Chapter 13 Material Project Changes since the 2003 EIA

13.1 INTRODUCTION

The project descriptions for each major project asset provided in the international-style EIA (2003) were based on the fifth version of the Sakhalin II Phase 2 Basis of Design (BOD 5), which corresponded to an early stage in the design process. Since that time, the detailed design specification of the overall project has evolved and these are presently captured in BOD 7 (May 2005). The changes that have materialised since BOD 5 have been driven either by technical or environmental improvements that are part of the natural design evolution of a project of this size and complexity. This chapter of the EIA addendum describes the material (i.e. significant) changes to the project specification or key mitigation measures since the EIA was issued. The changes are presented in a tabular form per asset or substance, in alphabetical order (see Section 13.2). Where certain changes are described in greater detail elsewhere in the EIA addendum, a cross reference is given rather than a full explanation in this chapter.

13.2 SUMMARY OF MATERIAL PROJECT CHANGES

Ref	Project Asset	Project design / activity stated in EIA (2003)	Change in design since EIA (2003)
Booster Station 2 (BS2)			
1.	BS2	*EIA Volume 5; Chapter* The EIA (2003) stated that BS2 was to be located 19.5 km to the south-west of Poronaisk, approximately 1.5 km north of the railway station for Gastello township and midway between the OPF and LNG/OET plant.	The siting for BS2 has been moved from a position 1.5 km South of Gastello to 1.2km North of Gastello due to minor onshore pipeline route changes and the avoidance of potential seismic hazards. There has been no significant change in design configuration since the TEO-C and EIA (2003). The change in location to north of Gastello is within a similar habitat type. Pre-construction baseline, flora and fauna, and birds surveys were undertaken in 2005. The Company is in the process of executing the air modelling required by Russian Federation regulations to determine the boundary of the MPC in relation to the nearest residences. The current SPZ is 700m and the MPC estimates (including NOx levels) all fall within this SPZ. The nearest dwelling is the Emergency Response and Restoration Depot, which is over 1000m from the plant (fence to fence), and the nearest

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			house in the village is over 1200m away from the plant fence. This is significantly further than the original distance envisaged in the EIA (2003) due to the change in location of the BS2. Overall, the Company is confident that the air modelling will confirm that MPC limits will fall within the given SPZ. The modelling work for the front-end engineering design update will be completed by Q2 2006.
Liquefied Natural Gas Facility (LNG)			
2.	LNG Dredging	*EIA Volume 5; Chapters 2.3.3 and 3.11.2* The initial estimated volume of dredge material was approximately 1 238 000 m^3 from the construction of the LNG Jetty and MOF. The EIA stated that the dredging of both the LNG Jetty and MOF areas would be undertaken by a cutter-suction dredger, with a capacity of dredging 6000 m^3 per day. Dredging associated with the MOF was planned for between April and December 2003 and dredging associated with the LNG Jetty was scheduled April 2004 and December 2005.	The revised volume of dredged material is: • LNG Jetty: 1,300,000 m^3; • MOF: 145,000 m^3; • Total: = 1,445,000 m^3. The project has committed to undertaking all dredging outside of the main salmon-spawning season, which falls between mid May and mid September. This, in addition to climatic constraints, such as weather and sea ice, means that the window of opportunity for dredging is restricted to mid-September and the end of November, and March to mid May. The majority of the dredging campaign has been undertaken using grab hopper dredgers, which was the preferred dredger specified by the contractor undertaking the LNG construction contract. A grab hopper dredger is a self-propelled vessel with a hopper. The hopper is loaded by means of an onboard grab crane. Unloading of the hopper at the disposal site takes place by means of bottom doors. Between the end of September and October 2005, a large cutter suction dredger was used in addition to the grab dredgers in order to complete all of the dredging work (within the restricted time frame) by the end of 2005, and by doing so significantly reduced by a number of months the overall duration of disturbance to the marine environment at both the dredge and disposal sites. The cutter suction dredger uses a special cutting device for loosening sediment in front of the suction inlet. Large centrifugal pumps transport the dredged spoil as a fluid mixture (slurry) through a pipeline onto a bottom

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			dumping hopper barge which then transports the material to the disposal site. The main advantages of this type of vessel are its ability to operate in shallow water and to dredge a wide range of materials including rocks, as well as being able to produce a uniform bottom level. It was therefore employed to undertake the dredging of the LNG turning circle (the amount of material to be dredged from the LNG turning circle is already included in the overall figures for the LNG Jetty). An advantage of using a large bottom dumping trailing suction hopper dredger is that the density of dumped material is so great that it acts as a consolidated "slug", which means that aggregate and fines are entrained together and act as one mass, rather than as individual particles, and the result is a more limited dispersal of material and a greater accuracy of placement on the seabed. This is another reason why bottom dumping is preferable to the use of chutes (see row 4). More detail is provided in EIAA Chapter 12: Dredging.
3.	LNG	*EIA Volume 5; Chapter 3.12.1* The EIA stated that there would be disturbance to approximately 125,680m^2 (equivalent to 12.5ha) of seabed associated with the disposal of dredged spoil at a site located approximately 22km from the shore. Regarding the potential for impacts from the disposed dredged materials at the dredge disposal site, it was predicted that the whole of the dumping site will eventually be covered in spoil up to a depth of several metres, but that sediment depths outside of the disposal site boundary would not exceed 50mm outside a zone of 65m from the site boundary.	Since the EIA (2003) was written, more modelling work was undertaken to the predict impacts at the dredging and disposal sites (the disposal site at 22km from the dredging site still being the same as that documented in the EIA (2003). The modelling concluded that during dredging and disposal activities, relatively high levels of suspended sediment would be generated (in the range of 20-200mg/l, depending on location to the actual works) in the water column and at the seabed. Within the dredging area and at the disposal site the works would result in the complete mortality of existing seabed communities. In the areas that have been dredged, recolonisation would occur and the communities re-establish within 2-3 years. At the disposal site the change in sediment characteristics (from fine, soft sediment to more consolidated, coarser grained material) following dumping of all of the sediment would be likely to lead to the establishment (over a period of 2-5 years) of a different community to that already

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			present. The change in sediment type at the disposal site would constitute less than approximately 0.1% of similar seabed conditions (within the 50-100m depth contours) in Aniva Bay and it is therefore concluded that disposal would have a negligible effect with respect to the seabed ecology of Aniva Bay. Some smothering of seabed organisms by fine sediment outside of the disposal site would occur. Potentially there would be mortality of smaller organisms inhabiting surface sediments within an area subjected to greater than 10mm of sediment deposition (approximately 14 hectares) and relatively high levels of suspended sediment (>50mg/l). This affected area represents approximately 0.03% of the whole bay area. Based on data from other studies and survey information it is estimated that recovery of the affected area would be expected within a period of less than three years. Any fish eggs present on the seabed surface where >2-3mm of fine sediment would be likely to accumulate would be killed. This temporary and localised impact would affect an area of less than 0.3% of the whole bay area and is therefore not considered to represent a significant impact with respect to the maintenance of fish populations within Aniva Bay. This limited impact is in part due to the fact that the offshore location of the dredging site is not as important a fish spawning and nursery area as the inshore areas of Aniva Bay. A dedicated 5 year monitoring programme initiated in 2003 has to date indicated that the types of effect observed are in line with those predicted and, importantly, that the scale of impact, particularly at the disposal site, is less than that which had been forecast. The potential disturbance effects of the revised dredging programme are covered in detail in EIAA Chapter 12: Dredging.
4.	LNG	*EIA Volume 5, Chapter 3.12.1* The EIA described that most of the material that would be dredged would be claystone bedrock, with dispersible fractions comprising 57% of	As noted above, the dredging work is to be undertaken using a combination of a cutter suction dredger and grab dredgers. Since the EIA was written it has been ascertained that the material to be dredged is more consolidated than originally reported, and

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		the total volume of which 15% would be medium sized sand, 31% fine sand and 11% is clay and silt. The EIA described the use of hoses or chutes to direct spoil and backfill material into specific locations on the seabed to minimise dispersion of sediments in the water column during dredged spoil disposal activities and trench backfilling.	actually comprises 80% rock and 20% dispersible sediments. Chutes were originally considered as a mitigation measure to restrict the dispersal of fines during disposal. However, because the ratio of rock to fine sediments was much greater than originally envisaged, they were not utilised as to do so would not have conveyed a net environmental benefit given that their use would have prolonged the disposal period, and hence the period of disturbance. This is further described in EIA Addendum Chapter 12 on dredging activities in Aniva Bay.
5.	LNG	*EIA Volume 5, Chapter 3.12.1* Disturbance to birds (particularly by noise from construction plant and by movement of construction personnel) will be minimized by strict adherence to good construction practice. If necessary, this will include the installation of screens between sensitive locations (for example, Mereya Lake to the west of the site) and any activities which have the potential to cause significant disturbance.	The use of screens around Mereya Lake was not required due to the distances of construction activities from sensitive receptors.
Oil Export Terminal			
6.	OET	*EIA Volume 5; Chapters 2.4.*3 The EIA described that the OET would have three crude oil storage tanks.	The number of OET oil storage tanks has been reduced from 3 to 2.
7.	OET	*EIA Volume 5; Chapters 2.4.*3 The EIA described that the oil tank roof design would incorporate a geodesic dome internal floating roof tanks with single seals on the single Glass Reinforced Epoxy (GRE) deck roof.	The previously obtained approval for a domed roof design was withdrawn after incidents with similar roofs in Russia, and therefore the design has been changed to a conventional floating roof.

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Offshore pipelines			
8.	Offshore pipelines Hydrotesting	*EIA Volume 2, Chapter 3.4.3* The EIA stated that the concentration of chemical additives (corrosion inhibitor, biocide, dye) used for pressure testing (hydrotesting) of offshore pipelines would be the minimum required for effective testing of the transport systems. The EIA stated that the type of chemical additives selected would be on the basis of their effectiveness and limited toxicity to marine organisms. Low toxicity chemicals additives for hydrotesting would be used.	The current offshore pipelines hydrotest plan (as of Q4 2005) is to prevent the discharge of chemicals into the marine environment. Therefore, no corrosion inhibiting or biocide chemicals shall be used for hydrotesting of pipelines from the offshore platforms. In Aniva Bay, the use of chemicals in hydrotesting is permitted under the Russian regulations, and their use is necessary. However, the Company has made a commitment not to discharge these into the marine environment, but they shall instead be diluted and loaded onto the first tanker at the TLU terminal.
9.	Offshore Pipelines	*EIA Volume 5; Chapters 2.5.2* The offshore pipeline trench at the LNG site remained open for longer than stated in the EIA. Pipeline and cable installation was planned to take place during the summer months i.e. between April and September most likely between June and July 2004 or 2005.	This trench in Aniva Bay lies between the landfall and KP 1.4 and will remain open until the end of 2005. This is due to the restrictions imposed for salmon spawning, which prohibited work on the trench between May and September 2005.
Onshore pipelines			
10.	Onshore pipelines Reroutes to avoid river crossings	*EIA Volume 2, Chapter 2.3.1* The project has maintained its pipeline routing philosophy, as set out in the EIA, in terms of avoiding sensitive areas wherever practicable to do so. The original pipeline route crossed 1103 watercourses. This number has been reduced, as set out in the adjacent column, bringing with	With the implementation of the Big Northern Nysh Bypass (BNNB) and the Big Southern Nysh Bypass (BSNB) re-routes, the number of watercourse crossings has been reduced by 19, bringing down the total number of watercourse crossings to 1084. • The Big Northern Nysh Bypass has reduced the pipeline length by just under 27km from the Piltun landfall to the OPF. The route deviates from the original route just south of the Tym river crossing, approximately 32km north of Nysh, to

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		it environmental benefits.	approach the OPF in a south-easterly direction. The new route length is approximately 33km and runs through relatively flat and dry country and is easily accessible by an existing forest road; • The Big Southern Nysh Bypass (BSNB): This re-route reduced pipeline length by approximately 22km including the Small Southern Nysh Bypass (SSNB). The BSNB itself is approximately 95km long. It runs through relatively dry land parallel to the Nabil river flood plain, but crosses a mountain range at an elevation of approximately 400m; • The ecological sensitivity of these reroutes is comparable with the original route.
11.	Onshore Pipelines Reroutes associated with the Alternative 1 reroute onshore	*EIA Volume 2, Chapter 2.3.1* The project has maintained its pipeline routing philosophy, as set out in the EIA, in terms of avoiding sensitive areas wherever practicable to do so.	In March 2005, the Company made a decision to move the offshore and onshore pipeline route at Piltun in order to avoid a known western gray whale feeding area. This new routing is known as Alternative 1. Given that this has been a significant design change since the EIA (2003), a more detailed account of the decision-making and environmental appraisal process is given in Section 13.3 below. In addition, the recommendations made during combined archaeological, ornithological and technical surveys carried out in June 2005 in the selection of the Alternative 1 pipeline reroute onshore resulted in four route changes to avoid potential impacts to birds and heritage sites: 1) Deviation in the section from the landfall to the pig trap site (at kilometre point (KP) 1) in order to avoid crossing the largest lake near the landfall, which provides an important duck nesting habitat; 2) Deviation in section pig trap site to HDD pull in point (between KP 3 & 5), in order to avoid archaeological sites and to avoid larch forest; 3) Deviation northwards (between KP 8.9 and 10.5) in order to be further away from Greenshank habitat and eagle nests, and avoidance of archaeological sites;

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			4) Onshore pipelines and the main facilities layout are to share the RoW to minimise environmental impact and move this northwards to avoid spotted greenshank habitat. 5) The footprint of the project has been reduced by decreasing the RoW width and choosing block valve sites and the pig trap sites at strategic locations, such as the sharing of Sakhalin I land at the ENL OPF site for the siting of block valve sites and some of the RoW. The approved route stretches 21.8km. Between May-Aug 2005, the design construction plans were approved by the Ministry of Natural Resources (MNR) (RosPrirodNadzor) and public hearings were undertaken in Nogliki district. The plans were submitted to MNR for ecological expertiza review in late September 2005, and is expected to conclude in December 2005. See Figure 13.1.
12.	Onshore Pipelines Minor reroutes associated with seismic and geohazard avoidance.	*EIA Volume 2, Chapter 2.3.1* The project has maintained its pipeline routing philosophy, as set out in the EIA, in terms of avoiding sensitive areas wherever practicable to do so. Although the pipeline route is largely fixed, a large number of re-routing decisions were taken into account during the detailed design of fault crossings and slope stability design.	Approximately 54 minor reroutes have been made to avoid sensitive seismic hazards, some re-routes have been up to 2km.These reroutes are presented in Chapter 8 of the EIA Addendum.
13.	Onshore pipelines Watercourses	*EIA 2003, Volume 4, Chapter 2.3.7* Based upon evaluation of the available data discussions with regulatory federal agencies the following approach was originally envisaged for watercourse crossings: • All 995 watercourses in Group I (lowest	The methods by which all rivers will be crossed by the onshore pipeline are set out in the Company's River Crossings Strategy Report (RCR). This document, which was updated in Q4 2005, has taken into account lessons learned from the construction of river crossings to date, and is designed to optimise contractor performance in good environmental management when undertaking river crossings. A total of 153 watercourses that belong to the

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		category) were to be crossed using wet open cut trenching; • 45 watercourses in Group II were to be crossed using wet open cut trenching (underground pipe laying). The Small Irkir River was to be further investigated for suitability for horizontal directional drilling (HDD); • 55 watercourses in Group III were to be crossed using wet open cut trenching (underground pipe laying). 36 watercourses, however, were to be further investigated for suitability for HDD; and • Eight watercourses in Group III were proposed for HDD, namely the Val, Tym (first crossing), Naiba, Nabil and Vazi. In addition, it was agreed that any Group II or Group III watercourses that had fish farms downstream of the crossing location would also be constructed using HDD, namely the Tym (second crossing), Buyuklinka and Firsovka. The EIA also stated that where the wet ditch method is used, turbidity curtains would be installed downstream to impede the release of	revised Highest Fish Category and are within categories of high and medium ecological sensitivity (definition of sensitivity can be found in Section 5 of the RCR) will be crossed in winter. This affords a high degree of protection from construction activities due to avoidance of the spawning season. Whilst the use of turbidity curtains has not been practical in many circumstances due to the flow rates of water, other forms of sedimentation control and mitigation are adopted, which include analysis of crossings of rivers that are tributaries of sensitive rivers, the minimisation of construction times, adherence to industrial good standard practice and relevant elements of the Federal Energy Regulatory Commission's guidelines, and proper erosion control. The Company is committed to reinstating riverbeds and the riparian vegetation. Seven rivers will be crossed using the HDD technique. One of the eight rivers originally proposed for HDD, the Buyuklinka, did not have suitable geology to enable HDD. The Buyuklinka crossing will be treated as a highest sensitivity crossing, and it will be carried out by wet cut during the winter. The 329 watercourses that belong to the Highest Fish Category, but do not have any fisheries value in that they have no recorded fish spawning grounds will be crossed in accordance with the restrictions imposed by the Russian authorities. In general this means that the watercourses will be crossed outside the salmon spawning season, and where practicable before the spring snowmelt. The remaining 602 watercourses that do not belong to the highest fish category, as defined by Sakhrybvod, will be crossed all year round. Where practical, watercourses that are adjacent to watercourses with restrictions will be crossed during the same period. The detail of river crossing methods will be set out in an Execution Plan, which will specify for each river crossing, and based on site-specific data, the details of construction techniques together with the planned mitigation measures and the supervisory and monitoring approaches to be used. The Execution Plan for 2005 will be

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		sediments.	finalised in early December 2005 and the Execution Plan for 2006 will be finalised during December 2005. Sensitive river crossings will only proceed once a detailed execution and monitoring plan for a specific river is in place, in compliance with the intent of the RCR and good industry practice. Further detail on crossing strategy and methodology is provided in the RCR.
14.	Onshore pipelines Watercourses	*EIA Volume 4, Chapter 2.3.2* The EIA described that the fibre optic cable could be installed in one of three main ways: 1) Directly into the ground (by a cable layer, or into a manually or mechanically excavated trench); 2) In high density polyethylene (HDPE) conduits installed into the ground; or 3) Hung from power line poles.	Initially the application of Option 2 was thought to be limited because of the potential for deformation of polyethylene tubes under frozen-earth conditions. As the FOC route goes through deep forest areas, above ground installation such as Option 3 was not considered appropriate, as the integrity of the FOC can be compromised by fire or falling tree branches. Option 1 has for the most part been pursued as the most appropriate option. However, the Company is committed to follow Option 2 wherever possible and therefore for the crossings of sensitive rivers (Type II and III rivers), an additional trench for the cable will be avoided by using an HDPE conduit. This conduit will be strapped to the oil pipeline, and the FOC will later be pulled through. For those crossings where trenching will be involved, the construction period for the FOC will be in accordance with the construction period of the oil and gas pipelines. Further detail on crossing strategy and methodology is provided in the RCR.
15.	Onshore pipelines Hydrotesting	*EIA Volume 4 Chapters 2.4.1 and 3.7.2* In 2003, it was planned that no chemicals would be added to the hydrotest water for onshore pipelines. However, in the event that additives would be used, the hydrotest chemical application guidelines detailed in Chapter 2 of the EIA would apply.	Though in general hydrotesting will be undertaken during the summer months, there may be a need to do some winter testing for the short pipe sections that will be installed at the winter river crossing sites. Hydrotest discharges will contain non-toxic waste only, as no corrosion inhibitors or oxygen scavengers will be used. The water will be discharged in sediment pits or surface filter/dissipaters. When the sediment has settled, the water will drain away on the ROW. To minimise run-off, the water will be discharged onto vegetated areas. The sediment will be cleaned up and transported from site, where it

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			will be disposed in accordance with the Company's Solid Waste Management Strategy. The only exception to this is for the short pipe sections that shall be hydrotested in winter, specific Work Procedures have been developed for hydrotesting in low ambient temperatures. Antifreezes shall be selected evaluating toxicity, product stability, and disposability (for example Mono-Ethylene Glycol) and shall be applied only after the necessary permits have been secured. As this hydrotest water shall contain antifreeze, it will not be discharged on the ROW. Instead, the water shall be discharged into dedicated tanks and sent back to the manufacturer for processing.
16.	Onshore pipelines Camps and construction workers	*EIA Volume 4, Chapter 2.1.1* The EIA described that onshore pipeline construction would entail ten camp locations, with a capacity of accommodation ranging from 500 to 1000 contractor construction workers and 50 SEIC specialists. The EIA therefore examined impacts on the assumption of between 5000 and 10,000 construction workers and 50 SEIC specialists.	The actual number of camps associated with onshore pipeline construction is 14. These camps vary in occupancy from 50 to approximately 600 people, and house a total of some 6,000 contractor and subcontractor staff and some 75 SEIC staff. Whilst the number of camps has changed from 10 to 14, the number of workers has not increased over that which was accounted for in the EIA. There is no significant additional environmental impact associated with this project change.
Onshore Processing Facility			
17.	OPF Beach landing facility (BLF)	*EIA Volume 3, Chapter 2.3.2* The planned pier length for the BLF was approximately 300m, with a width of 20m. It was also planned that approximately 800 linear meters of sheet piles would be installed, and that the fenced-off area would be filled with 25,000m^3 of basic fill material (sand) and covered by 5,000 m^3 of crushed stone.	The final BLF design now comprises a temporary barge structure, which carries far fewer environmental impacts than the permanent structure originally envisaged. Once the functionality of the BLF has been fulfilled, the BLF will be removed from the project site. A revised environmental appraisal associated with the decision-making on the BLF is presented in Chapter 14 of the EIA addendum.
18.	OPF	*EIA Volume 2, Chapter 3.11.3*	There shall be a second stand-by diesel-driven

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		Onboard power generation on Lun-A using standby 1.5 MW diesel generators will be available for emergency use.	generator installed at the OPF to overcome any shortages of standby power available to OPF, Lun-A platform and during Lun-A drilling activities should OPF power be down.
19.	OPF	Parking loop at OPF.	A parking loop shall be installed to facilitate the control of liquid slug associated with the 30" multi-phase pipelines from Lun-A.
20.	OPF	Additional dual fuel generator at the OPF.	Two generators out of four are dual fuel systems and are required to achieve a duty and standby arrangement when running on diesel whilst drilling from the Lun-A platform (in advance of Molikpaq Tie-In (MTI) gas arriving to OPF).
21.	OPF	Additional disposal of treated water by injection.	The OPF team shall drill and complete two deep disposal wells to dispose of liquid waste stream during the operation of the OPF. Water shall be treated and routed from the disposal water tank. This is not considered a change from the original OPF plan, but additional funding has been allocated to enable the completion of this work.
Platforms			
22.	Platforms	*EIA Volume 2, Chapter 2.2.5* The early design of the LUN-A platform was equipped with 32 well slots, all of which were to be exploitable.	The number of well slots for Lun-A has been reduced from 32 to 27.
23.	Platforms	BOD 7 includes a description of oil and gas processing equipment associated with the Molikpaq Tie-in (MTI) Project.	BOD 7 has been expanded to include a description of facilities for the Molikpaq Tie In (MTI) Project.
24.	Platforms	*EIA Volume 2, Chapters 2.2.5 and 3.5.3* The EIA described the overboard disposal plan for drill cuttings and water based muds generated during the drilling of the first well for the PA-B platform, the first four wells for the Lun-A platform and for the conductor string for	In mid 2005, the Company made a decision that no drilling mud and cuttings generated through the platform drilling programmes would be discharged into the marine environment. For some time, it has been international best practice not to discharge of oil- and synthetic-based mud and cuttings into the marine environment, and this has also been a standard to which the Project has also adhered. The disposal of water-based mud and cuttings is,

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		each subsequent well on both platforms. Cuttings and waste drilling mud for all other well sections were to be reinjected. The EIA also concluded that the main source of impact on benthic communities during the commissioning and operational phases would be related to this discharge of drill cuttings. The following mitigation measures were suggested: • limiting volumes of cuttings discharged overboard to practicable minimum; • use of water based drilling fluid when drilling tophole sections of each well; • reinjection of oil based drilling fluids; and • use of low toxicity chemicals for water based drilling fluids and cement.	however, still an internationally accepted and widespread activity. Nevertheless, given that two of the platforms (PA-A and PA-B) are within relative proximity to a known western gray whale feeding ground, Sakhalin Energy elected for a no discharge policy. The cuttings and mud disposal plan for each platform is set out as follows: • PA-A platform: From 2005, the existing PA-A platform shall dispose of any cuttings and mud down a dedicated cuttings reinjection (CRI) well; • Lun-A platform: the first well drilled shall be a CRI well. All cuttings generated through the drilling of this well are now scheduled to be shipped and disposed of at the PA-A CRI well, and thereafter the Lun-A CRI well shall be operational. In emergency situations only, water based cuttings and mud may be disposed of into the gravity-based structure, however, this does not apply to oil based or synthetic mud, which still must be reinjected; • PA-B platform: the first well drilled shall be a CRI well. All cuttings generated through the drilling of this well are now scheduled to be shipped and disposed of at the PA-A CRI well or Lun-A CRI well; • Each platform's CRI well shall become each other's backup. There shall be a few extra annuli on Piltun available for waste injection. In total, this presents a robust and environmentally sound disposal system.
25.	Platforms	*EIA Volume 2, Chapter 3.4.3* The EIA stated that during well testing and clean up there would be potential for incomplete combustion of the flared gas and associated well fluids (e.g. oil, drilling fluid) and drop-out of condensed liquid could occur onto the sea surface. Various mitigation measures were suggested in the EIA, including: • flaring to cease if oil sheen	Flaring shall cease if an upset condition occurs in the normal operation of the test equipment that is directly attributable to the observed sheen. This excludes initial well clean up periods for all wells and the cold start of Lunskoye wells.

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		appears on sea surface. This mitigation measure has been further clarified, as set out in the adjacent column.	
26.	Platforms	*EIA Volume 2, Chapter 3.7.2* The EIA states that helicopter flight paths would be routed to avoid bird nesting areas and migration flight paths. Also minimum flight levels of 300m should be observed, which would increase to 1km in areas of importance for birds.	Helicopter flights shall avoid a 600m (radius) zone around and 300m elevation above Steller's sea-eagle nests during the period 15 March to 15 September, except in cases of emergency. Helicopter landing sites shall be located at a minimum distance of 1 km from nesting sites except in cases of emergency response. The Company has agreed that the Western Gray Whale Advisory Panel (WGWAP) should continue to investigate additional noise mitigation measures, e.g. proactive design and scheduling measures to minimise noise introduced into the marine environment by the PA-B platform when operational. The Company is committed to incorporating all reasonable recommendations from the WGWAP in its annual work programme and budgets, provided that they comply with Russian law, and to seek support for these recommendations from shareholders, Russian Party and joint industry partners as appropriate.
27.	Platforms	*EIA Volume 2, Chapter 3.8.2* The EIA stated that to mitigate the impacts from aircraft and helicopter traffic, areas used by seals for haul out and by western gray whales for feeding would be avoided by all types of aircraft whenever possible. Helicopters would maintain a minimum altitude of not less than 500 m over western gray whale feeding areas, subject to pilot safety requirements. Aircraft would be prohibited from flying over or circling wildlife for the purposes of casual viewing.	All types of aircraft will maintain a minimum altitude of not less than 450m over the western gray whale feeding area, subject to pilot safety requirements. All aircraft will be prohibited from flying over or circling wildlife, including whales, for the purposes of casual viewing. The Company has agreed that the Western Gray Whale Advisory Panel (WGWAP) should continue to investigate additional noise mitigation measures, e.g. proactive design and scheduling measures to minimise noise introduced into the marine environment by the PA-B platform when operational. The Company is committed to incorporating all reasonable recommendations from the WGWAP in its annual work programme and budgets, provided that they comply with Russian law, and to seek support for these recommendations from shareholders, Russian Party and joint industry partners as appropriate.

Ref	Project Asset	Project design / activity stated in EIA (2003)	Change in design since EIA (2003)
28.	Platforms	*EIA Volume 2, Chapter 2.3.3* The EIA identified that some dredging at the PA-B site would be required, during which approximately 7,500m^3 of sand would be removed and relocated east of the platform site. The disposal site was to be located beyond the 12nm Territorial Sea boundary, east of the P-A field.	During the detailed design of the PA-B platform, it was identified that no dredging was necessary at the PA-B site, only localized levelling of the seabed. No levelling or dredging work was required prior to the installation of the LUN-A platform.
29.	Platforms (and marine / coastal activities in general)	*EIA Volume 2, Chapter 3.9.2* The EIA states that fisheries liaison officers will be appointed to communicate with fishermen during all phases of the project.	As of January 2005, the CLO network comprised of 12 SEIC-contracted CLOs and 8 CLOs employed directly by contractors. These CLOs work within key community centres around Sakhalin Island, particularly in project affected areas, including Nogliki and Val in the north, and Korsakov in the south. Liaison with fishing communities and ancillary industries forms part of their responsibilities (see PCDP for a fuller description of their roles).
30.	Platforms: PA-B	Additional J-tube for future tie-in.	Installation of additional J-tube for future tie-in to the PA-B GBS.
31.	Platforms: PA-B	A third stand-by generator.	In addition to two stand-by diesel generators, a supplemental diesel stand-by generator shall be installed to secure well and equipment during drilling operations.
32.	Platforms	Vol 2 section 3.11.3 suggested use of low-emission turbines.	Dry low NOx will not be used in all circumstances. Refer to HSESAP Annex A7 for a detailed explanation for this design change.
Schedule changes			
33.	Schedule changes	The EIA (2003) provided the following schedules for key project milestones: • PA-B topsides installation: 2006 • First oil and gas PA-B: Q4 2006 • First oil and gas Lun-A: Q3 2006	As of Q4 2005, the schedule for remaining key project milestones is as follows: • PA-B topsides installation: 2007; • First year-round oil (first cargo from OET): Q3 2007 • First LNG: Q3 2008 • First oil PA-B: Q3 2008

Ref	Project Asset	Project design / activity stated in EIA (2003)	Change in design since EIA (2003)
Tanker Loading Unit			
34.	TLU	*EIA Volume 5, Chapter 2.6.1* The EIA described the initial design of the TLU as a tower-type structure with gravity base and integrated rotating modular type deck.	The TLU design now encompasses a pile structure, comprising four piles, instead of a gravity-based structure, and therefore has a much smaller footprint and impact on the seafloor. The drilling of the pile cavities took place within a casing to prevent the discharge of drilling mud and cuttings into Aniva Bay (waste drilling mud and cuttings were disposed of to landfills). The piles were secured by vibropiling. During the execution of this programme, the piles slid into the grouted holes effectively under their own weight, and the vibro-hammer was used only for a short period to hold the piles whilst they were being inserted. Full RF approval was provided at the end of March 2005 for these works to take place and the process was endorsed by the Ministry of Natural Resources and an ecological expertiza. The full programme was carried out in Q3 2005 in order to avoid the salmon spawning season, and the total work took less than one month to complete. The environmental assessment for noise associated with the pile driving on aquatic resources is presented in EIAA Chapter 7 on Fisheries.
Waste management			
35.	Waste Management	*EIA Volume 1, Chapter 6.2* The EIA stated that the Company's Solid Waste Management Plan (SWMP) would integrate Phase 2 waste requirements by selectively utilising existing upgraded waste management facilities in addition to the construction of a new Integrated Waste Management Facility (IWMF). During the initial stages of the project, the existing sites would be used for non-hazardous (Class V) waste. Temporary secure storage	SEIC has further developed its Solid Waste Management Strategy (SWMS), which establishes and defines the procedures for management of waste materials generated by the assets, during construction, installation and throughout the scheduled lifetime of the Sakhalin II development. There have been some fundamental developments in the waste management strategy since the EIA was written, namely the landfill upgrade programme; the use of non-upgraded landfills; the temporary storage of Hazard classes 1-3; and the biotreatment of non-oily wastes: **Upgrading of three municipal landfills:** SEIC is committed to upgrading three existing landfills (Nogliki, Korsakov and Smirnykh) to meet

Ref	Project Asset	Project design / activity stated in EIA (2003)	Change in design since EIA (2003)
		would be provided for hazardous waste until the IWMF was constructed, originally scheduled for end 2005.	Russian regulatory standards and to bring operation more in line with international best practice of environmental performance. Only wastes falling into Hazard Classes 4 and 5 (the lowest hazard classes) will be sent to landfills. **Other Landfill Sites:** Between Q4 2005 and Q2 2006, in order to reduce the transport of waste, the onshore pipeline contractor will utilise a number of non-upgraded landfills for the disposal of Hazard Classes 4 and 5 wastes. SEIC will provide USD 350,000 funding for offset environmental improvements to these landfills (collectively) at Val, Tymovsk, Yasnoye, Dolinsk, Onor and Makarov, and will provide USD350,000 for environmental improvements at the Yuzhno landfill. By Q2 2006, SEIC shall have appointed a central waste transportation and compaction contract, which will centralise the collection of disposable Hazard Classes 4 and 5 waste from SEIC construction activities and ensure the disposal of waste at the three upgraded landfills only. **Temporary storage of Hazard Class 1 to 3 wastes:** Consistent with SEIC's commitment not to dispose of Hazard Class 1 to 3 waste on Sakhalin Island, the SWMS provides for secure storage facilities at the point of generation until suitable treatment and disposal facilities are available locally or sufficient quantities are accumulated to allow economical export to suitable treatment and disposal facilities elsewhere in the Russian Federation or other countries. **Bio-treatment of Hazard Class 3 oily wastes:** Facilities will be constructed to store and biologically treat soil and similar material that has been contaminated by hydrocarbons arising from accidental spillage of products during construction and operations. Because of the emphasis and commitment to these areas, and lack of public support on the island, there is no longer a requirement for an Integrated Waste Management Facility. More detail is provided on the current waste management strategy in Chapter 10 of the EIAA.

Ref	Project Asset	Project design / activity stated in EIA (2003)	Change in design since EIA (2003)
36.	Waste Management	*EIA Volume 1, Chapter 6.2* The EIA stated that the development of permanent incineration facilities would not be justified for the Phase 2 Project.	The project philosophy on the use of incinerators has developed since the EIA was written and is set out below. The use of small (non-EC Directive compliant) incinerators shall not be allowed by SEIC for waste allocated to the project during construction and operation with the exception of small capacity batch incinerators, not exceeding 25kg per hour. Under these circumstances, these incinerators may be used for the disposal of selected waste streams such as oily rags, where no feasible management option currently exists on Sakhalin Island, and shall not exceed 40 tonnes per annum in total across the whole project. The contractor must provide to SEIC, all necessary information concerning their proposed small batch incinerators and receive SEIC's approval prior to using them. SEIC shall carry out a compliance audit (to RF standards e.g., air emissions and waste disposal permits are required) for any such incinerator used. If any incinerators other than the above are used to incinerate waste from the project in the future, SEIC or its contractor (whichever is the operator) must demonstrate that the incinerator is compliant with appropriate EU directives (e.g. EC Directive on Incineration of Waste 2000/76/EC; Incineration of Hazardous Waste 94/67/EC; New Incineration Plants 89/369/EEC). Offshore incinerators are exempted from EU regulation and are subject to MARPOL requirements. Oily rags/materials shall be handled by SEIC's waste contractor and disposed of by co-combustion in coal boilers.

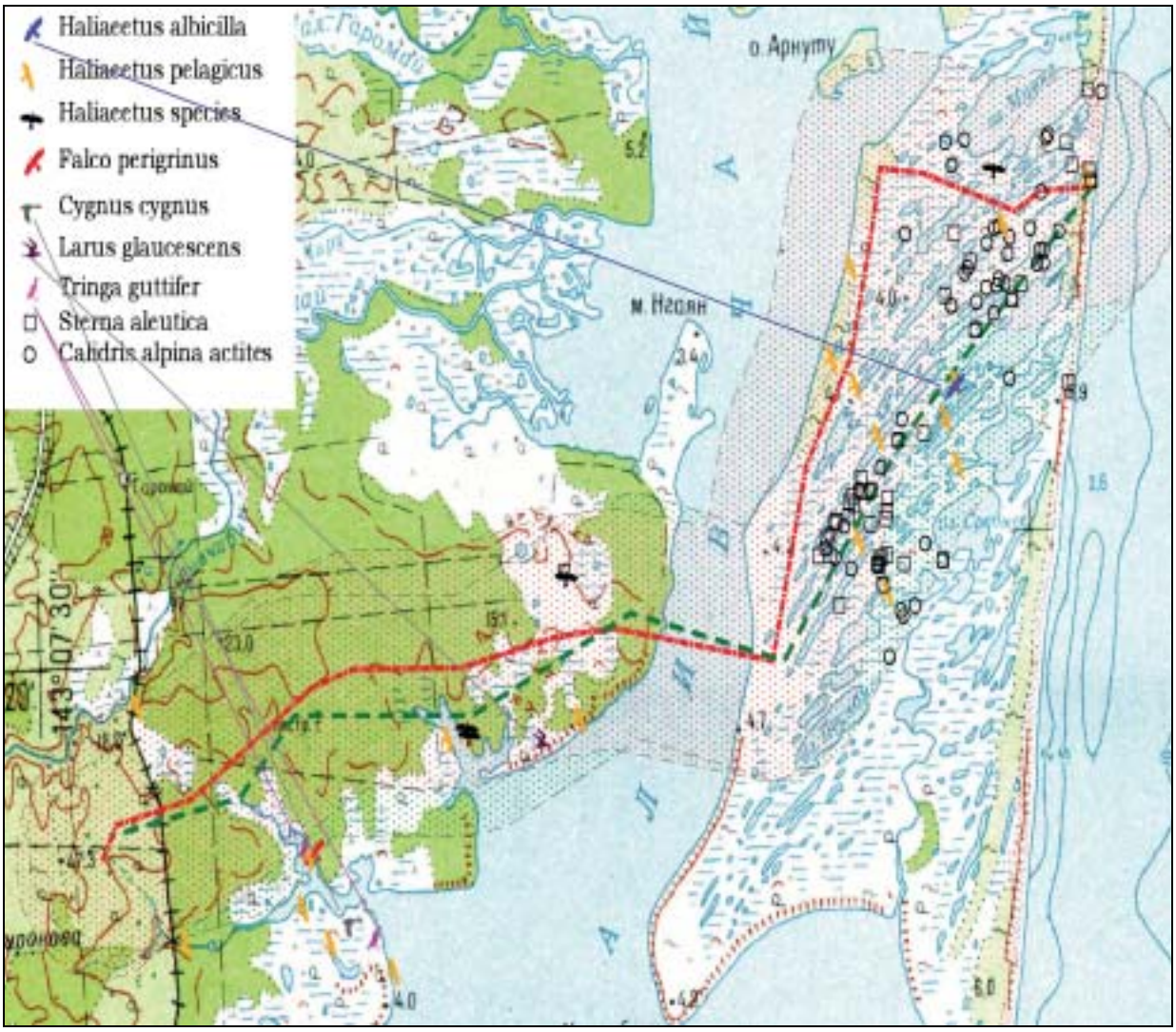

Figure 13.1 Recorded sites of protected bird species during nesting period at Chaivo Bay area in 2005. The stars depict sightings of dunlin. Green dotted line = original Alternative 1 onshore pipeline route; red solid line = re-routed Alternative 1 onshore pipeline route.

13.3 THE PILTUN OFFSHORE PIPELINE RE-ROUTE (ALTERNATIVE 1)

13.3.1 Introduction

This section describes the background and process that lead to the decision by Sakhalin Energy and its shareholders in Spring 2004 to re-route the offshore Piltun pipeline to a more southerly location. The re-route is part of the routine change management process (as defined in HSESAP Part 1 Section 5.8) that accompanies a project of this size and complexity, but due to the sensitive location of the Piltun pipeline, both offshore and onshore, the design and development work is accompanied by further environmental and social studies, which are described in this section. A summary of the design and approvals timeframe is also provided.

13.3.2 The Options Analysis

The coastal waters off north-east Sakhalin provide the only known foraging grounds for the remaining population of western gray whales (WGW), numbering about 100 animals. The population is listed by the World Conservation Union (IUCN) as 'critically endangered' and has been the focus of concern by the International Whaling Commission (IWC) and the 3rd World Conservation Congress. As a consequence of the critical status of the WGW population and its use of habitat in close proximity to oil and gas exploration and production activities particular attention has been given by SEIC to determining and dealing with potential impact to this species.

SEIC has undertaken a number of environmental impact assessments (EIAs) for Phases 1 and 2 of the Sakhalin II Project, beginning with the initial Project Feasibility Study in 1992. In 2002, the Company commissioned an international consultant (ERM) to undertake an EIA covering all Phase 2 activities, as well as a specific EIA focused on the WGW; the latter in particular was intended to address the Phase 2 Project's potential impact on the WGW population. These EIAs concluded that potential impacts could result from, among other things, noise, disturbance of the physical environment associated with dredging and installation of sub-sea pipelines, oil spills, and collision with vessels. However, with mitigation measures in place, potential residual impacts were assessed as acceptable.

Figure 13.2 shows the original route proposed for the pipeline system (shown as the 'Base Case' on Figure 13.2), as assessed in the Phase 2 EIA, from the PA Field, via the platforms (PA-B and PA-A) to the landfall south of Piltun Bay. The landfall section of the pipeline passes through the southern end of the WGW feeding area at Piltun. This route formed the basis upon which Russian Government approvals were obtained. However, one of the conditions issued by the state environmental expert review, undertaken as part of the approvals' process, stated that additional acoustics studies should be carried out with respect to potential impacts on the WGW population.

In 2003, additional seabed surveys were conducted as part of the final detailed engineering design process. These surveys indicated that the required burial depth for a section of the offshore pipeline should be deeper than originally designed to add an additional margin of safety associated with ice scouring and seabed mobility. In order to achieve this, a longer construction period and potentially noisier construction vessels and equipment would be required. During 2003 and 2004, SEIC implemented an acoustics' monitoring programme to acquire source noise level measurements for the specific vessels and equipment that would be used for offshore pipeline construction at Piltun. In some cases the measured levels were higher than originally anticipated.

After reviewing the new information, SEIC made a decision in April 2004 to postpone construction work in the PA field during the 2004 summer season to enable the implementation of an integrated environmental and engineering work programme designed to re-evaluate noise and other impacts and also to

evaluate other possible route options should the base case no longer be acceptable in terms of potential impact to the WGW. The objective of this exercise was to develop a programme that would ensure minimal disturbance to the WGW.

Two alternative pipeline routes were investigated through this options analysis. Both run from the PA-B platforms to the east before turning southwards and arriving at a more southerly landing than the Base Case; Alternative 1 comes to shore at approximately 20km south of the Base Case; and Alternative 2 has a shore landing approximately 12 km south of the Base Case. Importantly, both of these alternative routes avoid the nearshore Piltun WGW feeding area as well as the offshore feeding area (see Figure 13.2).

The synthesis of the Piltun pipeline options analysis was presented in the "Comparative Environmental Analysis of the Piltun-Astokh Field Pipeline Route Options" ("CEA"), which was published in December 2004. The primary purpose of the CEA was to identify and analyse the main sources of impact to the WGW from SEIC's construction and operations activities; evaluate the magnitude of the impacts; and outline mitigation measures that could reduce the impacts to acceptable levels. It compares the advantages and disadvantages from an environmental perspective for the three Piltun pipeline route alternatives, including their landfalls and connective routes to the main north-south onshore pipeline associated with the development of the PA Field. The report also includes an environmental analysis of associated platform installation activities, long-term operations and cumulative impacts associated with other Sakhalin offshore oil and gas development activities relative to the WGW. The CEA drew upon the body of information generated through WGW monitoring studies commissioned by SEIC and Exxon Neftegas Ltd since 1996, as well as other relevant studies and EIAs.

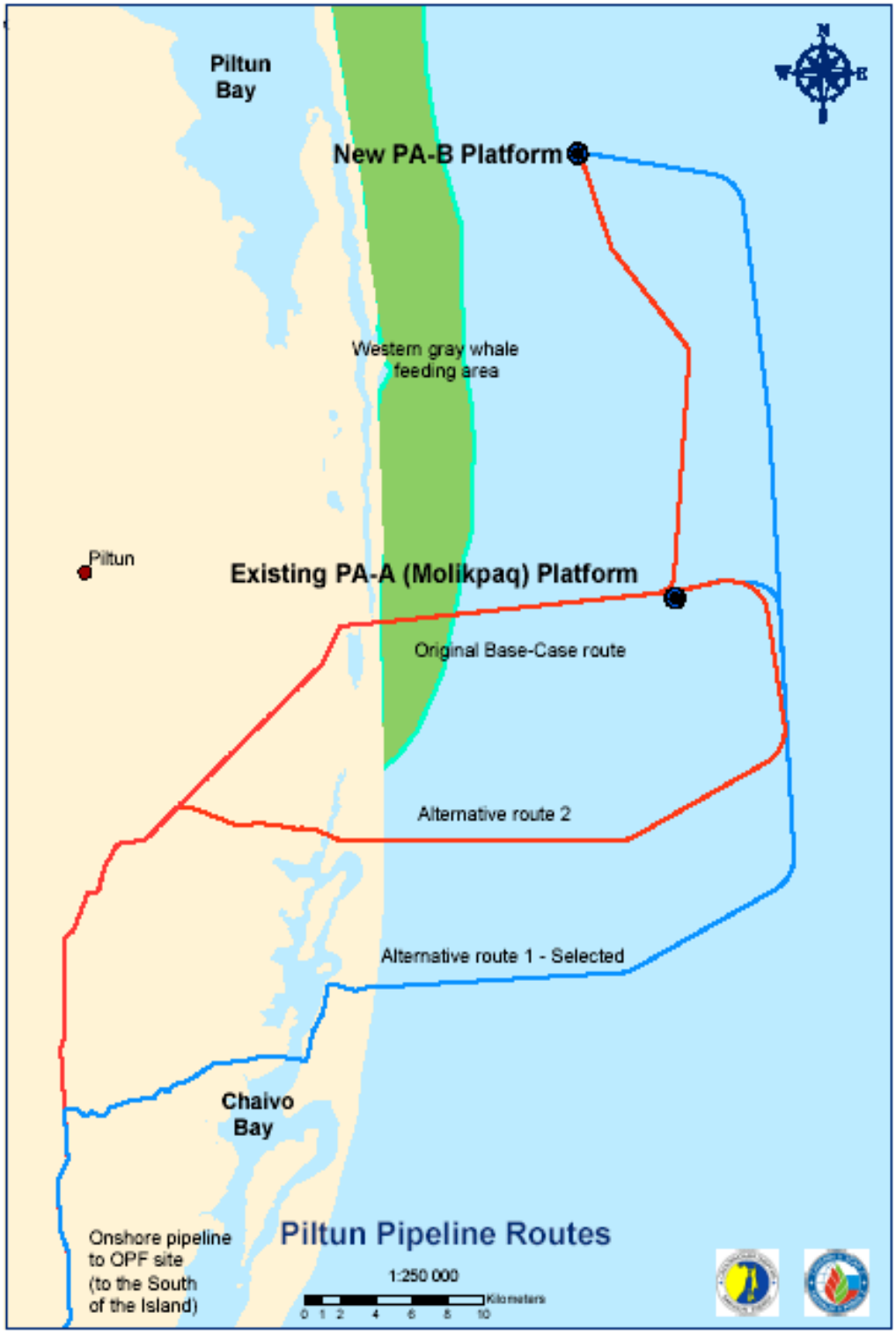

Figure 13.2 **The three Piltun pipeline route options, offshore and onshore, also showing their location in relation to the WGW inshore feeding area.**

13.3.3 CEA Conclusions

The CEA concluded that with suitable mitigation, all three routes were acceptable in terms of environmental impact in general and impact on the WGW in particular. The Base Case was considered to be acceptable, provided that appropriate mitigation measures as outlined in the CEA were implemented prior to and during construction activities. The CEA demonstrated that the more southerly alternative offshore routes would require fewer mitigation measures in order to reduce some potential impacts on the WGW to acceptable levels on the basis that potential impacts to the WGW diminish with distance from their feeding area. With respect to the key planned project activities and potential environmental effects, the following conclusions were drawn:

- The noise impact from pipeline construction activities on the WGW was considered acceptable for all three potential Piltun route options, provided appropriate mitigation measures are implemented during construction. Alternative 1 would have the least potential submarine noise impact and consequently the least mitigation required; Alternative 2 would potentially require some further minor mitigation; whereas the Base Case route would require specific mitigation, including dredging outside of the whale feeding season, summer construction over two seasons, and selected pipelay spreads to minimise noise impact to acceptable levels;
- Dredging of the Base Case route would result in the temporary loss of a small part of the feeding area for the WGW. The biomass of food species tends to decline toward the south and this area appears to be less favoured by feeding WGWs. It was concluded that construction of Alternatives 1 and 2 would, therefore, have no significant direct impact on WGW as they fall outside of the known feeding areas;
- Potential collision risks between whales and vessels associated with construction activity were assessed as being lower for the two alternative routes when compared with the Base Case. Though the potential for collision risk for any of the three routes would be greater than present Phase 1 activities due to an increase in the number of vessels operating in the area during construction, the majority of vessel activity would be in areas with infrequent WGW sightings. Methods for avoiding collisions are well established from Phase 1 and have contributed to a zero collision record to date;
- The overall risk of an oil spill from the offshore Piltun pipeline system was considered to be very low. The expected volume from any spill is an order of magnitude less than that from existing Phase 1 transport facilities because pipeline operations, based upon worldwide industry statistics, have inherently less risk than that of tanker operations;
- The risk to benthos from oil spills is difficult to quantify. The only pipeline route with potential to directly impact the benthos in the WGW feeding area in the event of a pipeline leak is the Base Case. A leak from the Alternative 1 pipeline route (that being pursued) would be very unlikely to

affect the benthos in the feeding area. Furthermore, the conservative pipeline design makes the likelihood of a leak occurring in the first place extremely low. Leak detection and pipeline gauging will ensure that if a leak does occur it will be detected with minimum delay followed by corrective action. The pipeline system will be equipped with a state-of-the-art highly sensitive leak detection system, which will detect losses of less than 1% of the inventory of the pipeline. So as not to rely solely on this leak detection system, the Company will implement additional detection and preventative measures, which include a rigorous monitoring programme to ensure that a leak of any size would be quickly identified. The elements of this programme include frequent walk-over surveys of the onshore sections of pipe, dedicated weekly flights of the whole pipeline, monthly internal cleaning of the pipeline (known as "pigging"), annual assessment using a subsurface remotely operated vehicle ("ROV"), ROV assessment after major storms or other events, and five-year "intelligent pigging" of the pipelines to inspect the integrity of the pipe and detect for any signs of corrosion;

- A relative assessment of the onshore routes was undertaken in the CEA and the overall environmental impacts from onshore pipeline construction along the three onshore route options were considered acceptable with appropriate mitigation, albeit that Alternative 2 would require less mitigation than Alternative 1. Mitigation measures associated with Alternative 1 are set out in Section 13.3.10, which include the crossing of Chaivo Lagoon during winter so as to avoid the sensitive migratory bird breeding and feeding seasons, and using the horizontal directional drilling technique so as to minimise impact to aquatic resources and fisheries livelihoods.

13.3.4 The Independent Scientific Panel

To retain transparency and to obtain additional input regarding SEIC's approach to the management of project activities specifically with regard to WGW conservation, in August 2004 SEIC commissioned the IUCN to convene an Independent Scientific Review Panel ("ISRP"). The ISRP was tasked with appraising the Company's environmental analyses and impact assessments and the effectiveness of proposed mitigation measures to minimise the impact of its Phase 2 operations on the WGW. The Panel was not asked to develop prescriptive conclusions, but rather to provide an evidence-based analysis of issues and options. The composition of the Panel, which comprised 14 international whale scientists, was determined by an independent and transparent selection process administered by IUCN.

To assist the review process, SEIC provided the EIA materials; the CEA and other related documentation; hosted a Panel briefing session on the Island; and attended other meetings with the Panel. The resulting ISRP report was published on the IUCN website in February 2005, and set out the following conclusions:

- Once completed and fully operational, Phase 2 would considerably reduce certain types of risk to gray whales, specifically those associated with the current procedure of transferring oil from the PA-A platform into tankers for transport;
- There are four key risks with respect to potential impact on the WGW population; noise and disturbance to whales during construction; ship strikes during construction; physical damage to benthic habitat during construction; and potential exposure of gray whales, their prey or ecologically important habitat (e.g. Piltun Lagoon) to oil spills and gas releases;
- The Base Case route poses additional risks because, among other things, it crosses the southern portion of the primary gray whale foraging area;
- Alternative 1 appears to be the safest with regard to the identified risks. In particular, it was noted that any oil spills and gas releases from the pipeline would likely occur farther away from the Piltun (nearshore) feeding ground and Piltun Lagoon. The only obvious disadvantage of Alternative 1 appeared to be that the probability of a leak or rupture would increase due to its greater overall length;
- Taking into account the potential risks, the uncertainty surrounding them and the questionable efficacy of proposed mitigation measures, the most precautionary approach would be to suspend present operations and delay further development of the oil and gas reserves in the vicinity of the gray whale feeding grounds off Sakhalin, and especially the critical nearshore feeding ground that is used preferentially by mothers and calves. Suspension would allow further refinement and assessment of the risk additional development of appropriate, independent mechanisms for monitoring and verification of mitigation practices;
- If, for some reason, the suspension of present operations and further development of oil and gas reserves were not deemed possible, risk management would need to be conservative with regard to western gray whales (particularly females with calves in the nearshore foraging area) and their feeding habitat (occupied from June to November). Moreover, substantial monitoring efforts would be required to assess the effects of decisions about risk management on gray whales, with the understanding that subsequent modification of procedures may be required in response to the monitoring results;
- The ISRP report provided some recommendations, including options for mitigation, and it stated that Alternative 1 would reduce the level of potential risk of harm to the WGW population from project activities in comparison with the Base Case and Alternative 2, due to the spatial separation of project activities from the whale feeding area.

13.3.5 Determination of the reroute option

SEIC undertook a review and analysis of the ISRP feedback, comments from other stakeholders, and the Company's more recent noise related modelling and verification work. The Company determined that Alternative 1 or 2 provided a more preferable option in environmental terms with respect to the WGW. A decision to re-route the offshore and onshore pipelines was therefore considered the most appropriate mechanism and way forward for reducing the risk of harm to the WGW population from project activities.

As part of the process for determining which was the better of the two options from an overall environmental perspective, additional survey work was carried out to assess onshore impacts. This took into account, amongst others, the needs of the indigenous reindeer herders in terms of pasture conservation and calving grounds, and Class 1 forest areas. Although Alternative 1 passes through or adjacent to some seasonally sensitive lagoon environments, appropriate mitigation measures for managing potential onshore impacts are available, and on this basis SEIC publicly announced its decision in March 2005 to progress with Alternative 1 as the preferred reroute option.

Further onshore ecological and environmental survey work will be undertaken for Alternative 1 and incorporated with existing environmental and technical data to finalise the route for the pipeline. Environmental mitigation measures that have been developed by the Project and which are already being implemented along the pipeline ROW will be used where appropriate and new measures or modifications to these measures formulated in order to meet environmental objectives and commitments as set out in the Health, Safety, Environment and Social Action Plan (HSESAP) Part 2 tables on Land Management (Table 2.5), Onshore Biodiversity (Table 2.3) and Offshore Biodiversity (Table 2.4).

The potential risk to WGW will be managed through the development of a detailed Marine Mammal Protection Plan that specifies mitigation measures, noise monitoring programmes during construction, "shutdown" criteria, communication and decision making processes. The key elements of this are provided in the HSESAP Part 2 table on Offshore Biodiversity (Table 2.4).

13.3.6 Further Independent Review

Following the issuance of the ISRP report, the IUCN convened a meeting in March 2005 between the Company and the whale scientists to discuss the report findings. This was followed by a meeting organised by the IUCN between the Company, the Chair of the Panel, interested NGOs and the media, to enable those parties to ask questions regarding the process and its outcome.

The Panel report, Sakhalin Energy's table of responses and the 2005 Marine Mammal Protection Plan and were used as the basis for a meeting of stakeholders convened by IUCN in Gland, Switzerland, on 11-12 May 2005.

The purpose of that meeting was to inform decision-making by SEIC and potential lenders, as related to the Project and the conservation of the Western Gray Whale Population. The Gland meeting provided an opportunity for stakeholders to share viewpoints regarding the nature and level of risks still posed to the western gray whale population by Sakhalin II Phase 2 project. A public report was issued as a result of that meeting. Given the remaining uncertainties, the potential lenders requested another meeting with the independent scientists formerly on the Panel to review the actions and approach taken by Sakhalin Energy to address these uncertainties and to prepare a written report evaluating those actions.

To that end, a second meeting was held in Vancouver, Canada on 17-19 September 2005 with representatives of Sakhalin Energy, the potential lenders, and several independent scientists. The single most important outcome of the Vancouver meeting was agreement on the formation of a long-term Western Gray Whale Advisory Panel (WGWAP) to provide a longer term mechanism for independent review and recommendation regarding management of threats to the western gray whale.

Over the course of the year in which the above meetings occurred, considerable progress has been made by all involved in identifying threats to the western gray whale and seeking solutions to reduce those threats. At the same time, however, it has become increasingly clear that many of those issues are pertinent to western gray whale conservation on a longer term and over their entire distribution range.

The key outputs of this further work will be made available on the Sakhalin Energy website as they become available. Additional mitigation and monitoring measures that are identified and agreed through this process will be incorporated into the HSESAP Part 2 commitment tables.

13.3.7 Onshore Environmental and Social Investigations

Since 1998, SEIC has carried out numerous onshore environmental surveys and literature reviews to optimise the location of the proposed onshore pipeline route. These surveys, which encompassed the area of the Base Case route, formed the basis upon which the final route was selected and which the relevant onshore sections of the Phase 2 EIA were developed. The scope and data from these prior surveys also formed the basis upon which additional onshore surveys were designed and executed during 2004 for the two alternative pipeline routes.

Environmental data collected through SEIC commissioned surveys and from other available sources has provided a good baseline against which to determine potential impacts of all of the re-route options. Specific environmental data for Alternatives 1 and 2 were collected through survey work undertaken during 2004 (data for the base case was already available from previous TEO-C and EIA studies).

Progressing Alternative 1 has required the collection and analysis of additional environmental data in order to:

- Fully determine and further refine the environmental baseline;
- Optimise the routing of the pipeline on technical and environmental grounds;
- Develop and refine appropriate mitigation measures.

Analysis of the survey work of 2004 has been undertaken and the aerial extent and composition of the surveys for 2005 were identified. Together, the two datasets will provide a comprehensive environmental baseline covering the entire pipeline ROW and the wider environment for some selected and particularly sensitive environmental parameters. The basic content of the 2005 survey programme for the onshore component of the re-route is provided below. Unless specifically stated, all of the surveys shall cover a 500m corridor of representative sections of the pipeline route. Survey methodologies shall be carried out in compliance with Russian Federation GOSTs.

Geology and topography:

- Topographic survey and levelling along the route;
- Collection of observational data at selected points along the route; and
- Drilling of boreholes and liquefaction studies at the proposed location for the pigtrap.

Hydrology and hydrochemistry - The survey covers watercourse crossings, small lakes and Chaivo lagoon. At each location the following parameters were covered:

- Watercourse channel type (width, depth, water area, flow speed, flow rate, description of sediment, maximum water level, description of floodplain);
- Lagoon/waterbody depth;
- Reconnaissance, determination of high water level and maximum theoretical water level in Chaivo Bay;
- Water quality – suspended solids, oxygen content, BOD, COD, biogenes, pH, salinity, petroleum hydrocarbons content, phenols, surfactants, pesticides; and
- Sediment quality – petroleum hydrocarbons content and heavy metals (Al, As, Ba, Cd, Cr, Cu, Fe, Hg, Pb, Zn).

Hydrobiology and ichthyology – Surveys encompassed species composition, food resources, biological status, abundance and biomass and spawning areas for salmon at the river crossings. For each watercourse, lake and lagoon the following parameters were covered:

- Sediment grain size;
- Structure and abundance of aquatic benthos, flora and phyto/zooplankton;

- Structure, abundance and biomass of fish fauna;
- The area and status of spawning areas for salmon at watercourse crossings;
- Status of rare and protected fish and invertebrate species; and
- Fishery evaluation of water bodies.

The surveys were conducted during the salmon run of 2005 (July – August).

Soil – the soil survey and laboratory analysis of samples completed the following tasks:

- Identification of sections particularly sensitive to anthropogenic impact;
- Preparation of a 1:5000 soil map;
- Identification of morphological and physical/chemical properties of soils (e.g. soil erosion, salinity levels, position of water table, humus content, absorption capacity, absorbed sodium, soil density, pH, carbonate content and mobile phosphorous);
- Assessment of the main characteristics of humic soils for protection and reinstatement within the ROW;
- Assessment of baseline content of heavy metals and petroleum hydrocarbons in soils;
- Assessment of polluted areas and levels of pollution;
- Coverage of degraded soils, to identify the type and level of degradation of soil and evaluate the area of degraded soils.

Flora and fauna (excluding birds) – The survey covered a 1km corridor around the pipeline route, and included:

- A description of the main vegetation associations and evaluation of their status;
- Identification of plant and animal species present (including lichen, moss and fungi species);
- Abundance and density;
- Identification and description of habitats and evaluation of abundance of any protected species (plants and animals) including those entered into the Red Books of Russia and Sakhalin Oblast;
- Location and abundance of commercial plant species and game fauna;
- Status of forestry and agricultural resources;
- Identification of sensitive areas, critical areas for preservation of protected or commercial plants and valuable animal species (e.g. game species);
- Select monitoring sites and undertake pre-construction monitoring.

Ornithology – En-route surveys assessed the status of breeding birds along the pipeline ROW and wider area. The surveys determined the following:

- Environmental situation, landscape pattern and status of bird assemblages;
- Species distribution, identification of nesting biotopes/sites and roosting/feeding areas along the lagoon and shore sections adjacent to the proposed pipeline route;
- Mapping of nests and nesting territories for rare and protected species (e.g. Steller's sea eagle, Siberian spruce grouse, spotted greenshank, Sakhalin dunlin, Aleutian tern, etc.); and
- Various types of bird habitats located within and outside the zone of construction impact for monitoring purposes, and to perform pre-construction monitoring of rare and protected species of birds at the selected sites.

Surveys were undertaken to coincide with the main breeding period (June-July) and main migratory period (September – October) for all key protected species.

Archaeology and cultural heritage –Archaeological investigations included:

- Walkover survey and inspection of potential sites at the landscape level;
- Identification of visible surface features and attributes of potential archaeological features (e.g. hollows in the ground where houses and other artificial structures may have been located);
- Inspection of site surface disturbed as a result of natural or anthropogenic factors to search for artefacts and check availability of occupation layers. Identification of artefacts;
- Drilling of boreholes to confirm presence of occupation layers and artefacts and identify distribution;
- Sampling for the purpose of object identification and dating;
- Photographing and/or making drawings of all discovered objects;
- Instrumental survey of all discovered objects, determination of their positions using GPS, photography and/or drawing of objects/sites as appropriate;
- Measurement of dimensions of houses, artificial structures and other objects revealed during the field survey; and
- Determination of boundaries of protection zones around discovered artefacts of cultural heritage subject to nature and area of the occupation layer.

Note: Offshore data, notably information on the WGW population and behaviour is being collected as part of the ongoing survey and monitoring programme.

Targeted social impact assessment – investigations included:

- Identification of potentially affected groups, such as herders, hunters, gatherers, fishing communities;
- Discussion with these groups the potential socio-economic impacts and concerns regarding the planned re-route,
- Assessment of potential socio-economic impacts; and
- Development of mitigation measures if required.

13.3.8 Dealing with potential environmental impacts of the re-route

A significant number of measures to mitigate the environmental and social effects of pipeline and other construction works have already been developed by SEIC and are contained in the TEO-C, International EIA, EIA Addenda and the HSESAP, Part 2. These measures shall be implemented, as required, during the construction of the reroute to ensure that the work meets environmental commitments and objectives. Given the sensitivities of some of the environmental receptors along Alternative 1 (e.g. coastal wetland habitats) and the presence of new receptors (e.g. Chaivo lagoon crossing), further measures to offset potential environmental effects associated with construction may be required. Reference to the main documents containing relevant mitigation measures and additional proposed measures are briefly described below.

13.3.9 Mitigation of offshore construction effects

In response to the independent review process (see 13.3.6), a number of modifications and additions to the mitigation measures initially set out in the CEA have been incorporated into the Marine Mammal Protection Plan (MMPP 2005). These commitments are also contained in the HSESAP Part 2 Table 2.4 (Offshore Biodiversity). The Company will continue to develop these mitigation measures and expand the base of scientific knowledge with respect to the WGW, not only as detailed in the MMPP, but also through its cooperation with the Western Gray Whale Advisory Panel (WGWAP); a body of independent scientists.

The Company shall undertake to accommodate all reasonable recommendations from the WGWAP in its Annual Work Programme and Budgets, provided that they comply with Russian law, and to seek support for these recommendations from shareholders, Russian Party and joint industry partners as appropriate.

13.3.10 Mitigation of onshore construction effects

Measures to ameliorate the effects of onshore construction during pipeline laying are contained in a number of documents, notably the International EIA (2003), River Crossings Strategy Report (2005) and relevant EIA Addenda (e.g. pipeline construction in wetlands) (2005). The various mitigation

measures detailed in these documents are collated and contained in the HSESAP Part 2 Table 2.3 (Onshore biodiversity) and Table 2.5 (Land Management). These documents are publicly available at www.sakhalinenergy.com and at www.sakhalinenergy.ru

The successful implementation of these measures address potential impacts of construction of the onshore component of the pipeline. These measures include: management of soil erosion; seasonal construction timing to avoid ecologically sensitive periods wherever practicable; and buffer zones around sensitive receptors (e.g. Steller's Sea Eagle nests during the nesting season).

On the basis of available information gained from previous survey work (2004), it is apparent that additional commitments will need to be made during construction to avoid and ameliorate adverse environmental impacts specific to Alternative 1 (i.e. not encountered on the base route) and which are not contained within the general suite of measures being utilised along the pipeline ROW. Further pre-construction environmental surveys and associated technical studies have been undertaken to refine and finalise required mitigation measures. The Company has committed to undertake a number of mitigation measures to avoid environmental impacts, namely:

- Micro-realignment to avoid key sensitive areas wherever possible (see table 13.1 for detail on micro-realignment undertaken for ecological and archaeological reasons);
- Horizontal Directional Drilling of the crossing of Chaivo Lagoon during winter;
- Winter working to avoid sensitive areas of wetland habitat used by breeding red data book bird species;
- Minimisation of footprint or land use by minimisation of ROW width and choosing block valve sites (BVS) and the pig trap sites at strategic locations (e.g. a BVS at ENL's OPF site).

These mitigation measures and associated monitoring requirements developed through the assessment work for the re-route have been included within the HSESAP Part 2 commitments' table for Onshore Biodiversity. These include a programme of monitoring surveys in sensitive bird habitats around Chaivo Bay during nesting and migratory periods for each year of construction.

13.3.11 Overview of the design and approvals timeframe

Offshore pipeline component

- Offshore engineering route surveys completed in 2004.
- Design approval documentation completed end May 2005.
- Approvals submission Q3 2005.
- Construction of the new landfall location during Q1 2006.
- Offshore pipeline installation will take place in Q3 2006.

Onshore pipeline component

- Onshore engineering route surveys partially completed in 2004.
- Some additional surveying/monitoring in summer 2005 undertaken.
- Design to be complete Q4 2005.
- Approvals and State Ecological Expertiza Review conclusion anticipated December 2005 to enable winter construction (a key environmental mitigation measure). Winter construction (first 14 km from shore and HDD) will take place during the winters of 2005/2006.
- Construction of access roads and pigging station foundations will commence Dec 2005.
- Summer construction (remaining 7 km) will take place in Summer 2006.

In Q4 2005, the Company will publicly disclose on its website the pre-construction surveys and detailed mitigation measures associated with the TEOC EIA of the Alternative 1 onshore pipeline route.