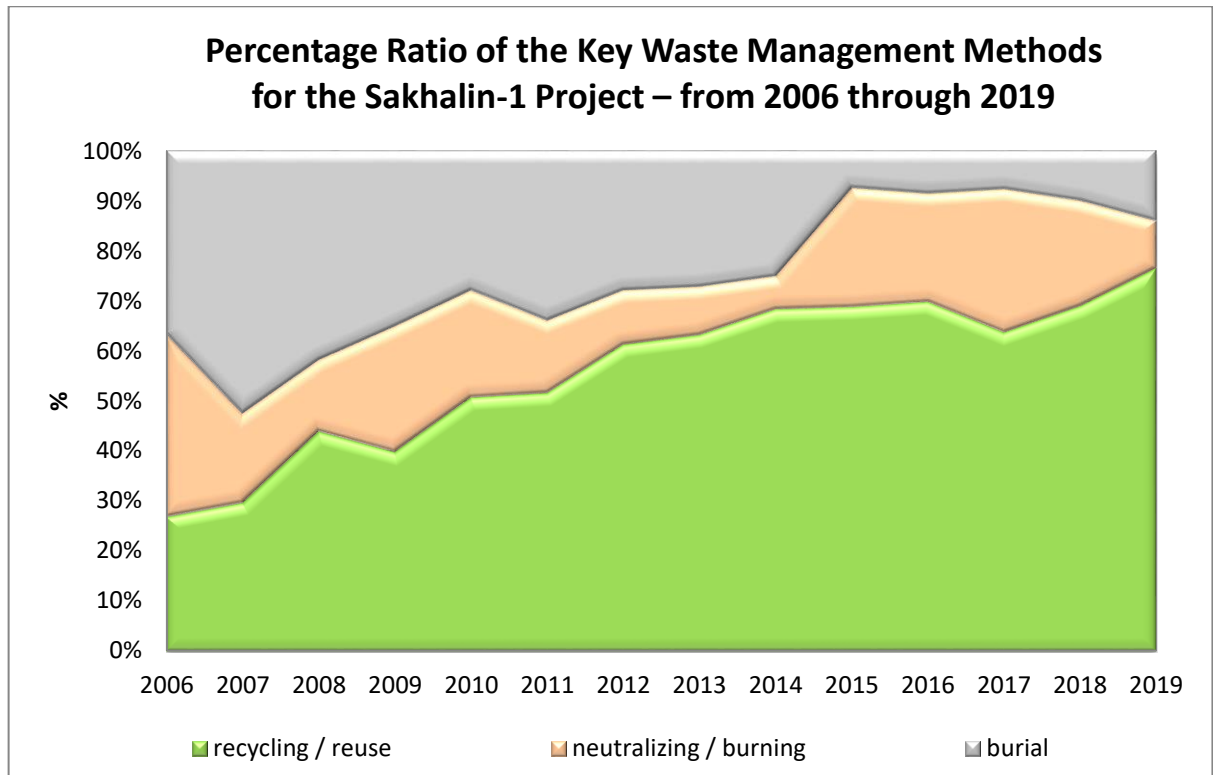
Waste burial was carried out as follows:

- ◆ 6.76% of hazard classes 4 and 5 waste was disposed of at the specialized solid waste landfill of the Waste Management Agency JSC in Nogliki settlement. The landfill is registered in the SRWDF state register of waste disposal sites;
- ◆ 0.17% of industrial and household waste of 4-5 hazard classes was disposed of at ENL landfill in the De-Kastri settlement. The landfill is registered in the SRWDF state register of waste disposal sites;
- ◆ 6.65% of solid household waste was delivered to the regional operator.

Summary Data of ENL Industrial and Domestic Waste Management in 2019

Waste management	%
Recycling and reuse	76.5%
Neutralization (incineration)	9.3%
Burial	13.6%
Total	99.4%

The diagram shows the percentage data of main industrial and household waste management methods for the whole "Sakhalin-1" project from 2006 through 2019.



2.2 Water use, water consumption, and water disposal

The data presented herein are in compliance with State Statistical Report form 2-TP (water management) by ENL, for 2019.

ENL carries out discharge of clean or treated in accordance with normative requirements waters into surface water bodies. The most effective available wastewater disposal technology is injection into a disposal well. The industrial wastewaters, rainwaters and household wastewater from Sakhalin-1 Project facilities are injected into specialized wells or sent to treatment facilities and to leach fields or into surface water bodies upon treatment. Uncontaminated wastewater (cooling water and water from desalination systems) is discharged into the sea.

In 2019, during facilities construction and operation under the Sakhalin-1 project, ENL carried out its water economic activities on the basis of eight Decisions and two Agreements on the right of using surface water bodies executed in strict compliance with legislation requirements, and also on the basis of six Licenses for the right of using subsoil resources for extraction of underground waters.

Total water consumption volume amounted to 19,825.6 thousand m³. Total wastewater disposal volume was 19,827.3 thousand m³.

Orlan Offshore Platform

During the reporting year, the intake of seawater at Orlan platform amounted to 6,363.3 thousand m³.

98.7% of the sea water used for direct-flow cooling was returned into the ecosystem.

Wastewater disposal:

- treated in compliance with water treatment standards wastewater from the desalination system was discharged to the sea in the amount of 87.7 thousand m³;

- household wastewater, which have passed electrochemical dissociation in «Omnipure 15 MX» system, and wastewater containing drilling technological waste, flushing waters from industrial zones, and also rainwater/stormwater drains were injected through disposal well in the Chayvo offshore license area.

Chayvo Onshore Processing Facility (Chayvo OPF) and Chayvo Well Site (Chayvo WS)

Water consumption at OPF Chayvo and Chayvo WS amounted to 132.4 thousand m³ from underground sources owned by ENL and EON LLC, a contractor of the Company supplying fresh water from its underground water intakes.

Wastewater disposal:

- household wastewaters, after treatment at biological wastewater treatment facilities of drilling platforms and Chayvo OPF were directed to leach fields in the volume of 65.2 thousand m³;
- industrial wastewaters via the regular surface drainage system were supplied to the retention pond of Chayvo OPF industrial zone, and then injected through disposal wells for placing produced waters and other technological waste.

De-Kastri Oil Export Terminal, Main Oil Pipeline and Single-Point Mooring (SPM) located in the Ulchi District of Khabarovsk Krai

Intake of fresh water was taken from underground sources on the basis of the subsurface use license, and amounted to 13.2 thousand m³. In 2019, 0.19 thousand m³ was received from urban networks for the Duplex living quarters at De-Kastri.

Wastewater disposal: sanitary wastewater in the volume of 9.6 thousand m³ and filter flushing wastewater in the volume of 0.38 thousand m³ after treatment at biological treatment facilities was transported to De-Kastri settlement Waste Water Treatment Plant.

Leachate from the industrial and household waste landfill, represented by atmospheric precipitation that has passed through the waste layer was transported from the landfill to the wastewater treatment facilities of the terminal.

Surface drains from the terminal site was collected in the system of retention ponds and treated wastewater in the amount of 33.6 thousand m³ then was released to the sea in accordance with permit conditions.

Odoptu 2 (North) Well Site (Odoptu NWS)

Water supply of Odoptu NWS facilities, including the multi-purpose building and the drillers' temporary camp, was sourced from «Odoptu-4» water intake owned by EON LLC.

Water consumption was 88.8 thousand m³

Household wastewater after treatment was disposed to leach fields in the volume of 83.1 thousand m³.

Berkut Fixed Offshore Platform

The Berkut platform is located on the northeast shelf of Sakhalin Island, in the aquatic area of the Okhotsk Sea in the exclusive economic zone of the Russian Federation.

According to the clarification of the RF Federal Water Resources Agency dated 20.09.2011 # BH-02-28/4462, the norms of the RF Water Code at making the water-use agreement and the

decision on water body submission for use do not cover on aquatic areas of water bodies located in the exclusive economic zone of the Russian Federation.

Intake of seawater in 2019 was 11,354.2 thousand m³.

Wastewater disposal to sea:

- treated in compliance with water treatment standards wastewaters (i.e., process, household, cooling) discharge from the platform amounted to 11,355.5 thousand m³.

2.3 Air emissions

The data presented herein are in compliance with State Statistical Report form 2-TP (air) by Exxon Neftegas Limited, for 2019.

Flared gas

In general, the flaring level for the Sakhalin-1 Project in 2019 was 1.2%.

Air emissions

In 2019, actual emissions of the substances and total emissions as a whole at all the company facilities did not exceed permitted concentration emissions.

Reduction in air emissions between 2014 and 2019 relative to oil and gas production (as shown in the Attachment 1 to this report) is attributable to the systematic efforts by ENL to minimize emissions through use of effective equipment and purchase of new equipment in compliance with modern environmental standards.

2.4 Oil/Products Spills Prevention

Oil/Products Spills

In 2019, there were no oil, condensate and oil products spills at the Sakhalin-1 project facilities as a result of accidents and ruptures.

The main reasons for the leaks of oil and petroleum products such as hydraulic fluids, lubricating oils, diesel fuel are the results of the occasional failure of some parts of mechanical equipment and motor vehicles used in production activities at the Sakhalin-1 Project sites. ENL specialists working at the facilities took the necessary actions in each specific case to respond to the incidents in a timely manner. The consequences of the leakage are eliminated immediately.

The Orlan and Berkut fixed offshore platforms for the Sakhalin-1 Project are equipped with an internal drain system operating in a closed loop. In the event of leakage of oil or oil products on any of the platform decks, all liquids are confined in the drain system, which keeps them out of the environment.

ENL has been developing and implementing procedures aimed at strengthening in-process monitoring, in particular:

- introduction of a system for testing equipment prior to and after the completion of work for wear and tear on hydraulic equipment and machinery;
- establishment of requirements for the mandatory availability of leak-proof drip trays to be placed under heavy equipment in parking spaces;

- stricter requirements for the motor vehicles of the contractors and subcontractors that provide services for the delivery of materials and equipment to the Sakhalin-1 Project sites.

ENL continues to work with the contractors and subcontractors that provide services for Sakhalin-1 Project facilities. The contractors and subcontractors are sent regular notifications requiring them to take all the measures required to prevent spills and leaks of oil and oil products during production activities. ENL considers the prevention of spills and leaks of oil and oil products not only a priority but also a necessary work standard.

In case of oil and petroleum products leaks, a written report is prepared, and an investigation and analysis of the causes is conducted.

Sakhalin-1 Corporate oil spill response (OSR) plan

The ENL Corporate OSR Plan covers all spills of oil products that may occur at Sakhalin-1 Project oil production and export facilities located on the offshore shelf of Sakhalin Island, on Sakhalin Island, and in Tatar Strait, as well as in the continental area of Khabarovsk Krai, including:

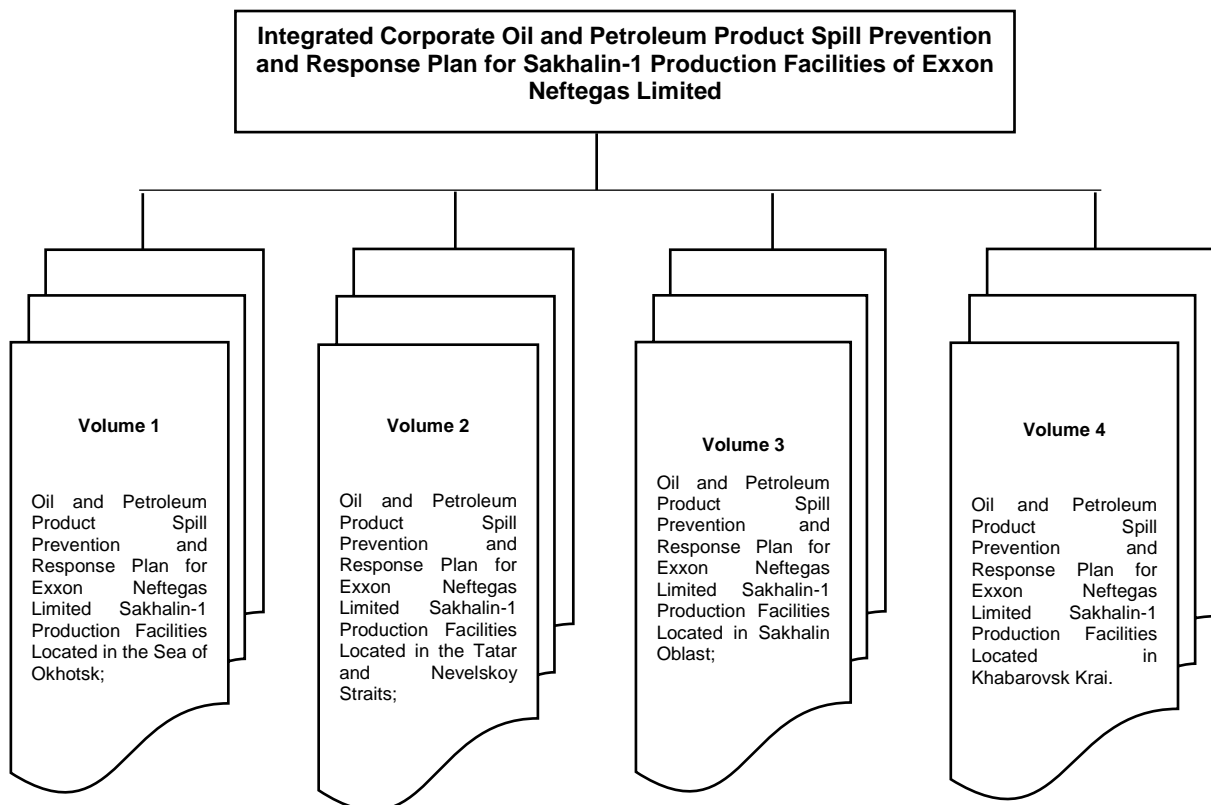
- ◆ the waters of the Sea of Okhotsk;
- ◆ coastal areas, including Piltun Bay and Chayvo Bay on the northeast coast of Sakhalin Island;
- ◆ land areas along the route of the main pipeline and flowlines in the northern part of Sakhalin Island;
- ◆ the Tatar Strait and Nevelskoy Strait, including the west coast of Sakhalin Island and coastal areas of Khabarovsk Krai.

The purpose of the Oil Spill Response Plan is to target actions for oil spill and oil product spill prevention and response. Such planning is intended to ensure timely and effective measures to mitigate the consequences of spills, to maintain emergency response manpower and resources in a state of constant readiness, to ensure the safety and protection of human beings and the environment, and to minimize potential damage to the environment and production facilities and losses in the event of oil or oil products spills.

The plan includes methods, rules, recommendations, and supporting information to allow ENL to:

- ◆ initiate timely and effective response to oil and oil product spills in compliance with the laws of the Russian Federation using manpower and resources of the company, contractors, and government organizations;
- ◆ develop procedures for initial emergency response in the event of the most likely scenarios of a Tier 1 oil or oil product spill;
- ◆ together with the Ministry of Emergencies of the Russian Federation (RF MChS), organize and coordinate general response to Tier 2 and 3 oil and oil product spills.

The structure of the Integrated Corporate Oil and Petroleum Product Spill Prevention and Response Plan is presented below:



OSR plans for production facilities located on the continental shelf of the Russian Federation and in inland sea waters, territorial waters, and the contiguous zone of the Russian Federation were developed in compliance with the following laws of the Russian Federation:

- Government Resolution No. 1189 of November 14, 2014, "On the Organization of Oil Spill Prevention and Response on the Continental Shelf of the Russian Federation and in Inland Sea Waters, Territorial Waters, and the Contiguous Zone of the Russian Federation";
- Federal Law No. 174-FZ of November 23, 1995, *On Environmental Expert Reviews* for the OSR plans of production facilities on the continental shelf of the Russian Federation and in territorial waters and inland seas;
- "Regulation on the assessment of the impact of planned economic and other activities on the environment in the Russian Federation", approved by the Order of the State Committee for Environmental Protection No. 372 of May 16, 2000.

The Integrated Corporate Oil and Petroleum Product Spill Prevention and Response Plan for Sakhalin-1 Production Facilities of Exxon Neftegas Limited under the Sakhalin-1 Project received a positive State Environmental Expert Review (SEER) conclusion approved by the Federal Service for Supervision of the Management of Natural Resources Directorate for the Far East Federal District.

The OSR plan was approved on the basis of the positive SEER finding and in accordance with the requirements of Federal Law No. 155-FZ of July 31, 1998, *On the Inland Seas, Territorial Waters, and Contiguous Zone of the Russian Federation*, and Federal Law No. 187-FZ of November, 30 1995, *On the Continental Shelf of the Russian Federation*.

The content and components of OSR plans for offshore facilities comply with the requirements specified in Government Resolution No. 1189 of November 14, 2014 "On the organization of prevention and liquidation of oil and oil products spills on the continental shelf of the Russian

Federation, in internal sea waters, in the territorial sea and the adjacent zone of the Russian Federation" ..

General Procedure for Endorsement and Approval of OSR plans for Sakhalin-1 Project Facilities in Offshore Waters



Development and approval of the OSR plans for production facilities in the Russian Federation were accomplished in compliance with the following:

- Government Resolution No. 240 of April 15, 2002, "On the Procedure for the Organization of Oil and Petroleum Products Spill Prevention and Response in the Russian Federation";
- Government Resolution No. 613 of August 21, 2004, "On Urgent Measures for Oil and Petroleum Products Spill Prevention and Response";
- Order of the Ministry of Emergencies No. 621 of December 28, 2004, "On Approval of the Procedure for the Development and Approval of Plans for Oil and Petroleum Product Spill Prevention and Response in the Russian Federation."

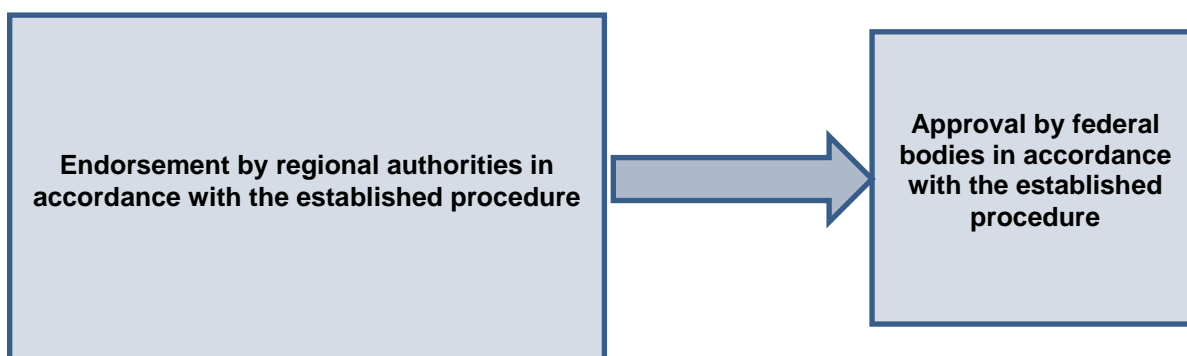
OSR Plans for production facilities in the Russian Federation were endorsed by the RF MChS Central Directorates for Sakhalin Oblast and Khabarovsk Krai, the RF MChS Far East Regional Center, the territorial departments of Rostekhnadzor, and executive bodies of Sakhalin Oblast and Khabarovsk Krai and approved by the Russian Federation Ministry of Energy the Russian Federation Ministry of Emergencies.

The Integrated Corporate Oil and Petroleum Product Spill Prevention and Response Plan for Sakhalin-1 Production Facilities of Exxon Neftegas Limited was endorsed and approved by three federal and seven regional executive bodies of the Russian Federation.

The OSR Plan was enacted by ENL Order.

The content and components of OSR plans for production facilities in the Russian Federation comply with the requirements specified in RF MChS Order No. 621 of December 28, 2004.

General Procedure for Endorsement and Approval of OSR Plans for Sakhalin-1 Project Facilities in Sakhalin Oblast and Khabarovsk Krai



2.5 Purchases of emergencies response equipment (OSR, fire protection and rescue equipment) in 2019

In 2019, ENL purchased the following OSR equipment:

- ◆ at Odoptu NWS: fire fighter truck Kamaz ATs-8,0-70(43118);
- ◆ at Chayvo OPF: drop-side truck Kamaz 659100 with a loader crane for OSR equipment transportation to the emergency site;
- ◆ at De-Kastri: drop-side truck Kamaz 43118 with a loader crane for OSR equipment transportation to the emergency site;
- ◆ at De-Kastri: 2 Yamaha snowmobiles;
- ◆ at De-Kastri: CAT battery forklift for emergency equipment handling;
- ◆ at Berkut OP: totally enclosed rescue boat CA6000;
- ◆ at Chayvo OPF: various type fire hoses – 185 items, various type fire extinguishers – 1560 items.

ENL acquires OSR equipment, which is characterized by its reliability and the possibility of using it under the climate conditions typical of northeastern Sakhalin Island, from the world's largest equipment developers, such as Vikoma International Ltd., Lamor, and Desmi.

2.6 Expenditures for Environmental Activities

Each Sakhalin-1 Project facility includes numerous environmental protection measures and equipment as part of the design solutions and implementation activities. Design solutions include the use of the latest environmental protection equipment and most environmentally friendly technologies. The table below shows ENL expenditures on environment protection in 2019.

Category	Environmental CAPEX (k RUR)	OPEX (k RUR)
Repair and rehabilitation operations along oil and gas pipeline routes	0	121,165
Water bodies protection	31,582	21,255
Air protection	0	550,110

Waste management	107,532	320,174
Gray whale surveys	357,854	67,322
Monitoring birds populations registered in the RF Red Book	0	11,690
Environmental and in-process compliance monitoring	6,056	151,842
Environmental Engineering Surveys	4,663	0
Oil spill response activities	48,609	400 406,00
TOTAL	556,296	1 705, 916
	2 262,212	

2.7 Natural Resource Use Charges

The Russian Federation Law and the Sakhalin-1 Production Sharing Agreement provide for charges for land, forest, and water use related to project facilities. The 2019 payments in this category are listed in the table below. There were no overruns for the negative impact on the environment.

Natural Resource Use Charges in 2019	k RUR
Land use (leases)	34 136,42
Subsoil use fees	2,70
Tax on extraction of common mineral resources	568,51
Water tax	937, 85
Water use fees	977,34
Total	36 622,82

3. KEY ENVIRONMENTAL PROTECTION AND ENVIRONMENTAL MONITORING PROGRAMS

3.1 Pipeline ROW Repair and Maintenance in 2019

The total length of the Sakhalin-1 project pipelines is 378.9 km.

Exxon Neftegas Limited does not operate pipelines beyond the design life specified in the design decisions.

The length of pipelines and commissioning dates

Name	Length km	Operating permit date
Trunk oil pipeline Chayvo OPF – De-Kastri OET	225.8	06 June 2005 05 October 2005
Chayvo OPF - Boatasino gas line	16.7	31 March 2005
De-Kastri gas line	3.7	03 July 2006
Orlan Platform – Chayvo OPF flowline	19.8	03 June 2005

Odoptu-2 WS (North) – Chayvo OPF flowline	79.0	08 July 2011
Berkut Platform – Chayvo WS full wellstream line	25.1	08 August 2012
Odoptu-1 WS (South) – Odoptu-2 WS 2 (North) flowline	8.8	13 May 2016

In 2019, maintenance and repair activities were carried out on the following “Sakhalin-1” Project pipelines: Odoptu-2 WS (North) – Chayvo OPF flowline, Chayvo OPF – De-Kastri OET main oil pipeline, Chayvo OPF – Chayvo WS flowlines site. These activities involved:

- Eliminating soil erosion sites and constructing engineered protective structures;
- Refurbishing /strengthening oil/gas pipeline motor road crossings ;
- Replacing block valve stations fencing;
- Re-establishing the natural vegetation;
- Cutting trees and shrubs;
- Restoring the pipeline burial depth, eliminating subsidence and washouts, constructing water erosion protection facilities at water body crossings;
- Repairing and restoring signs (air navigation, information, road signs) within the pipeline right-of-ways.

Throughout the year, every 15 days, visual observations of the pipeline routes were conducted using drones to assess the technical condition of the route corridor, assess the effectiveness of engineering protection facilities, and identify any exogenous processes in a timely manner.

3.2 Environmental and In-Process Monitoring in 2019

The environmental and in-process monitoring implemented in 2019 at ENL construction and operating sites included the types of operations listed below:

Monitoring of stationary air emission sources at:

- ◆ Chayvo Onshore Processing Facility (OPF)
- ◆ Chayvo (Chayvo WS) well site;
- ◆ De-Kastri Oil Export Terminal (OET);
- ◆ Orlan Offshore Platform (Orlan OP);
- ◆ Berkut Fixed Offshore Platform (Berkut OP);
- ◆ Odoptu Wellsite 2 (North) (Odoptu NWS);
- ◆ Olympia housing complex;
- ◆ Grounds of ENL head office in Yuzhno-Sakhalinsk;
- ◆ Common mineral quarries.

Air quality monitoring at:

- ◆ Chayvo OPF;
- ◆ Chayvo WS;
- ◆ De-Kastri OET;
- ◆ Odoptu-2 WS (North);
- ◆ Orlan offshore platform;
- ◆ Grounds of ENL head office in Yuzhno-Sakhalinsk
- ◆ Olympia housing complex;

- ◆ Chayvo OPF Temporary Waste Storage Area (TWSA)
- ◆ De-Kastri Oil Terminal TWSA;
- ◆ De-Kastri Oil Terminal industrial and household waste landfill;
- ◆ Odoptu Wellsite 2 (North) TWSA;
- ◆ 3a-ENL and 4-ENL quarries.

Potable water quality monitoring at:

- ◆ Chayvo OPF;
- ◆ Orlan offshore platform;
- ◆ Berkut FOP
- ◆ De-Kastri OET;
- ◆ Odoptu-2 WS (North);
- ◆ Olympia residential complex;
- ◆ ENL head office.

Household wastewater quality monitoring at:

- ◆ Chayvo OPF;
- ◆ Chayvo WS;
- ◆ Orlan offshore platform;
- ◆ Berkut FOP;
- ◆ De-Kastri OET;
- ◆ Olympia residential complex;
- ◆ ENL head office;
- ◆ Odoptu WS 2 (North);
- ◆ residential camp Nogliki.

Monitoring of wastewater/produced water quality for injection at:

- ◆ Chayvo OPF;
- ◆ Orlan offshore platform;
- ◆ Odoptu-2 (North) WS.

Groundwater level and quality monitoring at:

- ◆ Chayvo WS;
- ◆ Chayvo OPF;
- ◆ De-Kastri OET;
- ◆ Odoptu-2 WS (North);
- ◆ Odoptu-1 WS (Odoptu SWS) area borrow pits;
- ◆ Chayvo OPF – De-Kastri OET main pipeline route.

Surface stream hydrology and morphology monitoring:

- ◆ Chayvo Onshore Processing Facility (OPF) – De-Kastri Oil Export Terminal (OET) Main Oil Pipeline (Sakhalin Oblast). Hydrological survey performed at 5 water crossings: Belaush stream, Evay river (main bed), Tuksyu river, Yuktalin river, Khunmakta river;
- ◆ Chayvo Onshore Processing Facility (OPF) – De-Kastri Oil Export Terminal (OET) Main Oil Pipeline (Khabarovsk Krai). Hydrological survey performed at 5 water crossings: Berezovy stream, Chernaya river, Suschevsky Klyuch river, Kadi river, Kizhuch stream, Tatarka river;
- ◆ Odoptu-2 WS – Chayvo OPF flowline (with FOC – fiber-optic cable line). Works performed at 5 water crossings: Mukhto river, Piltun river, Ossoy river, Nutovo river, Maly Garomay river;

- ◆ Bezymyanny stream at the flowline crossing sites at the section between Chayvo WS and Chayvo OPF.

Seawater quality monitoring in:

- ◆ Chikhachev Bay, near the treated wastewater outlet (for production water and surface runoff);
- ◆ Piltun Bay, near the Odoptu-2 WS - Chayvo OPF flowline
- ◆ Sea of Okhotsk, near Orlan platform;
- ◆ Sea of Okhotsk, near the area of treated water discharge from combined outlet No. 1 of the Berkut FOP;
- ◆ Sea of Okhotsk, near the site of abandoned well Dagi 7-2 and suspended well Dagi-15.

Monitoring of water protection zones in:

- ◆ Chikhachev Bay, at the De-Kastri OET site;
- ◆ Piltun Bay, near underwater repair site of Odoptu-2 WS - Chayvo OPF flowline;
- ◆ Peschanoye lake;
- ◆ Unnamed lake (No. 4);
- ◆ Unnamed lake (No. 9);
- ◆ Unnamed lake (No. 10).

Monitoring of marine life and bottom sediments in:

- ◆ Piltun Bay, along the Odoptu-2 WS – Chayvo OPF underwater flowline crossing route;
- ◆ in the area of marine production facilities: Orlan OP, Orlan OP – Chayvo WS pipeline, pipeline across the Tatar Strait, Pipeline and single-point mooring (SPM) in the Chikhacheva Bay

Monitoring of vegetation communities:

- ◆ Odoptu-1 (South) WS;
- ◆ Odoptu-2 (North) WS;

Topsoil monitoring at:

- ◆ Chayvo OPF TWSA;
- ◆ De-Kastri OET TWSA;
- ◆ De-Kastri OET industrial and household waste disposal facility area;
- ◆ Odoptu-2 (North) NWS TWSA;
- ◆ Odoptu-1 WS (South) construction site, including flowlines and engineering utilities;
- ◆ Construction site 3a-ENL and 4-ENL quarries;
- ◆ Olympia housing complex site;

Geotechnical monitoring:

- ◆ Odoptu-2 WS (North) – Chayvo OPF Flowline;
- ◆ Odoptu-1 WS (South) – Odoptu-2 (North) Flowline;
- ◆ Orlan OP – Chayvo OPF flowline system, including
 - Full well stream flowline,
 - Gas reinjection flowline;

- ◆ Chayvo Flowlines, including:
 - Gas re-injection flowline Chayvo OPF – Orlan OP,
 - Full well stream flowline Orlan OP – Chayvo OPF.
- ◆ Arkutun-Dagi flowline system, including:
 - Chayvo OPF – Berkut MDP produced water flowline, FOC (fiber-optic cable line),
 - Berkut MDP – Chayvo WS Full well stream flowline;
- ◆ Chayvo OPF – De-Kastri OET main oil pipeline;
- ◆ De-Kastri fuel gas line;
- ◆ Chayvo OPF – Boatasino main gas pipeline.
- ◆ Chayvo OPF;
- ◆ Chayvo WS;
- ◆ De-Kastri OET;
- ◆ Odoptu-2 (North) WS;
- ◆ WS Construction site for Odoptu-1 (South) including flowlines and engineering utilities;
- ◆ Underwater slope and the onshore plot after dismantling the TOF in Piltun Bay;
- ◆ Landfall area of Odoptu NWS – Chayvo OPF Flowline underwater crossing of Piltun Bay;
- ◆ Pipeline landfall area near Chayvo WS;
- ◆ Pipeline landfall area at the Nevelskoy Strait exit, near Uangy Cape.

Geodynamic (seismic and geo-deformation) monitoring

- ◆ Seismic activity monitoring;
- ◆ Geo-deformation monitoring at points where the oil export pipeline crosses active faults (Garomay and Central Sakhalin Faults).

Monitoring of physical impact factors at:

- ◆ Orlan OP;
- ◆ Berkut OP;
- ◆ Chayvo OPF;
- ◆ Chayvo WS;
- ◆ De-Kastri OET;
- ◆ Odoptu-2 WS (North);
- ◆ ENL head office;
- ◆ Olympia residential complex.

3.3 2019 Environmental and In-Process Monitoring Results

Monitoring of stationary air emission sources

Monitoring of air emissions from the stationary sources at all Sakhalin-1 production facilities, camp and office blocks did not indicate any excess of maximum permissible emission standards with respect to the monitored parameters; compliance with the standards was made possible by timely equipment maintenance, use of high-quality fuel, and normal operating conditions

Air quality monitoring

The measured pollutant concentrations in all Sakhalin-1 facilities in most cases did not exceed the standard limits for residential and workplace air quality.

Potable water quality monitoring

Water samples for all parameters for the monitoring period conformed to GN 2.1.5.1315-03 Maximum Permissible Concentrations (MPC) of Chemicals in Domestic Water Supply and Recreational Water Bodies and SanPiN 2.1.4.1074-1 "Potable Water. Hygienic requirements to water quality in centralized drinking water supply systems. Quality Control".

Monitoring of Household Wastewater Quality

Monitoring of household wastewater quality at the intakes and outlets of treatment facilities allows ENL to monitor process efficiency and perform timely process adjustments to achieve the prescribed water quality standards for discharge into water bodies.

Injected Wastewater Quality Monitoring

Pursuant to the Field Development Plan, formation water produced from flow stream via separation at the Chayvo OPF and Odoptu-2 (North) WS is injected into dedicated wells along with treated production and combined waste water with consistent monitoring of all injection parameters. Produced water treatment system is intended to remove oil from water.

Such formation and waste water injection method has no impact on the condition of surface ecosystems (soils, surface and ground waters), and therefore constitutes an important environmental protection measure.

At the Orlan platform, household wastewater is passed through an electric dissociative treatment system in a wastewater treatment facility and is then injected from the storage tank into the disposal well. No wastewater is discharged into water bodies.

Groundwater Level and Quality Monitoring

Natural factors play a primary role in determining groundwater levels. Variations of groundwater levels throughout the observation period at all facilities have not exceeded natural seasonal variations. Groundwater quality analysis results remained stable by comparison with previous years of monitoring.

Hydrological, Morphological, and Hydrochemical Monitoring of Surface Streams

Hydrochemical monitoring of Peschanoye and unnamed lakes (№4), (№9) u (№10) in the northern part of the Chayvo Spit

The water body monitoring was performed during restoring, strengthening, and erosion prevention of the backfill layer of the Chayvo and Arkutun-Dagi flowlines at the lake crossings. Water samples for hydrochemical analysis were taken prior to, during, and after work execution at each lake, in the middle of the water use section at the pipeline axis. The water quality indicators are generally consistent with the MPC standards for fishery water bodies. After the work completion, all the analyzed water quality indicators were consistent with the MPC standards, which testifies the efficiency of water protection measures.

Hydrological, Morphological Monitoring of Flowline Water Crossings

2019 hydrological and morphological monitoring was performed during the summer steady low water level period in order to evaluate the condition of water way crossings and observe the river bed evolution within the pipeline route corridor affecting the pipeline system condition.

In all the surveyed waterways, the basic hydrological characteristics (flow rate, velocity, and width) were consistent with the typical mean indicators for the steady low water level period.

The water crossing condition is stable satisfactory. The bed of most waterways within the route corridor and at the adjacent reaches is stable with no bed deformations within the corridor or at the adjacent unhampered reaches. The observed detachments of the shore slopes at some crossings are driven by natural waterway behavior conditions and pose no hazard for accident-free operation of the pipeline system.

Monitoring of seawater quality

Chikhachev Bay. Treated wastewater (process and surface water) discharge area.

During the reporting period, sampling was performed before and after discharges. Laboratory test results confirm that the wastewater discharges had no effect on seawater composition and properties in the monitored aquatic area.

Piltun Bay. The Odoptu-2 WS – Chayvo OPF Flowline Area

Within the reporting period, seawater sampling was performed upon completion of repair operations for installation of weld unions at the underwater crossing of Piltun Bay by the existing and operating Odoptu NWS – Chayvo OPF pipeline.

Laboratory analyses of seawater samples from pipeline repair operations demonstrates water quality indicator results are in line with the MPC standards for fishery water bodies and with the background values characteristic of that water body.

Water area of the Sea of Okhotsk near Orlan Platform

Environmental monitoring of the seawater quality in the vicinity of Orlan platform was performed in June, August and September 2019.

Pollutant content in the seawater did not exceed the standard maximum permissible values for fishery water bodies established by Order #552 of 13 December 2016 “On Approval of Water Quality Standards for Fishery Water Bodies including the Standard Maximum Permissible Concentrations of Hazardous Substances in the Fishery Water Bodies”.

The observations did not detect any oil slicks on the water surface.

The Area of the Sea of near Berkut OP

Environmental monitoring of the seawater quality in the vicinity of Berkut platform was performed in June, August and October 2019 to evaluate the impact of the discharge of the treated effluents.

Overall, the controlled indicator values of contaminant concentrations in the seawater did not exceed the standard maximum permissible values for fishery water bodies established by Order #552 of 13 December 2016 “On Approval of Water Quality Standards for Fishery Water Bodies including the Standard Maximum Permissible Concentrations of Hazardous Substances in the Fishery Water Bodies”.

The observations did not detect any oil slicks on the water surface.

Okhotsk Sea Area near Abandoned Well Dagi 7-2 and Suspended Well Dagi-15

Marine environment monitoring in the area of abandoned well Dagi 7-2 and suspended well Dagi-15 in the basin of north-western shelf of Sakhalin Island was performed in August 2019. Visual observations of the well area detected no oil contamination of the water area.

Concentration of petroleum hydrocarbons in seawater samples analyzed did not exceed the MPC for fishery water bodies established by Order # 552 of 13 December 2016 “On Approval of Water Quality Standards for Fishery Water Bodies including the Standard Maximum Permissible Concentrations of Hazardous Substances in the Fishery Water Bodies”.

Monitoring of Water Protection Zones (WPZ)

Chikhachev Bay. De-Kastri OET Area

Visual monitoring at ENL land plot adjacent to the De-Kastri OET was conducted in the Chikhachev Bay water protection zone. Monitoring showed no changes in the size of the areas overgrown with grass, shrubs, trees, and tree and shrub vegetation as compared to the findings of monitoring conducted in previous years. No erosion processes were detected.

Piltun Bay. Site of Repairs of an Underwater Section of the Odoptu NWS – Chayvo OPF Flowline

The 2019 monitoring focused on ENL land plot located within the Piltun Bay water protection zone. The monitoring included erosion process observations, measurements of meadowed areas, shrub areas, forest areas, and tree-and-shrub areas. No erosion processes within the facility water protection zone were identified. The meadowed areas, as well as forest and tree-and-shrub areas were unchanged vs. the previous observation period.

Peschanoye and unnamed lakes (№4), (№9) u (№10) in the northern part of the Chayvo Spit

The monitoring of the Chayvo Spit water protection zones within ENL land plots was conducted upon work completion at the water use sites in the snow-free season. All control parameters within the water protection zone were measured. No visible erosion processes were detected at any site.

Monitoring of Marine Biota and Bottom Sediments

In Piltun Bay along the Subsea Flowline Crossing Route

Marine biota condition monitoring was performed with view to control recovery of benthic communities and herring and capelin spawning grounds (if any) within the pipeline route area.

The microphytobenthos species composition in Piltun Bay was practically the same as in previous years. The number of species in water samples varies from 5 to 8 depending mainly on the sampling period and environmental conditions, such as light and temperature regime, water transparency, currents. *Zostera japonica*, *Zostera marina* and *Ruppia occidentalis* account for the bulk of the aquatic vegetation in the Piltun Bay. The total phytomass (stocks) of aquatic vegetation along the pipeline route in 2019 was 1340t, on increase compared to the earlier monitoring stages. The monitored area in the Piltun Bay displays annual growth of macrophytes, increase in the projective cover area, and growth of macrophytes occurrence frequency at the stations where they were not observed before.

Thus, zoobenthos and macrophytobenthos communities in the Piltun Bay are stable.

In the area of offshore production facilities: Orlan OP, Orlan OP – Chayvo WS pipeline, Berkut OP, Berkut OP – Chayvo WS pipeline, pipeline across the Tatar Straight, pipeline and Single Point Mooring (SPM) in the Chikhachev Bay.

Monitoring of marine biota and bottom sediments at ENL offshore production facilities in 2019 demonstrated the absence of bottom sediments contamination.

The content of oil hydrocarbons in bottom sediments was minimal, metal contents in bottom sediments were below quality limits and by far below the initial concentrations affecting benthic organisms. In terms of biological contamination level, the bottom sediments are rated as clean.

No impact of offshore technical facilities on marine biota was recorded. Plankton communities evolution was consistent with the hydrological conditions prevailing in 2019. Ichthyoplankton localization was directly related to the plankton species characteristics. Changes in macrozoobenthos were driven primarily by hydrological conditions and hydrodynamic regime of the water areas. Distribution of benthic groups displayed allocation to specific depths. Restoration of background benthic values was observed.

Monitoring of plant communities

Results of flora monitoring in the Odoptu SWS and Odoptu NWS area show that in the reporting year no significant changes in specific and cenotic vegetation characteristics on monitoring areas have occurred.

No rare plant species recorded in the Red Books have been identified. Vegetation on trial areas had no visible signs of human impact.

Topsoil monitoring

The chemical, microbiological, and parasitological indices of soil samples analyzed from project operating facilities, including Odoptu-2 (NWS) TWSA, Chayvo OPF, Olympia housing complex site, De-Kastri landfill, Odoptu-1 (South) WS, 3a-ENL and 4-ENL quarries comply with soil quality standards.

By results of visual inspection in the Odoptu-1 (South) WS area, there was no infringement on land allocation boundaries, no oil impacted areas were identified, and no deviations from designed environmental solutions were found.

Geotechnical monitoring

Pipeline routes

A complete walk down inspection of all pipeline routes was carried out in 2019, with the following conclusions.

- ◆ identified exogenous processes have low potential for further development and do not represent a threat to safety of pipeline operation;
- ◆ the erosion cluster containment measures performed up to date have resulted in a significant minimization of major washout development.

Site facilities

There are erosion areas at the project site operation facilities (Chayvo WS, Chayvo OPF, De-Kastri OET, Odoptu NWS).

Most of erosion areas have been rather stable for several monitoring stages. New erosion advancing areas have been identified and recommendations provided for reclamation activities to be performed.

The identified processes do not threaten no-failure operation of the production buildings and facilities.

The condition of many sites identified in the previous observation period has been stabilized due to the reclamation measures performed with the erosion clusters eliminated. Insignificant development of suffusion (sagging) processes were detected at all the sites; small areas are areas prone to waterlogging or seasonal flooding. Aeolian processes (deflation and sand deposits accumulation) were detected across all the territories of Chayvo WS, Chayvo OPF, Odoptu NWS, and Odoptu SWS production facilities; those are characteristic of the northern area of Sakhalin Island. The extent of caving, landslide and freeze-thaw processes is negligible and limited to small areas.

Odoptu NWS coastal zone lithodynamics

The studied coastal area is an active area in which the combination of meteorological, hydrological, and lithodynamic factors has a distinct effect on the underwater and above-water shore slope.

The 2019 pipeline route survey results as compared to the previous monitoring stages have demonstrated that sand relocation and accumulation conditions at the reference observation

stations are natural processes that require constant monitoring. There have been no significant changes affecting the safety of buildings and structures.

A Coast Area after Dismantling of the Temporary Offloading Facilities (TOF); Underwater Slope

In 2019, the monitoring of geological-engineering processes was performed in the area where the TOF was previously located, with view to assess the underwater slope and the onshore plot after the TOF was dismantled. Comparison with the previous period of observations revealed only minor changes on all reference points.

Pipeline landfall areas

Geotechnical processes were monitored to assess the changes in the shore and the underwater slope at the pipeline abutments:

- Odoptu NWS – Chayvo OPF pipeline underwater Piltun Bay crossing landfall area;
- Chayvo WS pipeline landfall area;
- Pipeline landfall area in Nevelskoy Strait near Uangy Cape

The 2019 monitoring results have demonstrated that the characteristics of the coastal zones remain generally stable.

Comparison of the 2018 vs 2019 underwater slope surveys has demonstrated relative stability of the underwater slope topography with bottom sediment accumulation in the waterline area.

Geodynamic (Seismic and Geo-Deformation) Monitoring

Geodynamic Monitoring

In 2019, high accuracy GPS measurements were conducted at locations where the pipeline crosses the Central Sakhalin and Garomay faults to identify and quantify deformations of geological environment caused by tectonic activity in the fault zones. During the 2006-2019 period, the geo-deformation monitoring revealed mostly unidirectional tectonic movements in the Central Sakhalin and Garomay fault zones.

No significant slips within the Central Sakhalin fault zone were observed in 2006-2019. In the Garomay fault zone, the right-lateral slip was measured at 1.3 mm/year.

Possible ground movements in the areas where the pipeline crosses the Garomay and Central Sakhalin faults as a result of local and remote earthquakes are negligible and have no effect on the slip rates of local grid stations.

Seismic Monitoring

The local and regional station network comprised 21 observation point during the reporting period. Between January 1 through December 31, 2019, 210 seismic events with the magnitude $M_L \geq 1.0$ were recorded. The spatial pattern of seismic activity distribution in the monitoring zone during the reported period is generally similar to patterns recorded during the previous survey periods.

The control and study of these areas is the primary objective of natural and man-induced seismic intensity monitoring with view to ensure seismic and environmental safety.

Physical Impact Factors Monitoring

Physical impact factors monitoring has demonstrated that the staff working conditions are generally optimal and allowable, classify as safe and do not exceed the established workplace hygienic standards.

3.4 Results of Monitoring Sakhalin Protected Species

Western Gray Whale Monitoring

In 2019, ENL with assistance of the specialists from the Institute of Marine Biology (IBM) of the Far East Branch of the Russian Academy of Sciences (DVO RAN), and Sakhalin State University continued the diagnostic monitoring of the Gray Whales and their habitats condition offshore northeast Sakhalin.

The surveys were conducted in accordance with programs approved by the relevant Russian Federation agencies. Office processing and analysis of the extensive field data obtained in 2019 is at present underway. Completion of the final reports is expected in the second quarter of 2020.

Preliminary data indicate that the status of the Sakhalin feeding grouping is stable. As in the previous years, the whales foraged in the two well-known feeding areas in the offshore waters of northeast Sakhalin Island from summer to fall. The photo ID catalog contains 297 whales (according to the 2018 data) and is continuously replenished. In 2018, 10 calves were registered.

The ENL Marine Mammal Protection Program has been updated and implemented successfully during the summer and fall marine and coastal operations. In 2019, not a single incident involving marine mammals was recorded.

Geophysical activities were performed at the Odoptu and Arkutun-Dagi field water areas in 2019. Marine Mammal Monitoring and Mitigation Plan was developed specifically for these activities. Due to the Plan implementation, not a single incident involving marine mammals was recorded during the geophysical activities.

The following types of monitoring were carried out: acoustic monitoring, observations of the distribution and behavior of gray whales, photo-identification work, as well as sampling of benthos. Based on the information collected, an analysis of the probability of success of the feeding season will be carried out, taking into account the impact of geophysical work using the method of estimating energy consumption by gray whales.

According to the results of the program implementation, there were no significant deviations in the behavior and distribution of whales that could indicate an anthropogenic impact on a population scale.

Due to the Plan implementation, not a single incident involving marine mammals was recorded during the geophysical activities.

Monitoring the status of bird populations registered in the Red Book of the Russian Federation and the Red Book of Sakhalin Oblast.

Monitoring of the Red Book bird populations and of colonial nesting, nomadic and migratory species in the area between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the 1km - 7 km stretch of the flowline route.

The ornithological monitoring conducted in 2019 nesting period within the monitored area # 1 (between Odoptu-2 (North) WS and Odoptu-1 (South) WS) did not identify any changes in distribution and abundance of the main monitored bird species and groups, caused by the activities related to Sakhalin-1 Project implementation.

In 2019, the status of the nesting groups of the Red Book species on the sea spit of Piltun Bay in the vicinity of Sakhalin-1 facilities was as follows:

- ◆ The Aleutian tern nesting density on the spit was 33.1 pairs per km²; the total abundance of the Aleutian terns nesting on the spit between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the area of 4.5 km² was estimated at 150 pairs.

On B. Vrangelvsky Island, the colony of the Aleutian tern consisted of 3428 pairs and on M. Vrangelvsky Island, of 371 pairs. This has been one of the highest colony abundance numbers for all the years of monitoring. Overall, the abundance of the nesting Aleutian terns within the monitored area and the Vrangel Islands nature reserve territory has been increasing in the last 9 years of observations.

- ◆ The Dunlin (Sakhalin subspecies) nesting density within the monitored area was 36.3 pairs per km². In 2019, the general distribution of the nesting pairs' density was typical for this territory. The condition of the nesting habitats of dunlin remained unchanged. Based on the pre-construction and 2011-2019 surveys data, the abundance of the nesting group of this species is stable.
- ◆ Other protected species (Red-necked (Northern) Phalarope, Black-tailed Godwit, long-toed stint, Ruff) continue to nest, in small numbers, within the monitored area. The rare species using the monitored area as a feeding territory (Steller's Sea eagle, White-tailed eagle, hobby) also did not change their hunting territories.
- ◆ The abundance of the colonial nesting species (common tern and black-headed gull) within the monitored area #1 was stable throughout the last 9 years. Their habitats were not disturbed during construction and operation of the project facilities.
- ◆ Distribution of background species of sea, dabbling, diving ducks, looms, grebes, and sandpipers remains typical for this region, their abundance numbers being stable.

Within the monitored zone, no increase of the degree of the direct impact of the activities related to operation of Sakhalin-1 Project's facilities was observed.

Monitoring of Steller's Sea Eagle Population in the North of Sakhalin Island

Steller's Sea eagle population was monitored in spring and summer periods at the Piltun and Chayvo Bays, in the lower reaches of their influent rivers, and at the western coast along the pipeline route at the Uanga river mouth. The population status analysis was performed separately at the potential impact area covering the 2km radius around the pipeline, OPF and WS boundaries, and at the reference area.

Analysis of multi-year Steller's Sea eagle monitoring data has provided for the conclusion that this indicator species population at NE Sakhalin has been gradually decreasing in the recent quarter-century. However, the trend within the Sakhalin-1 potential impact area appears more favorable than at the reference area. Both in 2019 and during the period since 2005, the population demographic rate within the Sakhalin-1 potential impact area has almost always been higher than at the reference area; thus, for example, productivity rate was twice higher in 2019. At present, the adverse impact is mainly driven by brown bears' predation, forage base degradation (humpback salmon school reduction), and increased recreational impact on the coastal area.

In order to stabilize the population, in 2019 additional measures were taken to protect nests from destruction by bears and to optimize the habitat structure, such measures aimed to increase the birds' hunting efficiency, and hence, enhance the nestlers' survival rate. 26 additional nesting tree protective devices (168 protective devices in total) and 12 new artificial roost sites (50 roost sites in total) were installed at the Kolembunch Peninsula adjacent to the Chayvo WS. In addition, 2 artificial nests were restored, which were built in the previous monitoring years. Most of the prospective nesting trees within the potential impact area were protected with steel belts to prevent animal climbing.

3.5 Compensation for Damage to Aquatic Biological Resources

In 2019, ENL continued funding of artificial reproduction of aquatic biological resources to compensate for the fishery damage caused by the economic activities in the Sakhalin Oblast and Khabarovsk Krai.

In Sakhalin Oblast, 2,889,494 of juvenile salmon fishes (including 130,581 silver salmon fishes) to the total cost of 11,764,145 roubles 44 kopecks were released into the Rybovodny Stream of Tym River, East Sakhalin.

In Khabarovsk Krai, 267 calico salmon species to the total cost of 2,002 roubles 50 kopecks were released into the Bridjan river water body of the Amur River basin.