SAKHALIN-1 PROJECT
REPORT OF ENVIRONMENTAL PROTECTION ACTIVITIES

EXXON NEFTEGAS LIMITED

2018
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Attachment: ENL’s SSHE performance results in 2014-2018
1. HEALTH, SAFETY, AND ENVIRONMENTAL PROTECTION IN 2018.

In 2018, 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;
- The Company started implementation of the Safe Choice program, embracing all those engaged in Sakhalin-1 activities, the Company employees and the contractors. The program focuses on the different aspects associated with decision-making and how to take 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 individual production sites. During the year, over 241 sessions were conducted, and 4496 people were trained. The training activities have continued into 2019 and will be conducted on a regular basis as the training program is required for all employees and contractors, including those new to the project.
- The 15th 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 2018 at ENL facilities, accidents or incidents, including oil and oil products spills affecting the population or the environment, were not recorded.

2. 2018 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 2018.

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

ENL’s waste management strategy is uploaded to: [www.sakhalin-1.ru](http://www.sakhalin-1.ru)

Realization of Waste Management Strategy in 2018

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 2018, 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 17.5% reduction of mercury waste generation in 2018 vs 2017. 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. Also, in 2018 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. Optimization of the separate waste collection conditions resulted in a 37% increase of the volumes of glassware waste directed for recycling from the company’s non-process facilities while the waste plastic bottles amount was reduced by 14%.

Overall, the share of the wastes handed over for recycling and reuse grew from 63.7% in 2017 to 68.7% in the reporting year of 2018.

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 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 Noglici landfill, in Khabarovsk Krai at its own landfill in the area of De-Kastri OET, and at the specialized Serebristy landfill of Zelyony Gorod CJSC in Krasnoyarsk. All landfills used for waste deposition for the “Sakhalin-1” project are registered in the State register of waste disposal facilities.
- 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 2018, ENL performed monitoring of the environmental conditions in the area of the Sakhalin-1 Project waste disposal facilities in accordance with 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 2018 showed that controlled parameters met the required environmental quality standards and there were no violations of mandatory requirements.

Main indicators in the field of waste management in 2018

On facilities constructed and operated under the “Sakhalin-1” project in the Sakhalin Region and Khabarovsk Krai in 2018, 2 263 287.9 tonnes of produced water, and of drilling, industrial and household waste were generated.

Total amount of generated waste included:
- Produced water;
- Drilling waste (pulp, drill cuttings);
- Sanitary wastewater from the Orlan OP;
- Sanitary wastewater from De-Kastri OET.

All sanitary wastewater from De-Kastri OET was transferred for neutralization to “Prometei” LLC. 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:
- Chayvo onshore license block;
- Chayvo offshore license block;
- A block within Arkutun-Dagi field;
- Onshore Odoptu-1 license.

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 and De-Kastri OET amount to 99.6% of the total amount of waste generated in 2018.

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 2018 amounted to 8 310.3 tons.

In 2018, 99.6% of the Hazard Class 1-5 waste generated and accumulated since 2017 was neutralized, buried and recycled (transferred for recycling and reuse) as described below.

Overall, in 2018, the level of recycling and reuse of industrial and household waste generated at the Company facilities reached 68.7%. 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.

The waste transferred to outside contractors for recycling and reuse amounted to 68.7% of total generated wastes and included: various batteries, waste oils and lubricants, tires, LED bulbs, stabilized sludge from biological treatment plants, plastic and polyethylene waste, cardboard, paper, ferrous and non-ferrous scrap metal, printer cartridges, machinery, ash, construction waste, food waste, plant waste from landscaping activities (care of lawns and flower beds) on the grounds of industrial facilities and company offices.

20.8% of the waste generated was processed by thermal treatment in the company’s own incinerators. The mercury-containing waste in the amount of 0.02% was transferred to the contractors and subcontractors organizations for disposal by means of specialized equipment.

Waste burial was carried out as follows:
- 8.4% of hazard classes 4 and 5 waste was disposed of at the specialized solid waste landfill of the Waste Management Agency JSC in Noglici settlement. The landfill is registered in the SRWDF state register of waste disposal sites;
- 1.1% 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;
- 0.004 % of the waste generated was disposed of at the specialized Serebristy landfill of Zelyony Gorod CJSC. The landfill is registered in the SRWDF state register of waste disposal sites;
0.5% of other process waste was injected into waste disposal areas of the licensed subsoil formations. Waste disposal facilities are recorded in the SRWDF.

**Summary Data of ENL Industrial and Domestic Waste Management in 2018**

<table>
<thead>
<tr>
<th>Waste management</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling and reuse</td>
<td>68.7%</td>
</tr>
<tr>
<td>Neutralization (incineration)</td>
<td>20.8%</td>
</tr>
<tr>
<td>Burial</td>
<td>10.1%</td>
</tr>
<tr>
<td>Total</td>
<td>99.6%</td>
</tr>
</tbody>
</table>

The diagram shows the percentage data of main industrial and household waste management methods for the whole “Sakhalin-1” project from 2006 through 2018.

### 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 2018. 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 2018, during facilities construction and operation under the Sakhalin-1 project, ENL carried out its water economic activities on the basis of ten Decisions and five 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 16,952.8 thousand m³. Total wastewater disposal volume was 16,568.3 thousand m³.

**Orlan Offshore Platform**

During the reporting year, the intake of seawater at Orlan platform was 26% of the limits established in Water Use Agreements and amounted to 4,844.2 thousand m³.

98% of the sea water used for direct-flow cooling was returned into the ecosystem after a single use.

**Wastewater disposal:**

- treated in compliance with water treatment standards wastewater from the desalination system was discharged to the sea in the amount of 93.8 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 87.7 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 49.1 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 15.1 thousand m³.

Wastewater disposal: sanitary wastewater in the volume of 11.5 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 72.4 thousand m³ then was released to the sea in accordance with permit conditions.

Odoptu 2 Well Site (Northern) (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 106.0 thousand m³

Household wastewater after treatment was disposed to leach fields in the volume of 103.5 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 2018 was 10 485.2 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 10 488.9 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 2018.

Flared gas

In general, the flaring level for the Sakhalin-1 Project in 2018 was 0.9%.

Air emissions (NO₂, SO₂, VOCs)

In 2018, actual emissions of the substances and total emissions as a whole at all platforms of the company did not exceed permitted concentration emissions.

<table>
<thead>
<tr>
<th>Sakhalin-1 operations sites</th>
<th>Permitted emission t/year</th>
<th>Actual emission t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nogliki District</td>
<td>23 049.9</td>
<td>4 178.2</td>
</tr>
<tr>
<td>Okha District</td>
<td>4 394.9</td>
<td>951.2</td>
</tr>
<tr>
<td>Khabarovsk Krai</td>
<td>4 093.8</td>
<td>2 659.5</td>
</tr>
<tr>
<td>Aniva District</td>
<td>9.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Yuzhno-Sakhalinsk</td>
<td>2.7</td>
<td>0.3</td>
</tr>
</tbody>
</table>

In 2018, equipment inventory was made and draft Maximum Permissible Emission (MPE) Standards for harmful substances were developed and approved, and the following new emission permits were issued for the facilities:

- Atmospheric Emission Permit for Facility: Berkut offshore platform, issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid form 01 Jan 2019 through 31 Dec 2025;
- Atmospheric Emission Permit for Facility: Chayvo Onshore Processing Facility (OPF) issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid from 17 July 2018 through 16 June 2025;
- Atmospheric Emission Permit for Facility: Chayvo Onshore Processing Facility (OPF), Drilling and Surface Infrastructure Development of Water Source Well for Formation Pressure Maintenance at Arktun-Dagi Field; issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid from 23 Nov 2018 through 22 Nov 2025;
- Atmospheric Emission Permit for Facility: Chayvo WS, issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid from 01 Jan 2019 through 31 Dec 2025;
- Atmospheric Emission Permit for Facility: Odoptu-2 (North) WS, issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid from 01 Jan 2019 through 31 Dec 2025;
- Atmospheric Emission Permit for Facility: Odoptu-1 (South) WS (Okha District), issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid from 01 Jan 2019 through 31 Dec 2025;
• Atmospheric Emission Permit for Facility: Orlan offshore platform, issued by Sakhalin Oblast Administration of Rosprirodnadzor, valid 01 Jan 2019 through 31 Dec 2025;
• Atmospheric Emission Permit for Facility: Fuel Gas Pipeline at De-Kastri (Khabarovsk Krai), issued by Rosprirodnadzor Department for Far Eastern Federal District, valid from 8 Aug 2015 through 15 Aug 2025;
• Atmospheric Emission Permit for Facility: De-Kastri Oil Export Terminal (Sokol Single Point Mooring, Industrial and Domestic Wastes Landfill) Ulchsky District of Khabarovsk Krai (operation period), issued by Rosprirodnadzor Department for Far Eastern Federal District, valid from 03 Dec 2018 through 02 Dec 2025.

Reduction in air emissions for SO₃, VOC, and NOₓ between 2014 and 2018 relative to oil and gas production is attributable to the systematic efforts by ENL to minimize emissions through effective equipment strategies and equipment changes as well as effective environmental management during the design of any new equipment.

2.4. Oil/Products Spills Prevention

Oil/Products Spills

In 2018, there were no oil, condensate and oil products spills at the Sakhalin-1 project facilities as a result of accidents and raptures.

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 the 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 process of development of the “Integrated Corporate Oil and Petroleum Product Spill Prevention and Response Plan for Sakhalin-1 Production Facilities of Exxon Neftegas Limited” (hereinafter, Integrated Corporate OSR Plan) was completed in 2016 in accordance with the requirements of current legislation in the field of oil spill emergency prevention and response.

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:


- "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 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

1. **Public hearings and endorsement by local administrations**
2. **State Environmental Expert Review (SEER)**
3. **Notification of regional and federal agencies in accordance with the established procedure**

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


OSR Plans for production facilities in the Russian Federation were endorsed by the RF MChS Central Directorates for Sakhalin Oblast and Khabarovsky Krai; the RF MChS Far East Regional Center, the territorial departments of Rostekhnadzor, and executive bodies of Sakhalin Oblast and Khabarovsky 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.
### 2.5 Purchases of emergencies response equipment (OSR, fire protection and rescue equipment) in 2018

In 2018, ENL purchased the following OSR equipment:
- Beech Protection Boons Lamor SFB 760/15 TC (30in/50ft) PVC ASTM Z (total 2025 m) and BSB550/10m (total 60 m);
- Snowmobiles BRP Lynx Yeti Army 600 e-tec for OSR reconnaissance (2 ea.).

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 2018.

#### Environment protection programs cost in 2018

<table>
<thead>
<tr>
<th>Category</th>
<th>Environmental CAPEX (k RUR)</th>
<th>OPEX (k RUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory/environmental technical personnel</td>
<td>33 142.57</td>
<td>74 329.27</td>
</tr>
<tr>
<td>Repair and rehabilitation operations along oil and gas pipeline routes</td>
<td>9 000.00</td>
<td>57 189.93</td>
</tr>
<tr>
<td>Water bodies protection</td>
<td>23 794.01</td>
<td>16 124.33</td>
</tr>
<tr>
<td>Air protection</td>
<td>0</td>
<td>250 322.00</td>
</tr>
<tr>
<td>Waste management</td>
<td>56 005.03</td>
<td>268 876.00</td>
</tr>
<tr>
<td>Gray whale surveys</td>
<td>1 469.30</td>
<td>90 508.12</td>
</tr>
<tr>
<td>Monitoring birds populations registered in the RF Red Book</td>
<td>4 301.44</td>
<td>8 990.13</td>
</tr>
<tr>
<td>Environmental and in-process compliance monitoring</td>
<td>3 884.00</td>
<td>126 757.45</td>
</tr>
<tr>
<td>Environmental Engineering Surveys</td>
<td>15 926.76</td>
<td></td>
</tr>
<tr>
<td>Oil spill response activities</td>
<td>50 383.19</td>
<td>400 406.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>197 906.30</td>
<td>1 293 503.23</td>
</tr>
<tr>
<td></td>
<td>1 491 409.53</td>
<td></td>
</tr>
</tbody>
</table>

### 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 2018 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 2018

<table>
<thead>
<tr>
<th>Natural Resource Use Charges in 2018</th>
<th>k RUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use (leases)</td>
<td>37 097.66</td>
</tr>
<tr>
<td>Subsoil use fees</td>
<td>1.27</td>
</tr>
<tr>
<td>Tax on extraction of common mineral resources</td>
<td>0.00.</td>
</tr>
<tr>
<td>Water tax</td>
<td>308.73</td>
</tr>
<tr>
<td>Water use fees</td>
<td>1 181.62</td>
</tr>
</tbody>
</table>
3. KEY ENVIRONMENTAL PROTECTION AND ENVIRONMENTAL MONITORING PROGRAMS

3.1 Pipeline ROW Repair and Maintenance in 2018

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Length km</th>
<th>Commissioning dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk oil pipeline Chayvo OPF – De-Kastri OET</td>
<td>225.8</td>
<td>06 June 2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>05 October 2005</td>
</tr>
<tr>
<td>Chayvo OPF - Botasino gas line</td>
<td>16.7</td>
<td>31 March 2005</td>
</tr>
<tr>
<td>De-Kastri gas line</td>
<td>3.7</td>
<td>03 July 2006</td>
</tr>
<tr>
<td>Orlan Platform – Chayvo OPF flowline</td>
<td>19.8</td>
<td>03 June 2005</td>
</tr>
<tr>
<td>Odoptu-2 WS (Northern) – Chayvo OPF flowline</td>
<td>79.0</td>
<td>08 July 2011</td>
</tr>
<tr>
<td>Berkut Platform – Chayvo WS full wellstream line</td>
<td>25.1</td>
<td>08 August 2012</td>
</tr>
<tr>
<td>Odoptu-1 WS (Southern) – Odoptu-2 WS 2 (Northern)</td>
<td>8.8</td>
<td>13 May 2016</td>
</tr>
</tbody>
</table>

In 2018, maintenance and repair activities were carried out on the following “Sakhalin-1” Project pipelines: Odoptu-2 WS (Northern) – Chayvo OPF flowline, Chayvo OPF - Botasino gas line, and Trunk oil pipeline Chayvo OPF – De-Kastri OET. 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 subsidences 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 2018

The environmental and in-process monitoring implemented in 2018 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.

Air quality monitoring at:
- Chayvo OPF;
- Chayvo WS;
- De-Kastri OET;
- Odoptu-2 WS (North);
- Odoptu-1 WS (South WS) construction site;
- Construction site of flowlines and engineering services;
- 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.

Potable water quality monitoring at:
- Chayvo OPF;
- Chayvo WS;
- 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.

Groundwater level monitoring:
- Chayvo OPF;
- De-Kastri OET;
- Odoptu-2 (North) WS;
- Along the ROW of trunk oil pipeline Chayvo OPF - De-Kastri OET.

Surface stream hydrology and morphology monitoring:
- A reach of Berezovy stream located 3.7 from the mouth in Nikolaevsky District of Khabarovsk Krai;
- A reach of the Kadi River located 44 km from the mouth, in Ulchsky District of Khabarovsk Krai.

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 plugged and abandoned wells Dagi 7-2 and 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;
- Berezovy steam and the Kadi River in Khabarovsk Krai.

Monitoring of marine life and bottom sediments in:
- Piltun Bay, along the underwater flowline crossing route;
- Piltun Bay, in the area of the TOF dismantling activities.

Monitoring of vegetation communities:
- Chayvo OPF;
- Chayvo WS;
- Odoptu-1 (South) WS;
- Odoptu-2 (North) WS;
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- De-Kastri OET.

**Topsoil monitoring at:**
- Chayvo OPF TWSA;
- De-Kastri OET TWSA;
- De-Kastri OET industrial and household waste disposal facility area;
- Odoptu NWS TWSA;
- Odoptu-1 WS (Southern WS) construction site;
- Construction site of flowlines and engineering services
- Olympia housing complex site);

**Geotechnical monitoring:**
- Odoptu-2 WS (North) - Chayvo OPF Flowline.
- Orlan - Chayvo Flowlines, including:
  - Gas re-injection flowline Chayvo OPF – Orlan OP,
  - Full well stream flowline Orlan OP – Chayvo OPF.
- Arkutun-Dagi field flowlines, including:
  - Produced water re-injection flowline Chayvo OPF – Berkut MDP,
  - Full well stream flowline Berkut MDP – Chayvo WS;
- Trunk oil pipeline Chayvo OPF – De-Kastri OET, section KP0-126
- Trunk oil pipeline Chayvo OPF - – De-Kastri OET, section KP145-226;
- Trunk gas pipeline Chayvo OPF – Boatasino.
- Chayvo OPF;
- Chayvo WS;
- De-Kastri OET;
- Odoptu NWS;
- Construction site for Odoptu SWS and 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’s underwater crossing of Piltun Bay;
- Temporary Offloading Facility (TOF) area in Piltun Bay;
- Pipeline abutment in the area of Chayvo WS;
- Landfall area of the Oil Export Pipeline crossing of Nevelskoy Strait at 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 NWS;
- Odoptu-2 WS (Northern);
- ENL head office;
- Olympia residential complex.

### 3.3 Summary of 2018 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, temporary waste storage sites and the industrial/domestic waste landfill 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.

**Quality monitoring of injected wastewater**
Produced water treatment system at Chayvo OPF is intended to remove oil from water. After the treatment cycles, water is pumped into the flushing drum to remove light hydrocarbons and then injected into the disposal well. During injection activities, injection parameters are continuously monitored.

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.
Monitoring of groundwater level and quality

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 stream

A reach of Berezyov stream located 3.7 from the mouth in Nikolaevsky District of Khabarovsk Krai

The water body observations were performed during restoring and increasing the backfill layer over the Chayvo OPF - De-Kastri OET trunk oil pipeline at its crossing Berezyov stream.

Water for hydrochemical analysis was sampled during the work activities at the stream reach. The results of the analysis of the water samples recovered at the station 20 m downstream from the crossing showed that all the water quality indicators were in line with the MPC standards for fishery water bodies, except the suspended substances. That resulted from the work that was being done in the streambed to protect it from washing out. The conformance of all the other indicators to the MPC standards testifies the efficiency of the water protection measures.

A reach of the Kadi River located 44 km from the mouth, in Ulchsky District of Khabarovsk Krai

The water body observations were performed during the work to restore the backfill at the Chayvo OPF - De-Kastri OET trunk oil pipeline section at the Kadi River crossing.

Hydrological and hydrochemical monitoring was performed during operations at stations 20 m upstream and 20 m downstream from the work site. Exceedence of the suspended substances MPC standard for fishery water bodies was observed at the downstream station. That resulted from the riverbed washing out protection operations being done directly in the riverbed. All the other indicators, including for diluted and emulsified oil and petroleum products, were below the MPC standards.

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 NWS – Chayvo OPF Flowline Area

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

According to the results of the laboratory analyses of the seawater sampled during the pipeline repair operations at the operations site, practically all the water quality indicators were in line with the MPC standards for fishery water bodies and with the background values characteristic of that water body.

Analyses of the seawater quality upon completion of the works also showed that all the analyzed parameters of the seawater quality conformed to the MPCs for fishery water bodies.

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 August and September 2018.

In August and September, the MPCs of contaminants 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 FOP.

Environmental monitoring of the seawater quality in the vicinity of Berkut platform was performed in August and October 2018 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 plugged and abandoned wells Dagi 7-2 and Dagi 15.

These works represented a continuation of the annual environmental monitoring and were performed in order to assess the environmental conditions in the area of plugged and abandoned wells according to the Program of monitoring of plugged and abandoned wells Dagi 7-2 and Dagi-15 in the basin of north-western shelf of Sakhalin Island for the period from 2012 through 2020.

Visual observations failed to detect any oil sheen in the area. Concentration of petroleum hydrocarbons in seawater samples analyzed did not exceed the MACs prescribed for fishery sites.

Monitoring of Water Protection Zones (WPZ)

Chikhachev Bay. De-Kastri OET Area

Visual monitoring in the De-Kastri OET area 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. The erosion process did not develop.

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

Based on the monitoring conducted in 2018, no ecosystem changes in the water protection zone and surrounding areas were identified. No visible erosion processes within the facility water protection zone were identified.

Berezyov stream and Kadi River in Khabarovsk Krai.
The monitoring of the water protection zones of Berezov Stream and Kadi River was performed within the ENL land plots adjacent to the water use sites. The area of the meadowed parts within the Berezov Stream water protection zone was 80% with the rest occupied by shrubbery. No visible erosion processes were identified.

**Monitoring of Marine Biota and Bottom Sediments**

**In Piltun Bay along the Route of the Underwater Crossing of the Flowline**

Only 22 species of the benthic hydrobionts were observed in 2018. The Polychaeta (4 species), Crustacea in general (5 species), Diptera larvae (5 species), and bivalve mollusks (3 species) were the most representative. The average benthos indices were: density – 787±80 ind./m², zoobenthos biomass – 49.2±5.5 g/m². The dominant species, as in the previous years, were bivalve mollusks Macoma balthica.

The microphytobenthos species composition in Piltun Bay was the same as in previous years. Zostera japonica, Zostera marina and Ruppia, the main benthos communities in the Bay account for the bulk of the underwater vegetation in the Piltun Bay. The total phytomass (stocks) of underwater vegetation on the pipeline route in 2018 was 999 t, and compared to the earlier monitoring stages remained at the same level (2017 – 1204 t; 2016 – 1024 t; 2015 – 979 t). Thus, zoobenthos and macrophytobenthos communities in the Piltun Bay are stable.

**In Piltun Bay in the Area of the TOF Dismantling Operations**

The microphytobenthos species composition in Piltun Bay after the TOF dismantling did not change vs the previous years. Zostera marina is the predominant underwater vegetation at the site. At the sampling time, the average unit biomass of Zostera marina across the study area was 396 g/m². Ruppia occidentalis and Cladophora opaca were rarely observed.

Zostera marina dominates the phyto-benthos community of Piltun Lagoon and on its condition the species diversity and abundance characteristics of the animals whose life cycle is associated with the sea grass thickets. After dismantling of the TOF sea grass thickets were observed at the locations where they had not been observed before.

**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. On certain monitored areas, increase in the number of plants species was observed.

The monitoring of vegetation communities at the sample plots near Chayvo OPF, Chayvo WS and De-Kastri OET showed that in the period since the previous monitoring, the vegetation cover at all the permanent sample plots had not been subjected to any substantial negative man-made impacts; no traces of fires, burns, bonfires, entries of machinery, dustiness, mechanical damage of plants, or presence of mechanical waste were detected.

**Topsoil monitoring**

The chemical, microbiological, and parasitological indices of soil samples analyzed from project operating facilities, including flowlines and utilities and the De-Kastri landfill, comply with soil quality standards.

By results of visual inspection in the area of construction of the Odoptu SWS, flowlines, and utilities, there was no infringement on land allocation boundaries, no oil impacted areas were identified, and no deviations from designed environmental solutions were found.

In all sampling points (including background ones) concentrations of petroleum products were considerably below the level specified for defining the level of lands pollution.

**Geotechnical monitoring**

**Pipeline routes**

A complete walk down inspection of all pipeline routes was carried out in June - August 2018, 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 previously reclaimed areas are in good, stable condition;
- The area of protective grass cover is from 60% to 100%;
- Further reclamation and engineering protection operations are scheduled for the summer of 2019.

**Site facilities**

The areas of exogenous processes at site operation facilities of the project (Chayvo WS, Chayvo OPF, De-Kastri OET, Odoptu NWS) are local and limited. The identified processes do not threaten the no-failure operation of the production buildings; however, in view of the anticipated future expansion local reclamation measures are being planned.

Insignificant development of suffusion (sagging) processes were detected at all the sites; small areas are 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 production facilities; those results from the geographical location and 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 2017 and 2018 surveys show that the coastal area in question 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 monitoring coverage along the length of the coastline revealed the general stabilization of the situation and reduction of the potential hazard of the coastal processes (in this case, abrasion erosion). These are natural phenomena and need the ongoing instrumental observation (monitoring) to timely identify and prevent their negative consequences that could affect the production activities at Odoptu-2 (North) WS.

**Construction of Odoptu-1 WS (Southern), flowlines and engineering services.**

At present, there are no sites of exogenous processes development representing danger to the facility and requiring execution of off-schedule restoration work. The condition of flowline corridor is assessed as satisfactory and stable.

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

In 2018, the monitoring of geological-engineering processes focused on the assessment of the underwater slope and the onshore plot after the TOF was dismantled. The underwater slope profiling in the TOF area revealed the shoaly character of in the seabed at the east part of Piltun Bay; the depths reach up to 5 m in the lagoon channel; then the relief goes up. The changes in the seabed topography result from the natural movement of the deposits caused by the wave phenomena.

**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**

There were no any substantial changes in the position of the coastal slope at pipeline abutment in the eastern and western coast of the Bay in 2017 - 2018. In 2018, at the eastern shore the position of the beach terrace edge changed insignificantly, in most cases receding towards the shore by 0.3 - 0.6 m. The beach zone characteristics of the western shore remained practically the same. Since 2017, there were slight changes in the seabed topography due to transformation (erosion) of the bottom sediments in the area of the east channel. Across almost entire west area the seabed became deeper. The changes in the east and west channel depths were due primarily to higher current speeds, which slightly altered the seabed topography.

**Chayvo WS pipeline landfall area**

The situation is stable along the entire revetment line. The installed bank protection functions effectively. The surface above the bank protection crest to the west from the bank protection to the Chayvo WS process zone boundary is good and stable. The areas adjoining the bank protection are covered with grass and sand; no exogenous processes that could affect the ground mass stability were identified. The erosion processes observed the previous year at the southern boundary of the work site have been found to slow down in 2018. No recent detached blocks along the crest of the shore slope were observed, those previously formed were covered with sand, which testifies of the absence of active erosion processes at this location. No additional bank protecting operations are required.

**Pipeline landfall area in Nevelskoy Strait near Uangy Cape**

In 2018, changes in the position of the terrace edge were noted along the entire surveyed area, mainly represented by the terrace receding towards the shore. At the reference observation stations in the northern part of the location under study. The recedence was 1.2 to 4 meters. The changes of the beach zone parameters were mostly reduction of its width. The topography of the underwater slope has been changing across the entire surveyed area: the depth of the underwater slope is shallower due to accumulation of sand deposits transported from the bank.

**Geodynamic (seismic and geo-deformation) monitoring**

In 2018, high accuracy GPS measurements were conducted at locations where the pipeline crosses the Central Sakhalin (6 stations) and Garomay (6 stations) faults In 2018, to identify and quantify deformations of geological environment caused by tectonic activity in the fault zones. During the 2006 -2018 period, the geo-deformation monitoring revealed mostly unidirectional tectonic movements in the Central Sakhalin and Garomay fault zones. Minor alternating movements with amplitudes up to 4-5 mm and a period of 10 years are observed in both grids along individual horizontal displacements. No significant slips within the Central Sakhalin fault zone were observed in 2006-2018. In the Garomay fault zone, the right-lateral slip was measured at 1.4mm/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. Between January 1 through December 31, 2018, 231 seismic events with the magnitude M, ≥ 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. Seismic activity within the previously identified zones, such as at the Chayvo, Nysh, and Argi-Pagi stations should be noted, as well as intensification of seismic activity away from the main monitoring region, at the Island’s west coast, and minor activity in the area of the onshore fields.

**3.4 Results of Monitoring Sakhalin Protected Species**

**Western gray whale monitoring**

In 2018, 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 2018 is at present underway. Completion of the final reports is expected in the second quarter of 2019.

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 283 whales The ENL Marine Mammal Protection Program has been updated and implemented successfully during the summer and fall marine and coastal operations. In 2018, not a single incident involving marine mammals was recorded.

In 2018, the International Union for Conservation of Nature leveled down the Gray Whale conservation status from critically endangered to endangered.

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

**Monitoring Surveys during the Fall Migration Period in the TOF Area (Northern Spit of Piltun Bay and the Adjacent Sea and Bay Water Area).**

The 2018 surveys constituted the final stage in the assessment of the impact of the TOF facilities on the nesting and migratory birds that started in 2014. The acquired data are the basis for the future production monitoring.

The 2018 summer and fall surveys yielded data on the abundance and distribution of waterfowl in the bay water area in the vicinity of the TOF, the waterfowl being the main group that could be affected by the disturbance during the future in migration gatherings.

The significance of the coastal zone of Piltun Bay in the area of the vessel routes for the migratory birds was assessed. The data on the abundance and distribution of sandpipers and gulls along the coastline was obtained. The importance of different locations along the sea coast and the adjoining sea area for the migratory birds was assessed, including their abundance and distribution at the stretch from Odoptu-2 WS to the Bay mouth.

The monitoring continued of the most important region in the construction zone - the region that includes Bolshoi Vrangelevsky Island (nature monument of regional significance "The Wrangel Islands") and the adjacent part of the sea spit with a lake system.

Data was acquired on the degree and distance of the impact of the technogenic factors on various bird groups within the monitoring zone near the TOF facilities. The disturbance impact distance did not exceed several dozen meters for sandpipers and seagulls, 200 - 400 m for diving-ducks, 400-700 m for dabbling duck gatherings of up to 1000 birds, and 1.2 km, for dabbling duck gatherings of over 1000 birds. The technological structures did not disturb birds and did not cause any changes in their distribution.

The reclaimed areas including the site of the dismantled TOF birth, do not affect the nesting, feeding and moving birds. After the natural recovery of the transformed habitats birds they will be able to use them for nesting, resting and feeding.

The areas of key importance - the reproduction locations of the Red Book birds - remain beyond the limits of the project’s impact zone. The nearest large colony of Aleutian tern is 2.5 km from the TOF, while the nesting habitats of Sakhalin’s dunlin are 4.5 km from the TOF. The abundance of the colonies varied due to the natural factors. No impact of the facilities under construction was found.

In 2018, the status of the nesting groups of the Red Book species on the Piltun Bay sea spit in the area of Sakhalin-1 Project facilities was as follows:

The Aleutian tern nesting density on the sea spit was 28.3 pairs per km²; the total abundance of terns nesting on the spit between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the area of 6 km² is estimated at 170 pairs. On the Bolshoi Vrangelevsky Island, the abundance of the Aleutian tern was 919 pairs; on the Mal Vrangelevsky Island, 63 pairs. The abundance is rather low; however, this resulted from the significant impact of predators (seagulls, bears) attracted to the spit by beached dead herring. Overall, the abundance of the nesting Aleutian terns within the monitored area and the adjacent territory has been increasing in the last 8 years of observations.

Dunlin (Sakhalin subspecies) nesting density within the monitored area was 27.6 pairs per km². The estimated total abundance of dunlins nesting on the sea spit between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the area of 5 km² is 138 pairs. 94 nest sites of this species were mapped within the 1 km zone of monitoring. In 2018, 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 - 2018 surveys data, the abundance of the nesting group of this species is stable.

Other protected species (Red-necked (Northern) Phalarope, Black-tailed Godwit, 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, etc.) 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 8 years. Their habitats were not disturbed during construction and operation of the project’s facilities.

The most abundant migratory protected species, the swans, retained their traditional flying routes and the feeding congregation locations the largest of which (27 000 birds in 2017) are located in 4 km to the north from the TOF. The swan migration routes in the TOF area did not change.

Transformation of heavy loads over the TOP - Odoptu-2 (North) WS in the previous years did not cause any impact on the nesting birds and migration gatherings of waterfowl. The concentration sites of migratory birds remained along the route. The main feeding habitats of the waterfowl, semiaquatic birds and waders were not disturbed during construction, operation, dismantling and reclamation of the TOF facilities.

Overall, no negative impact of the TOF facilities on birds and their habitats during the nesting and migration periods was observed.

**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 2018 nesting period within the monitored area 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 2018, 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 28.3 pairs per km²; the total abundance of the terns nesting on the spit between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the area of 6 km² was estimated at 170 pairs. On B. Vrangelevsky Island, the colony of the Aleutian tern consisted of 919 pairs and on M. Vrangelevsky Island, of 63 pairs. The rather low numbers were due to the predator activities (sea gulls, bears) attracted to the spit by beached dead herring. Overall, the abundance of the nesting Aleutian terns within the monitored area and the adjacent territory has been increasing in the last 8 years of observations.

The Dunlin (Sakhalin subspecies) nesting density within the monitored area was 27.6 pairs per km². The estimated total abundance of dunlins nesting on the sea spit between Odoptu-2 (North) WS and Odoptu-1 (South) WS within the area of 5 km² was 138 pairs. 94 nest sites of this species were mapped within the 1 km zone of monitoring. In 2018, 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 - 2018 surveys data, the abundance of the nesting group of this species is stable.
Other protected species (Red-necked (Northern) Phalarope, Black-tailed Godwit, 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, etc.) 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 8 years. Their habitats were not disturbed during construction and operation of the project’s facilities.

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

Monitoring of Steller’s Sea Eagle Population within the Mainland Part of Sakhalin-1 Project

In 2018, the Steller’s Sea eagle population was monitored at the following locations of Khabarovsk Krai: (1) the water bodies linked with the Amur River (Lake Kadi and Lake Kizi), and (2) the shores of Chikhachev Bay, Nivelskoy Strait, water bodies in the territory adjacent to the coast (the Nigir River, the Psyu River).

The analysis of the multiyear dynamics of the monitored population has shown that in the Amur flood-land water bodies, as well as in the group of the nearshore water bodies, the share of the territorial pairs did not decrease in 2006-2018. The negative tendency started and observed in 2013, disappeared. The qualitative composition of the nesting fund was also stable.

Reproduction capacity or productivity is the most important indicator characterizing the population stability and response to changes in the habitat conditions. In 2018, the actual productivity (the number of fledglings vs the number of all territorial pairs) of the eagles population did not statistically differ from the averaged multiyear indicator. Overall, no vectored long-term changes of the productivity were observed.

The principal population characteristics within the zone of potential impact of Sakhalin-1 facilities in most cases did not significantly differ from the seashore region or even the benchmark lakes Kizi and Kadi, where the where the habitat quality is consistently higher.

The results show that the man-made impact mitigation measures made it possible to retain the nesting sites of the Steller’s Sea eagle vicinity of Sakhalin-1 industrial facilities. There had been no significant negative impact of this indicator species population throughout the entire period of studies.

Monitoring of Behavior of Steller’s Sea Eagles Nesting in the Vicinity of Chayvo OPF and Chayvo WS

Monitoring of behavior of Steller’s Sea eagles nesting in the vicinity of Chayvo OPF and Chayvo WS has been going on since 2006. After completion of construction and commissioning activities of Sakhalin-1 Project, the impact of the disturbance factor from the facilities decreased. The biotechnical measures implemented under the Project also had a positive effect. However, the man-made load from tourists, hunters and fishermen has been growing in parallel, due to better accessibility to the nesting locations via the access roads and the bridge across the Chayvo Bay. In 2018, predation by bears resulted in a reduction of the Steller’s Sea eagle productivity within the monitored territory vs the previous years of monitoring.

3.5 Compensation for Damage to Aquatic Biological Resources

In 2018, ENL developed and obtained approvals of the measures for 2019 and concluded contracts with the territorial bodies of the Federal Fishery Agency for artificial reproduction of aquatic biological resources in the water bodies of Sakhalin Oblast and Khabarovsk Krai to compensate the damage to the aquatic biological resources and their habitats caused by the activities of the following facilities:

Water Bodies of Sakhalin Oblast

1. Sakhalin-1 Project. Odoptu-1 – Chayvo OPF Flowline. Installation of Weld Connections;

Within Khabarovsk Krai Territory

4. Sakhalin-1 Project. Program of Integrated Offshore Site Surveys at the sites of ERD Drilling and Temporary Mooring Facilities in the Chayvo Bay Area;
5. Sakhalin-1 Project. Program of Integrated Offshore Site Surveys at Arkutun-Dagi Field.