Chapter 8: Residual Impacts after Mitigation

8.1 Introduction

This chapter summarises predicted impacts before the application of the mitigation measures described in Chapter 7, and reassesses predicted impacts after the application of the mitigation measures.

8.2 Construction

8.2.1 Impacts of Underwater Construction

Impacts of the temporary disruption of seafloor habitat caused by the pipeline construction from the Piltun landfall to the PA-A platform site were predicted to be *moderate*. Mitigation of those impacts is impractical, and the residual impact is, therefore, ALARP.

8.2.2 Physical Presence of Vessels

Before mitigation, impacts from collisions between western gray whales and vessels involved in construction activities were predicted to be *major*. Mitigation measures described in Section 7.2.2 include on-going surveillance, avoidance of western gray whales and certain areas frequented by them, slow speeds, and direct courses. After those mitigation measures, the probability of a collision, and the probability that any collision would be fatal, would be very low. Impacts would then be reduced to *moderate.*

8.2.3 Noise

8.2.3.1 Pipeline/Cable Installations

Pipeline and cable installation could exclude some western gray whales from their feeding area, which in turn could affect the condition and the well being of the population. Before mitigation, impacts from noise associated with pipeline/cable installation on western gray whales were predicted to be *major*. Mitigation measures described in Section 7.2.3.1 would prevent the exclusion of any whales from their feeding areas. Impacts would then be reduced to *moderate*.

8.2.3.2 GBS and Topsides Installation

Before mitigation, impacts from noise associated with GBS and topside installations on western gray whales were predicted to be *moderate*. The use of the sound-reduction measures for vessels (Sections 7.2.2 and 7.2.3.4) and platforms (Section 7.2.3.2) would reduce but not eliminate noise from platform installation. Thus, residual impacts remain *moderate*, and are ALARP.

8.2.3.3 Landing Pier and Approach Channel Construction

Landing pier and approach channel construction, particularly dredging and pile-driving, could exclude some western gray whales from their feeding areas, which in turn could affect the condition and the well being of the population. Before mitigation, impacts from landing pier and approach channel construction were predicted to be *major*.

Mitigation measures described in Section 7.2.3.3 would prevent the exclusion of any whales from their feeding areas. Impacts would then be reduced to *moderate*.

8.2.3.4 Vessels

Before mitigation, impacts from noise generated by vessel traffic associated with the construction phase of the Sakhalin II project were predicted to be *moderate*. Mitigation measures described in Sections 7.2.2 and 7.2.3.4, including noise-reduction design, restrictions on vessel speed and course changes, and the presence of MMOs, will limit the number of western gray whales disturbed and the distance to which they are disturbed. After mitigation, impacts would remain *moderate*, and are ALARP.

8.2.3.5 Helicopters

Before mitigation, impacts from noise generated by helicopters associated with the construction phase of the Sakhalin II project were predicted to be *moderate*. Mitigation measures described in Section 7.2.3.5 would reduce the number of western gray whales disturbed and the size of the area in which they were disturbed. After mitigation, impacts would remain *moderate*, and are ALARP.

8.2.3.6 Seismic Exploration

If western gray whales are feeding near the survey area, before mitigation, impacts of the Lunskoye seismic survey were predicted to be *major.* Mitigation measures described in Section 7.2.4, including seasonal restrictions, aerial surveys, airgun array size and configuration, marine mammal observers, ramp up or soft start, and safety distance would prevent the displacement of feeding whales. After mitigation, impacts would be reduced to *moderate*.

If western gray whales are present in the survey area and not feeding, or migrating past the survey area, before mitigation, impacts were predicted to be *moderate*. Mitigation measures described in Section 7.2.4 would reduce disturbance to any whales near the seismic survey vessel. After mitigation, impacts would remain *moderate*, and are ALARP.

8.2.4 Summary of Residual Impacts

Table 8-1 summarises mitigation measures for the construction and exploration phases of the Sakhalin II Project and predicted impacts before and after mitigation.

8.3 Operations

8.3.1 Presence of Vessels

Before mitigation, impacts from collisions with vessels during the operations phase of the project were predicted to be *major*. Mitigation measures described in Section 7.2.2 include on-going surveillance, avoidance of western gray whales and certain areas frequented by them, slow speeds, and direct courses. After those mitigation measures, the probability of a collision, and the probability that any collision would be fatal, would be very low. Impacts would then be reduced to *moderate*.

TABLE 8-1. Summary of mitigation measures for the construction and exploration phases of the Sakhalin II Project and predicted impacts before and after mitigation.

Source of predicted impact	Impact	Predicted impact before mitigation	Mitigation measure(s)	Predicted impact after mitigation
Installation of pipelines and cables (disruption of seafloor habitat and increased turbidity)	Temporary loss of food resources	Moderate	None	Moderate
Physical presence of vessels	Movement away from the area, avoidance of the area and/or obstruction of normal movement patterns, interrupted feeding, and collisions	Major	Vessel restrictions (exclusions, speed and course changes); MMOs; 1,000 m separation	Moderate
Noise from pipeline/cable installations	Blockage of spring northward migration, disruption of feeding	Major	Scheduling activities, daily aerial surveys, suspension of activities, MMOs, ramp up, additional precautions in low visibility	Moderate
Noise from GBS and Topsides installation	Short-range avoidance movements, possible disruption of feeding	Moderate	Vessel restrictions (exclusions, speed and course changes); MMOs; 1,000 m separation; noise suppression on platforms	Moderate
Noise from landing pier and approach channel construction	Blockage of spring northward migration, disruption of feeding	Major	Scheduling activities, daily aerial surveys, suspension of activities, MMOs, ramp up, possible use of Vibropile	Moderate
Noise from support vessels	Change in behaviour, short-range avoidance movements	Moderate	Vessel restrictions (exclusions, speed and course changes); MMOs; 1,000 m separation; noise suppression	Moderate
Noise from helicopters	Change in behaviour, short-range avoidance movements	Moderate	Flight path restrictions, minimum altitudes	Moderate
Seismic exploration, if western gray whales are feeding near the survey area	Avoidance movements, disruption of feeding	Major	Seasonal restrictions, aerial surveys, airgun array size and configuration, marine mammal observers, ramp up or soft start, and safety distance	Moderate
Seismic exploration, if western gray whales are present in the survey area and not feeding, or migrating past the survey area	Short-range avoidance movements, displacement of migration corridor	Moderate	As above	Moderate
Oil spills	Health/sublethal, avoidance movements, possible disruption of feeding, oiling of prey	Major	Update oil spill response plans specifically for western gray whales, aerial surveys and other monitoring programmes in the event of a major oil spill, prepare western gray whale emergency plan.	Moderate

8.3.2 Noise and Disturbance

8.3.2.1 Drilling

Before mitigation, impacts of drilling noise were predicted to be *moderate*. No mitigation measures are practical to reduce drilling noise, so residual impacts remain *moderate*, and are ALARP.

8.3.2.2 Platforms

Before mitigation, impacts from noise generated from the platforms during the operations phase of the project were predicted to be *moderate*. The use of the sound-reduction measures described in Section 7.3.2.2 would reduce but not eliminate noise from the platforms. After those mitigation measures, residual impacts would remain *moderate*, and are ALARP.

8.3.2.3 Maintenance of Subsea Structures

Before mitigation, impacts on western gray whales of maintenance of subsea structures were predicted to be moderate. No specific mitigation measures are planned, but those described for mitigating impacts of noise from vessels (Sections 7.2.2 and 7.2.3.4), helicopters (Section 7.2.3.5), and platforms (7.3.2.2) will reduce noise associated with maintenance activities.. Residual impacts would remain *moderate*, and are ALARP.

8.3.2.4 Vessels

Before mitigation, impacts on western gray whales of noise from vessel traffic during the operations phase of the project were expected to be *moderate*. Mitigation measures described in Sections 7.2.2 and 7.2.3.4, including noise-reduction design, restrictions on vessel speed and course changes, and the presence of MMOs, will limit the number of western gray whales disturbed and the distance to which they are disturbed. After mitigation, residual impacts would remain *moderate*, and are ALARP.

8.3.2.5 Helicopters

Before mitigation, impacts from noise generated by helicopters associated with the operations phase of the project were predicted to be *moderate*. Mitigation measures described in Section 7.2.3.5 would reduce the number of western gray whales disturbed and the size of the area in which they were disturbed. After mitigation, impacts would remain *moderate*, and are ALARP.

8.3.3 Oil Spills

Before mitigation, impacts of oil spills on western gray whales were predicted to be *major*. Mitigation measures described in Section 7.4 would reduce the risk of spilled oil impacts in areas of importance to western gray whales, i.e. migration routes and feeding areas. After mitigation, impacts would be *moderate*.

8.3.4 Summary of Residual Impacts

Table 8-2 summarises mitigation measures for the operations phase of the Sakhalin II Project and predicted impacts before and after mitigation.

TABLE 8-2. Summary of mitigation measures for the operations phase of the Sakhalin II Project and predicted impacts before and after mitigation.

Source of predicted impact	Impact	Predicted impact before mitigation	Mitigation measure(s)	Predicted impact after mitigation
Presence of vessels	Movement away from the area, avoidance of the area and/or obstruction of normal movement patterns, interrupted feeding, and collisions	Major	Vessel restrictions (exclusions, speed and course changes); MMOs; 1,000 m separation	Moderate
Drilling noise	Short-range avoidance movements, possible disruption of feeding	Moderate	None	Moderate
Noise from platform operations	Short-range avoidance movements, possible disruption of feeding	Moderate	Noise suppression on platforms	Moderate
Maintenance of subsea structures	Short-range avoidance movements	Moderate	Measures for vessels, platforms, and helicopters	Moderate
Noise from support vessels	Change in behaviour, short-range avoidance movements	Moderate	Vessel restrictions (exclusions, speed and course changes); MMOs; 1,000 m separation; noise suppression	Moderate
Noise from helicopters	Change in behaviour, short-range avoidance movements	Moderate	Flight path restrictions, minimum altitudes	Moderate
Oil spills	Health/sublethal, avoidance movements, possible disruption of feeding, oiling of prey	Major	Update oil spill response plans specifically for western gray whales, aerial surveys and other monitoring programmes in the event of a major oil spill, prepare western gray whale emergency plan.	Moderate