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REMEDIAL ACTION PLAN

RIVERS, EROSION CONTROL AND REINSTATEMENT AND WETLANDS

AUGUST 2007

SAKHALIN ENERGY INVESTMENT COMPANY LTD

ACRONYMS and GLOSSARY

ECR	Erosion Control and Reinstatement
FERC	Federal Energy Regulatory Commission
FOC	Fibre Optical Cable
GPS	Global Positioning System
Group 2 rivers	Less than 10000sqm spawning habitat downstream, no taimen, and medium biodiversity
Group 3 rivers	More than 10000sqm spawning habitat downstream and / or taimen habitat and / or high biodiversity
HSESAP	Health, Safety, Environmental and Social Action Plan
IMPACT/FOUNTAIN	SHELL Global Incident and Action Tracking System
KP	Kilometre Post
LGP	Low Ground Pressure (machinery)
NTU	Nephelometric Turbidity Units
RF	Russian Federation
RoW	Right of Way
RPN	<u>R</u> os <u>p</u> rirod <u>n</u> adzor
SakhNIRO	Sakhalin Institute for Fisheries and Oceanography
Sakhalinrybvod	Sakhalin Agency for Fisheries
SEIC	Sakhalin Energy Investment Company
SEIC-PDP	Sakhalin Energy Investment Company, Project Directorate Pipeline
SREPP	Soil Reclamation and Erosion Protection Plan
TEOC	Technical and Economic Substantiation of Construction
TsUREN	Federal Agency for Fisheries
WPZ	Water Protection Zone
WUL	Water-use Licence

1 INTRODUCTION

This document presents the Remedial Action Plan relating to the construction and post-construction activities on the oil and gas onshore pipelines for the Sakhalin II Phase 2 project, dated July 2007.

The plan has been produced by SEIC in the context of the requirements of the Health, Safety, Environmental and Social Action Plan (HSESAP), with its requirements for remedial action plans in the event of non-compliances against HSESAP commitments. Its overall purpose is to restore compliance of the onshore pipeline activities in relation to the HSESAP commitments.

The remedial actions described in this plan are a response to various HSESAP non-compliances that have occurred to date during the construction of the onshore pipelines in the areas of river habitat, erosion control and reinstatement, and wetlands. In relation to these non-compliances the following is applied:

- Stop the non-compliance from further occurrence;
- Monitor the effects, if any, of the non-compliance;
- Remediate the negative effects, if appropriate;
- Where remediation is not possible, create an offset for the negative effects of the non-compliance.

The plan is structured around the three topics of river habitat, erosion control and reinstatement, and wetlands and for each topic there is a chapter that sets out:

- The issue/topic;
- Details of the commitments relating to this topic;
- Description of the non-compliances that have occurred;
- Planned corrective actions.

The HSESAP commitment details are given in Attachments 1-3.

SEIC will track the actions required to restore compliance through its software system "IMPACT" and internal progress reports will be produced to assist in the remedial action work management. Regular external reports of progress against the plan will be published on the Sakhalin Energy public website www.sakhalinenergy.com

In order to prevent re-occurrence of non-compliances, a considerable management effort has been undertaken within the pipeline organisation to eliminate root cause problems. These include deficiencies in contractor management and in this respect the commercial/contractual framework of the main pipeline project contract was changed on 15 January 2007. This change includes the use of integrated teams i.e. SEIC and the main contractor, with SEIC staff taking controlling roles in certain management areas including three key site management positions (Section Managers), for Sections 1, 2/3 and 4; a new position and appointee of Environmental Manager reporting to the onshore pipeline Project Manager; and five new Environmental Coordinators together with Reinstatement Supervisor positions within the construction teams.

2 RIVER HABITATS

2.1 Description of Issue

The Sakhalin Energy Investment Company (SEIC) pipelines cross over 1,000 watercourses and the overall strategy taken with respect to these is documented in the River Crossing Strategy [SEIC 5600-S-90-04-7-7018-00]. 179 of these watercourses are listed as salmon spawning rivers classified as being most sensitive (Group 2 and 3) and 55 tributaries as having the potential to impact on Group 2 and 3 rivers. These sensitive tributaries were identified by carrying out a review of the hydrogeomorphological susceptibility of each tributary.

Construction of the winter river crossings started in winter 2004/2005, spanned over the 2005/06 and 2006/07 winter construction windows and, on 14th April 2007, the winter river crossing programme was completed. Given that the winter crossings are complete, the emphasis of this Remedial Action Plan is on the historical description of non-compliances and on the actions to remediate the identified impacts to the river habitat.

SEIC has demonstrated continuous improvement in performance during the winter river crossings campaigns and this was assisted by the decision by the authorities in late March 2006 to allow the use of the flume-pipe techniques for “dry” rather than “wet” crossings for some of the rivers. Wet cut river crossings are undertaken without diversion of river flow away from the work area. Dry cut techniques on the contrary, involve water containment, such as passing it through a flume pipe or the use of dam and pump to allow work in “dry” stream/river beds. “Dry” crossings result in a lower sediment flow downstream the crossing. Specifically, approximately 81% of the crossings were performed using the preferred dry cut method during the 2006/2007 winter season, compared to around 20% of the crossings being dry cut during the winter season 2005/2006.

The team of External Observers that SEIC mobilised during the 2005/06 winter crossing period, to monitor River Crossing Strategy compliance, observed non-compliances for 978 of the 5,000 requirements (or approximately 20% of the total). During the 2006/2007 winter crossing season, External Observers reported 224 non-compliances out of 2,410 requirements (approximately 9%) via the designated checklists. Most of these non-compliances have already been addressed (i.e. implemented directly on site where possible) and closed out, particularly those relating purely to construction practice during the crossing season, and are not referred to in this Plan.

The remaining HSESAP non-compliances are the primary focus of this action plan, which sets out measures to ensure that the non-compliances are addressed.

2.2 HSESAP Commitments

The HSESAP commitments relating to the non-compliances during the winter river crossings campaigns are listed in Attachment 1.

2.3 Description of Non-compliances

Some construction practices during the river crossings were identified that did not meet the HSESAP commitments. These include: non-consecutive crossings of individual rivers (i.e. multi-season, contrary to regulatory requirements), river drying incidents, long duration of in-stream construction activities, crossing of sensitive rivers outside of mid-winter without use of dry cut methods (including some crossings outside of the wider winter period). In total, approximately 50% of the group 2 and 3 rivers have been affected by one or more of the above non-compliances.

The majority of the non-compliances listed in Attachment 1 are historic since the activity has been completed. However in the special case of the Pulka River (Group 2), summer construction works being carried out under an RPN approved detailed design entail partial diversion of the river. Approval from the relevant authorities has been gained for diversion of the river and mitigation measures are being put in place. The river is being diverted through flume pipes to minimise sediment input, due care is being taken when working in the WPZ and works are monitored daily by on site environmental inspectors.

The significance of the stated non-compliances has been assessed and the most significant potential consequence is the release of sediment to the water bodies and its impact on the river habitat, such as smothering of spawning grounds. The overall significance has been assessed as “amber” using the HSESAP risk assessment matrix.

Individual non-compliances are included in Attachment 1, where relevant, below the corresponding commitment description.

2.4 Corrective Actions

Since the river crossing non-compliances are mostly historical (river bank reinstatement is considered further in Erosion Control and Reinstatement Chapter), corrective actions are focused on monitoring the consequences of those non-compliances and are accompanied by remediation as needed.

The River Crossing Strategy specifies the requirements that should be included in the design of the post construction-monitoring programme. The programme will be designed to determine:

- The impact of sediment released during the construction work;
- The effects of the works at the crossing point; and
- The effectiveness of mitigation and restoration measures.

During this monitoring programme the following parameters will be taken into consideration where required: river morphology, hydrochemistry, suspended sediment sampling and turbidity monitoring, ichthyofauna and benthos, and fisheries characteristics.

Two monitoring programmes, complimentary to each other, are considered below.

Monitoring during the construction phase

This programme has a pre-construction, construction and post-construction component and lasts as long as construction takes place. It considers short-term consequences of the construction activities.

Medium and long-term post construction monitoring

This programme occurs in the medium and long-term period beyond construction, and considers medium-term and long-term affects (if any) of the construction activities. It also assesses the effectiveness of the mitigation measures applied during construction phase

There will also be monitoring during the operations phase of the pipelines after operations commence. This will focus on monitoring environmental effects potentially resulting from normal operating activities and is approved by the Russian Federation (RF) State Environmental Expertise. Relevant sections of this monitoring are briefly included in Table R-2 below.

The tables below present the corrective actions in a standardised form with the following components: the corrective action in detail, deliverables with timing and the objectives/success criteria.

R-1. River monitoring during the construction phase

<p>Corrective action in detail</p>	<p>Construction monitoring started in 2004 and is still taking place in order to evaluate the health of the rivers that are potentially affected by construction activities. Summer and autumn construction monitoring campaign 2007 is the final step of this activity.</p> <p><u>Sediment sampling</u> was carried out during construction of each winter river crossing and an analysis made of Total Suspended Solids and Grain Size Analysis coupled with flow velocity and turbidity measurements. The survey area encompassed the stretch of river 50m upstream to 500m downstream (extending up to 1km downstream if turbidity readings exceeded 200 NTU (Nephelometric Turbidity Units) at 700m and 900m downstream respectively). Turbidity measurements are being carried out during 2007 summer and autumn at least once a month at every Group 2/3 river. The aim of this monitoring is to assess the efficiency of sediment control measures installed.</p> <p><u>Hydrological and hydrochemical monitoring</u> has been developed and undertaken to address Technical and Economic Substantiation of Construction (TEOC) requirements. It covers 31 rivers that were selected through the TEOC process to represent the main types of rivers in relation to the riverbed processes. Selection was based on; landscape characteristics; channel formation; channel dynamics and riverbed processes. Also these rivers belong to the high fishery category and were to be crossed by the open cut method. This programme has been approved by Sakhalin Oblast Department of hydrometeorology and environmental monitoring, Amur Water Basin Inspection and Rosprirodnadzor (RPN). The monitoring parameters include: flow rate, depth, pH, dissolved oxygen, suspended matter, Total Petroleum Hydrocarbon (TPH).</p> <p><u>Fishery characteristics monitoring</u> has been developed in response to the State Environmental Expertise requirements. This programme was</p>
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	<p>approved by FGU TsUREN (Federal Agency for Fisheries), Sakhalinrybvod (Sakhalin Agency for Fisheries) and RPN. It covers spawning area monitoring for 85 rivers, mostly of Group 3 type. Additionally, zoobenthos and ichthyofauna are monitored for 26 control rivers. Monitoring parameters include:</p> <ul style="list-style-type: none"> • river width, depth, flow rate; • suspended matter: sampled at 50m upstream and 500m downstream from the point of crossing; • granulometric composition: sampled at 50m upstream, point of crossing, 20m, 150m, 250m, and 500m downstream from the point of crossing; • salmon spawning area condition: evaluated at 50m upstream, point of crossing, 20m, 150m, 250m, and 500m downstream from the point of crossing; • zoobenthos quantity and biomass: sampled at 50m upstream, point of crossing, 20m and 150m downstream from the point of crossing; • ichthyofauna quantity and biomass: sampled at up to 100m upstream, point of crossing and 500m downstream from the point of crossing. <p>Where riffles, sizeable bends, multiple branches of river channel etc. are present at the survey site, the sampling net may become denser.</p> <p>Both of the above programmes have been executed by a third-party company “Averina”¹ as a sub-contractor to the main contractor Starstroi.</p> <p>The monitoring is specifically used to enhance understanding of the combined effect of river crossings made during different winter crossing campaigns. This work is focused on monitoring the status of invertebrate communities and the characteristics of salmonid spawning substrates in sections downstream of the crossing points on affected rivers. Where, from analysis of this data, it is apparent that an adverse ecological effect has occurred, suitable mitigation measures are being developed and implemented in line with those already prescribed in the River Crossing Strategy.</p>			
Deliverables	<i>Detailed action points</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>

¹ CJSC “Averina” is a reputable Russian company performing integrated tasks in the field of industrial ecology. Its key personnel have 10-15 years of experience performing various environment protection and research projects. In particular, about 40 projects in the field of environment protection were executed during the last years including environment protection sections of projects and work documentation for construction stages, defining damage to fish bio-resources, environmental monitoring programs, support of SEER of various projects, public consultations materials on oil and gas projects, etc. Averina was selected through a formal tender process by Starstroi.

with timing	1.1 Execute a summer and autumn construction monitoring campaign.	Field survey	SEIC-PDP Environmental Manager/ Starstoi/ Averina	August- October 2007
	1.2 Report results of the summer/autumn monitoring campaign.	Final Report		February 2008
	1.3 Carry out detailed analysis of the monitoring results 2004-2007.	List of the rivers identified for medium term monitoring. Report summarising river status, and highlighting impacts in comparison with pre-construction status (where available).		March 2008
Objectives and success criteria	<p>Objective: Assessment of the actual short-term potential impact on the rivers due to construction activities.</p> <p>Success criteria: Fully executed monitoring programme. Identification of short-term environmental impact on fish habitat due to construction confirmed, as verified by the SEIC-PDP Environmental Manager after analysis of monitoring data and reports.</p>			

R-2 River monitoring during the medium and long-term post construction period

This section only covers monitoring related to remedial work associated with river habitats and does not cover other monitoring activities during operations.

Corrective action in detail	<p>After the end of construction phase, medium term monitoring will take place. The programme will be designed to assess:</p> <ul style="list-style-type: none"> • the possible medium-term impact of sediment released during construction work; • the medium-term effects of river bed disturbance at the crossing point; and • the effectiveness of mitigation and restoration measures.
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	<p>In the case of critical rivers, the following parameters will be considered for monitoring (in line with monitoring during the construction phase); main hydrology parameters, bottom sediment composition, spawning areas and redds, and benthos.</p> <p>When selecting the rivers for monitoring, the following parameters will be considered:</p> <ul style="list-style-type: none"> • efficiency of river crossing (i.e. peak NTU-value, duration of crossing, whether drying up occurred, number of non-compliances); • method of river crossing (wet cut crossing or dry cut); • sensitivity of river (tributary, Group 2 or 3); • availability and quality of data collected prior to the crossing (benthos, ichthyofauna, hydrology etc); and • compatibility with rivers being monitored in the long term monitoring programme(see below). <p>The selection will include the Pulka and Nabil rivers.</p> <p>A specialist third-party contractor will be selected for executing this programme which is being developed during 2007 and which will have an end date of 2011. This contractor will be selected according to the following criteria: locally based, Russian and with experienced in river habitat monitoring on Sakhalin.</p> <p>The medium term monitoring programme will be submitted for approval to the RF authorities. If residual impacts or deterioration of the situation due to project activities were observed, the monitoring programme would be extended.</p> <p>Long term monitoring</p> <p>In addition, SEIC has committed to long term monitoring during the Operations phase of the pipelines under a separate scope of work, and the programme has been approved by RF authorities.</p> <p>The following parameters from the long term monitoring programme will compliment the medium term monitoring scope of work described above.</p> <p><u>Hydrological and hydrochemical monitoring</u></p> <p>Monitoring will include; water flow, suspended solids, granulometric composition of bed load and dissolved oxygen (together with non-construction related parameters which will not be analysed as part of this programme).</p> <p><u>Biological monitoring</u></p> <p>Observations of the condition of macro-zoobenthos species: total</p>
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	<p>abundance (specimen/m²), total biomass (g/m²), total number of species; number of groups (according to Appendix 3 GOST²), number of species in a group, biomass (abundance and diversity) of main groups (g/m²); abundance of main groups (specimen/m²); common species and indicator species (name, percentage of total abundance).</p> <p>A third party company will be appointed to carry out the monitoring programme subcontracted according to the selection criteria noted above and will be managed by SEIC Operations HSE.</p> <p>Actions pertaining to the long term monitoring programme are not included in this plan and are the responsibility of SEIC Operations HSE.</p> <p>Since there are no official standards for benthos and ichthyofauna surveys in Russia, the corresponding monitoring methodology for the construction phase of the Sakhalin II Phase 2 Onshore Pipeline Project was substantiated and developed by the leading Sakhalin Institute for Fisheries and Oceanography (SakhNIRO), in accordance with the monitoring practices accepted in the RF scientific community.</p> <p>The SakhNIRO methodology was included in the "Programme of monitoring spawning rivers in crossings with Sakhalin II pipeline". The Programme was approved by Sakhalinrybvod and TsUREN.</p>
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Medium term monitoring programme

Deliverables with timing	Detailed action points	Deliverable	Action party	Timing
	2.1 Identify the most critical rivers affected by non-compliances during the winter river crossing(s).	List of the selected rivers (scope for medium term monitoring).	SEIC-PDP Environmental Manager/ specialist sub-contractor	January 2008
	2.2 Set up a post-construction monitoring programme	Medium term monitoring programme		March 2008
	2.3 Execute a medium term monitoring programme.	Annual monitoring reports	SEIC-PDP Environmental Manager/transition to SEIC-HSE Manager	2008-2011 (or longer if monitoring results indicate this is required)

² GOST is a Russian technical standard.

	2.4 Evaluate the results.	Advice for remediation	SEIC-PDP Environmental Manager/transition to SEIC-HSE Manager	2008-2011
Objectives and success criteria	<p>Objective: Assessment by SEIC-PDP Environmental Manager and specialist sub-contractor of the actual medium term impact on the rivers due to construction activities.</p> <p>Success criteria: Fully executed monitoring programme. Identification of medium term environmental impact on fish habitat due to construction confirmed, as verified by the SEIC-PDP Environmental Manager after analysis of monitoring reports and associated remediation plan.</p>			

R-3. Remediation

Corrective action in detail	<p>Monitoring programmes (construction and medium term) will deliver results on a yearly basis reflecting river status. Data from this work, and previous baseline studies, will be analysed to determine the impact of the river crossings on aquatic ecology and physical habitat conditions.</p> <p>On the basis of this assessment, any additional specific remediation plans will be developed in consultation with local authorities and experts and may include one or more of the following:</p> <ul style="list-style-type: none"> • Targeting locations of sediment load into the watercourse and installation of additional sediment control/erosion control measures as and where required in order to minimise sediment load if this is identified as contributing to, or being the cause of impact. • Riverbank rehabilitation across the RoW to stabilize banks and encourage habitat regeneration. Banks may require reshaping or rebuilding if there is evidence of hydrological disturbance as a result of bank contours (i.e. scour, eddies or ponding). Revegetation of banks will be observed and enhanced by additional seeding if required. • Based on expert hydrologist advice, substrate or in-stream channel remediation may be carried out, but the potential short term negative effects of this work would be carefully considered (i.e. sedimentation). Where there is evidence of unnatural ponding, riverbed scour or shallowing, remediation of this type may be considered taking all factors into account. <p>The ultimate aim of these actions will be to ensure that there is no net loss</p>			
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	<p>of habitat available for spawning salmon as a result of pipeline construction activities.</p> <p>A reputable Russian or international advisor will be selected on a case by case basis.</p>			
Deliverables with timing	<i>Detailed action points</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	<p>3.1 Obtain expert input and agreement with Russian authorities on remedial actions, if any. Identify remediation benchmarks and criteria that indicate successful remediation.</p>	Expert advice/approval	SEIC-PDP Environmental Manager/ /transition to SEIC-HSE Manager/ external advisor	2008 – 2011 after review of monitoring reports and data
3.2 Execute remedial actions, if any.	Remediated rivers	2008 – 2011 as agreed		
Objectives and success criteria	<p>Objective:</p> <p>River habitat recovery as defined in the medium term Monitoring Programme or as otherwise agreed with the authorities.</p> <p>Success criteria:</p> <p>Rivers remediated in accordance with requirements and river habitat recovery demonstrated, as verified by the SEIC-PDP Environmental Manager or delegated external advisor by analysis of monitoring reports.</p>			

R-4. Offset: River restoration project

Corrective action in detail	<p>The project focuses on the restoration of salmon spawning habitat through the use of appropriate management measures, such as limiting fine sediment inputs from sources adjacent to watercourses and/or the creation of new in-channel habitat. Such measures are viewed within the overall concept of restoring and sustaining ecological function to the selected river basin so as to benefit a wide range of species and not just spawning salmon.</p> <p>In cooperation with Nogliki fisheries association and other relevant authorities and interest groups, the Dzhimdan River was chosen as the first restoration project.</p> <p>The Dzhimdan restoration work is the first step in determining how to measure habitat i.e. to provide metrics which SEIC can apply to all of the winter river crossings to estimate actual loss and also to demonstrate when remediation is sufficient to be able to demonstrate no net loss.</p>
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	<p>The Dzhimdan (and any following) project is split into two phases.</p> <p><u>Phase 1 - Site selection, survey and planning.</u></p> <p>Discussions with local fisheries inspection and relevant Russian experts will take place in order to choose the river, to prioritise the river reaches and areas for restoration, to coordinate and approve the plans and to be sure that all the issues are addressed. Surveys (including any relevant pre-construction data) will provide baseline parameters of the river and its fish population that will be used to evaluate the progress achieved in Phase 2. Water quality, riverbed quality, distribution and filled density of spawning grounds, survivability of eggs, benthos and upstream/downstream fry migration will be covered. The survey is to be performed by a contractor, SakhNIRO.</p> <p><u>Phase 2 - Restoration work, monitoring and management.</u></p> <p>The plan of restoration works depends on the results of the reconnaissance survey in Phase 1, which will identify anthropogenic or naturally disturbed areas. It has to be approved by stakeholders (e.g. by authorities and controlling agencies). The examples of possible restoration works are: removing logjams, culvert replacement, tree planting in the Water Protection Zone, slope stabilisation, reduction of the fine sediment input, improving the spawning ground quality, etc. The monitoring plan will include annual reports with an assessment of the success of the restoration measures applied.</p> <p>Phase 1 is being undertaken in 2006/2007 and Phase 2 from 2007 onwards for a period of up to 5 years in order to obtain suitable data to determine success. Throughout, opportunities for socio-economic benefit (e.g. local employment, business creation in local communities etc.) will be sought and integrated into the project.</p> <p>The experience gained in this project can provide the opportunity to review and improve river restoration methods and approaches in order to apply them to other river basins and on pipeline river crossings from 2008 onwards if an impact is identified during monitoring works.</p> <p>The contractor specialist third party and monitoring specialist third party for Phase 2 are yet to be awarded.</p>			
<p>Deliverables with timing</p>	<p><i>Detailed action points</i></p>	<p><i>Deliverable</i></p>	<p><i>Action party</i></p>	<p><i>Timing</i></p>
	<p>4.1 Conduct reconnaissance survey and watershed assessment of the river to identify areas for restoration.</p>	<p>Field survey and development of restoration plan in consultation with experts</p>	<p>SEIC-Operations/ SEIC-HSE Manager/ SakhNIRO</p>	<p>July 2007</p>

	4.2 Carry out detailed ecological survey of the river sections.	Report on baseline ecological characteristics of the Dzhimdan river		November 2007
	4.3 Implement initial restoration measures at identified areas. Determine whether further river basins be selected for offsets in the event that net fisheries loss is observed to have occurred as a result of construction.	Restoration work completion	SEIC-Operations/ SEIC-HSE Manager/ contractor (construction)	Summer-Autumn 2007 (dependent on the status of salmon spawning timing and conditions)
	4.4 Monitor the environmental conditions of river and control of the implemented measures.	Annual field monitoring surveys Site inspections Monitoring reports	SEIC-Operations/ SEIC-HSE Manager/ contractor (environmental)	2008 – 2011
Objectives and success criteria	<p>Objective: Developing approaches and methods that contribute to maintaining natural salmon populations and the ecosystems that support these populations.</p> <p>Success criteria: Effectiveness of the restoration measures assessed against the changes in the environmental characteristics of the salmon habitat as verified by the SEIC-Operations HSE/Environmental Manager.</p>			

3 EROSION CONTROL AND REINSTATEMENT

3.1 Description of Issue

This chapter of the Remedial Action Plan covers HSESAP non-compliance in the areas of:

- temporary erosion control; with the objective to reduce slope instability, minimise surface erosion and prevent sediment run off into adjacent watercourses before installation of permanent erosion control measures;
- technical reinstatement; involving the removal of construction debris, pipeline right of way (RoW) clean up, levelling and re-contouring to pre-construction contours where possible, installation of permanent erosion control measures; and
- biological reinstatement; soil preparation and seeding.

This is collectively called Erosion Control and Reinstatement (ECR).

Comments.

- (i) *The term Technical Reinstatement is used in this document to describe both the minimum reinstatement requirements necessary before hydrotesting and commissioning and the final reinstatement necessary prior to biological reinstatement and return of the land to the landowners. (Efforts will be made to attain final reinstatement wherever possible but this will not be the case in many areas of the RoW during 2007 due to construction constraints).*
- (ii) *Seeding, both hydroseeding and conventional seeding, performed until now has been undertaken as a temporary erosion control measure. The term "seeding" is used in this remedial action plan to refer to temporary seeding (additional clarification is given in Action E-1). Seeding to be carried out during biological reinstatement is not included in this plan.³*

Pipeline construction activities commenced in 2004. By November 2006, almost the entire RoW had been cleared and both oil and gas pipelines had been installed along the majority of the RoW. In view of the discontinuous nature of pipeline installation, and the separate installation of the Fibre Optic Cable (FOC), only limited permanent reinstatement has been completed on the RoW to date. As a result installation of temporary erosion control has been and remains the primary method of reducing soil instability and to prevent sediment discharge into watercourses.

3.2 HSESAP Commitments

The HSESAP commitments relating to the non-compliances during the temporary erosion control and reinstatement campaign are listed in Attachment 2.

³ An Addendum to Soil Reclamation and Erosion Protection Plan (SREPP) is under development. A draft has been submitted to the site teams for comment, and when revisions are finalised it will go through approval by land users and other relevant stakeholders. Target date for the SREPP with addendum to be in place is September 2007. Tendering for execution of biological reinstatement is ongoing. Target for completion of biological reinstatement is December 2008.

3.3 Description of Non-compliances

In the area of erosion control and reinstatement, the following non-compliances have been observed:

- Track walking for surface stabilisation has been limited. The lack of equipment suitable for track walking has reduced the opportunity for executing this type of temporary erosion control;
- Slope breakers are the primary method of drainage control and need to be installed on all bare slopes. Slope breakers have been installed at an increasing number of sites but there are some inconsistencies in adherence to HSESAP requirements (e.g. slope breakers constructed too deep, too infrequently, angle of slope breaker too steep, inadequate outflow control);
- Sediment control relates primarily to the installation of silt fences. This is generally in line with the HSESAP commitments, although minor breaches have occurred, especially with regard to maintenance.

Topsoil has not always been segregated where relevant and this may make biological reinstatement more challenging in some areas. In addition, the amount of topsoil that has been stripped and stockpiled is limited. Whilst the HSESAP commitment proposes that topsoil will be stripped in all areas, RF requirements stipulate that where the topsoil depth is less than 10cm, topsoil stripping is not required. To improve re-vegetation, the HSESAP advocates the use of mulch and fertilizer. However, the use of mulch and fertilizer is not permitted by the Forestry Department, except in conjunction with hydroseeding. The lack of topsoil issue is being addressed as part of the biological reinstatement plan and is not included in this Remedial Action Plan.

Addressing the non-compliances entails bringing ongoing project activities back into compliance with the HSESAP, preventing reoccurrence and the remediation of any actual impacts that may have resulted from the non-compliances.

The significance of these non-compliances has been assessed and the most significant potential consequence is sedimentation of sensitive water bodies as a result of lack of or poorly maintained erosion control measures, lack of surface stabilisation and limited permanent reinstatement. The overall significance has been assessed as “amber” using the HSESAP risk assessment matrix.

Individual non-compliances are included in Attachment 2, where relevant, below the corresponding commitment description.

3.4 Corrective Actions

Specific corrective actions to limit and remediate the consequence and to restore compliance have been grouped into the following programmes:

- Temporary Erosion Control Campaign 2007;
- Reinstatement;
- Spoil management;

- Winterisation Campaign 2007.

Monitoring and remedial action in relation to the potential sedimentation of sensitive rivers is covered in Chapter 2 (River Habitat).

The tables below present the corrective actions in a standardised form with the following components: the corrective action in detail, deliverables with timing and the objectives and success criteria.

E-1 Temporary Erosion Control Campaign 2007

<p>Corrective action in detail</p>	<p>The temporary erosion control plan for 2007 recognises that temporary erosion controls installed during 2006 and the winter river crossing campaign 2006/2007 will require maintenance. The plan sets schedules for installation of new erosion control measures in the spring/summer of 2007 and maintenance of existing measures. The programme covers 270 locations and comprises some 639⁴ activities. The focus and priority are given to locations with Group 2/3 river crossings and adjacent slopes. These have been identified as posing the highest potential impact from sediment laden run-off entering rivers. The programme covers 114 out of the 170 sensitive rivers (65 Group 2 rivers and 49 Group 3). The other 56 rivers are in relatively flat areas or do not require additional temporary erosion control work because they are in good condition due to the erosion control works carried out in the previous years. Sensitive rivers that were crossed in the winter river crossing campaign 2006/2007 represent 30 of the locations.</p> <p>The main activities identified in the scope of work for 2007 are:</p> <ul style="list-style-type: none"> • Silt fence installation and repair; • Slope breakers installation and repair; • Reno mat repair or replacement; • Temporary and unstable bridge removal, bridge repair, and acquisition of new temporary bridges from the RF Military; • Flow clearance and the removal of ice plugs from bridges and culverts to prevent flooding on the RoW due to ice plugs blocking water flow; • Slope stabilisation, in particular currently vulnerable high risk slopes (e.g. drainage channels, hydroseeding and coconet/geojute). <p>Other repair or clean activities were also identified: clearance and maintenance of culverts, streambeds, berms, drainage ditches and trenches, levees, toe-boards. At rivers, the bank will be stabilised, silt fences will be installed and the area will be seeded.</p> <p>An erosion control incentive scheme is in place, managed by SEIC-PDP</p>
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⁴ The number of locations varies, as access improves to previously inaccessible sections of the RoW.

	<p>Commercial Manager.</p> <p>The following actions stem from the temporary erosion control campaign:</p> <p><u>1. Training</u></p> <p>Toolbox talks were held prior to start of temporary erosion control campaign and when new activities were being started (e.g. hydroseeding). Formal training with dedicated trainers was organised for section 1 this year and it was done on other sections in the summer of 2006. Appropriate training will also be given to any new personnel joining the crews.</p> <p>Additional supervision in the form of site based Reinstatement Coordinators are in place to ensure supervisors and operators are aware of temporary erosion control techniques, i.e. temporary slope breakers to be installed according to HSESAP specifications. The role of the Reinstatement Coordinators is to ensure compliance and they have the authority to reject the work until it meets project standards.</p> <p><u>2. Material procurement</u></p> <p>Materials availability has been reviewed by the SEIC-PDP Environmental and Construction teams and additional stores procured where needed.</p> <p>Dedicated procurement officers have been established on each section to track material use and requirements. Their role is to track the supply of materials such as filter fabric, wooden stakes, hand tools, seeds, hydroseed products, hydroseeder spare parts. Inventories are checked on a regular basis and submitted to Yuzhno procurement team informing quantities in stock and site requirements. Procurement requests are submitted in advance of stocks running out and currently a 2-month lead time is allowed for imported materials and 1 month for local materials. There are adequate stocks of materials on the island for the temporary erosion control campaign.</p> <p><u>3. Installation of temporary erosion control measures</u></p> <p>SEIC-PDP Reinstatement Coordinators will establish where temporary erosion control measures need to be installed by visiting sites and visually assessing the status of existing erosion control measures. The coordinators will supervise works to ensure that:</p> <ul style="list-style-type: none"> • Slope breakers are installed according to HSESAP requirements; • Silt fences are constructed according to erosion control procedures and typical drawings and are installed according to HSESAP requirements; • Any other temporary erosion control measures used on site are designed and installed or repaired to ensure fitness for purpose (i.e. drainage installation or repair, renomat repair, removal of bridges). <p><u>4. Maintenance</u></p>
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	<p>The SEIC-PDP/Starstroi project team on each site is responsible for notifying the Site Reinstatement and Environmental Coordinators of maintenance requirements identified during their routine site visits. The Reinstatement Coordinator is then responsible for incorporating the maintenance work into the plan and supervising completion. In addition to notification from project team members, erosion control works will be inspected at each sensitive river location during the turbidity monitoring (see item 7 below) and addressed in the same manner.</p> <p>The need for maintenance may be indicated by any one or combination of the following factors; broken, stolen or breached silt fences; breached or sediment filled slope breakers; blocked or insufficient drainage; visual surface erosion (i.e. rills or channels on RoW); visual impact on river water quality as a result of run-off from the RoW.</p> <p><u>5. Track-walking</u></p> <p>Track-walking will be carried out as per HSESAP requirements depending on availability of suitable equipment and provided that it can be accomplished in compliance with all HSE requirements, permits to work and work procedures. The requirement for track-walking will be assessed by the SEIC Reinstatement Coordinators.</p> <p><u>6. Temporary seeding</u></p> <p>In addition to temporary technical erosion control measures temporary biological measures will also be applied where relevant. Preliminary visual observations of effectiveness of temporary seeding carried out in 2006 indicate the following:</p> <ul style="list-style-type: none"> • hydroseeding was the most effective method of temporary seeding on the sandy soils in Sections 1A/B and 1C; • hydroseeding has been effective on slopes in Sections 1C and 2; • manual seeding has been effective on riverbanks in Section 2; and • aerial seeding has been effective on the flat areas in Section 2 but not as effective on the hilly sections of the RoW including areas of Section 3. <p>Temporary seeding will be used as an integral part of the 2007 temporary erosion control programme and will be carried out at priority locations.</p> <p>Hydroseeding forms part of the final biological reinstatement programme therefore its usage as a temporary erosion control technique will be balanced between where final works can be completed and priority areas.</p> <p>Six hydroseeders have been mobilised and hydroseeding has commenced on all sections. The hydroseeding programme is being refined to maximise efficiency. It focuses on 47 km of steep slopes (>10 degrees), subject to permission of the landowners to hydroseed. These</p>
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	<p>slopes are also targeted for drainage controls and sediment controls as well as seeding. Alternatively, if hydroseeders will not be able to access/work on some steep slopes, they will be protected by other erosion control means such as slope breakers, drainage, silt fences etc. Hand seeding in combination with coconet/geojute may be also applied. The mentioned erosion control measures will be implemented based on site-specific judgments of Reinstatement Coordinators and accessibility to sites. Additional resources will be added to undertake manual seeding as a temporary measure. For instance, two crews from EMERCOM (Ministry of Emergency) have been mobilised to section 2 and 3 consisting of 15 men each. Part of their scope of work is manual seeding of WPZ and slopes. When necessary, special surface preparation will be undertaken to prevent seed wash-off on slopes.. It is projected that approximately 50% of these slopes (~24 km) will be hydro-seeded this year based on all hydro seeders working daily for the remainder of the season, accounting for weather conditions and accessibility to slopes, equipment reliability, and landowner approval. As stated above, the remaining critical slopes have been or will be included in the Temporary Erosion Control Campaign 2007, Winterization Campaign 2007, and/or targeted for manual seeding, technical stabilization (e.g. gabions for side cuts), or final technical reinstatement activities as appropriate.</p> <p><u>7. Turbidity monitoring</u></p> <p>Turbidity measurements will be undertaken at all Group 2/3 rivers at least once a month, until October 2007, upstream and downstream of the pipeline crossing. Turbidity sampling protocol defines how turbidity measurements should be performed. Specifically, sampling should be done 50 m upstream and 50 m downstream of the crossing (other sampling points are possible); in case samples are taken back to the office the sample bottle should be agitated prior to filling measuring vials. A standard Turbidity Reading Record form should be filled in. It includes among the others, notes on weather conditions (rain/ dry/ snow/ freezing) and on river stage (flood/ high// mid/ low). The staff is encouraged to record comments in the form, i.e. any useful information about sample site, access, or other point sources of sediment. In interpreting results, due consideration will be given to the prevailing weather conditions with priority given to readings taken during or after precipitation.</p> <p>The field environmental team will take turbidity readings under the overall responsibility of the SEIC-PDP Environmental Manager.</p> <p>The measured turbidity difference between upstream (i.e. unaffected by sediment input from the RoW) and downstream locations will be used as an indicator of the effectiveness of erosion controls. A difference of more than 10 NTU is being used as a threshold difference (red indicator). Evidence from other studies, particularly those in the United States, indicates that a 10 NTU rise above background levels may have an effect on freshwater life (fish and invertebrates) particularly over the long term. Additionally, for clear water (<10 NTU), amber indicator reflects a</p>
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	<p>small increase in turbidity if the downstream value is more than twice the upstream value. This approach is consistent with that adopted in 2006.</p> <p>If an increase in turbidity values greater than 10 NTU is found across the RoW, additional attention will be given to these sites as required, i.e. by installing additional erosion control measures or enhancing existing measures. Additional turbidity monitoring (readings taken at least fortnightly) will be carried out until the values fall below the threshold.</p>			
Deliverables with timing	<i>Detailed action point</i>	<i>Deliverable</i>	<i>Action Party</i>	<i>Timing</i>
	1.1 Training Carry out on-site demonstrations and instruction in temporary erosion control techniques.	Onsite demonstrations carried out	SEIC-PDP Reinstatement and Environmental coordinators	July 2007
	1.2 Materials Ensure that equipment and materials can be obtained on an as needs basis to allow repairs to control measures.	Inventories forwarded weekly to Yuzhno procurement team	SEIC-PDP Reinstatement Lead (Yuzhno)	May – July 2007 (will continue for technical reinstatement)
	1.3 Installation of temporary erosion control measures compliant with HSESAP and fit for purpose.	Erosion control works are performed and maintained as specified in Scope of Work and installed as per HSESAP requirements: 639 action points at 270 locations.	SEIC-PDP Section Managers	June - October 2007
	1.4 Maintenance of temporary control measures.			
1.5 Track-walking in accordance with HSESAP commitments where possible.				

	1.6 Temporary seeding carried out according to scope of works and taking results of 2006 seeding into account	Temporary seeding carried out as per temporary erosion control scope of works. Hydroseeding steep slopes (>10 degrees)	SEIC-PDP Section Managers	June – August 2007
	1.7 Turbidity monitoring for all Group 2/3 rivers.	Turbidity measured monthly on 170 Group 2/3 rivers	SEIC-PDP Environmental Coordinators	June – October 2007
Objectives and success criteria	<p>Objective:</p> <p>Temporary erosion control measures installed at 270 locations identified in the temporary erosion control scope of works. 80% of the scope to be executed by August 2007; the remaining 20% primarily as a result of access problems and water use licence (WUL) restrictions are targeted for completion by October 2007.</p> <p>Hydroseeding: focus on steep slopes (>10 degrees) with all 6 hydroseeders active on all the sections until no longer practical (i.e. September/October 2007).</p> <p>Turbidity difference downstream versus upstream for all Group2/3 rivers less than10 NTU.</p> <p>Success criteria:</p> <p>Temporary erosion control measures compliant with HSESAP commitments.</p> <p>No visual observations of significant erosion features at Group 2/3 rivers as verified by SEIC-PDP Reinstatement Coordinators.</p> <p>Visual observation of successful germination.</p>			

E-2 Reinstatement

Corrective action in detail	During 2006 technical reinstatement measures were undertaken on approximately 200km of the RoW. This work was not subject to the reinstatement process recently implemented by SEIC. The quality of this technical reinstatement is currently being assessed by SEIC-PDP Reinstatement Coordinators as access allows. The work will either be
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	<p>approved or a punch list prepared and additional works undertaken under the supervision of a Reinstatement Coordinator in order that they meet HSESAP and project requirements (such as those specified in the Erosion Control and Reinstatement Plan). No final biological reinstatement works were undertaken in 2006.</p> <p><u>1. Erosion Control and Technical Reinstatement Schedule</u></p> <p>Schedule information for final reinstatement has been received from each of the sections and has been included in both a stand-alone schedule and integrated into the overall construction schedule. The level of detail in the schedule is being updated on an ongoing basis as RoW access improves and all critical areas requiring major technical reinstatement works prior to hydrotesting are identified.</p> <p>These critical areas include <u>very</u> steep slopes (greater than 22 degrees), significant groundwater seepages where engineered drainage is required, sidecuts and stabilisation of river crossings requiring major gabion basket installation. There are 74 very steep slopes with a total length of 4.1 km. These are mainly present in sections 3 and 4. There are 23 rivers requiring some use of gabions, mainly in the same locations.</p> <p>These critical tasks are integrated into the over all construction March Chart in coordination with other construction activities such as mechanical completion and hydrotesting constraints.</p> <p>The reinstatement focus during 2007 is work requiring heavy machinery (i.e. grading, contouring, gabion restoration and close side slopes) that has to be carried out prior to hydrotesting. After the temporary erosion control campaign, dedicated machinery and resources will concentrate and focus on areas of RoW where full permanent technical reinstatement can be carried out. Pipeline mechanical completion must be achieved (as determined by SEIC Quality Manager) before technical reinstatement works can commence. Reinstatement works carried out after hydrotesting will be carried out under the appropriate Permit to Work system. Total scope of Technical reinstatement includes also side cuts stabilisation – mainly battering back the side cuts to an appropriate angle and hydroseeding in combination with coconet/geojute.</p> <p>Areas that are not technically reinstated during 2007 will have temporary erosion, drainage and sediment control measures installed.</p> <p>During 2007 SEIC will commence final technical reinstatement on segments of the RoW where pipeline installation and backfilling is completed and FOC is installed. Based on the construction schedule and current and projected equipment and resources, it is estimated that approximately a total of 400 km or ~50% of the RoW will be technically reinstated this year (not in a continuous stretch), with the exception of the running track which is required for ongoing construction activities.</p> <p><u>2. Procedure for and Issuing, Approving and Tracking Reinstatement Actions</u></p> <p>A systematic procedure for issuing work instructions for reinstatement</p>
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	<p>activities has been developed. The Reinstatement Coordinator and Geotechnical Engineers are responsible for preparation and issue of an approved set of work instructions to the Contractor.</p> <p>Once works have been undertaken they will be inspected by the Reinstatement Coordinators and Geotechnical Engineers and a punch list prepared of any additional work required prior to the works being approved. A final inspection will be undertaken when the Reinstatement Coordinators and Geotechnical Engineers are satisfied that all works have been undertaken in accordance to HSESAP and Project requirements.</p> <p>Following the approval of technical reinstatement, biological reinstatement can commence.</p> <p>The Reinstatement Lead in Yuzhno will be responsible for ensuring that reinstatement activities are systematically tracked and for communicating any issues regarding delays in reinstatement and shortage of resources to SEIC-PDP Environmental Manager and Construction Support Manager in Yuzhno.</p> <p><u>3. Resources</u></p> <p>The human and equipment resources have been identified in the reinstatement schedule.</p> <p>The following equipment is available for reinstatement works, the quantities in brackets are those on order and yet to arrive; equipment starts arriving end July 2007:</p> <table border="0"> <tr> <td>Excavators (300, 320 and 325 or similar)</td> <td>20 (10)</td> </tr> <tr> <td>Excavators (312 or similar)</td> <td>7 (1)</td> </tr> <tr> <td>Wide ditching buckets (for 320)</td> <td>4</td> </tr> <tr> <td>Bulldozers (D4-D6 or similar are being procured based on equipment requirements specified by each section)</td> <td>13 (12)</td> </tr> <tr> <td>Dump truck</td> <td>5</td> </tr> <tr> <td>Graders</td> <td>(2)</td> </tr> </table> <p>Each section has provided a list of equipment necessary to conduct technical reinstatement. When additional equipment arrives it is provided to the sections based on requirements.</p> <p>In addition to the reinstatement equipment on order, additional excavators, dozers, graders are being ordered for general construction works across all sections.</p> <p>Technical reinstatement requires the use of low ground pressure (LGP) machinery in many wetland and swampy areas. It has been confirmed that 50 units of LGP are available on Sakhalin.</p> <p>An Environmental Coordinator in Yuzhno has been tasked with tracking the physical materials required for reinstatement works such as hydrotesting materials, erosion control blanket and seed. This position has been created in addition to the procurement and logistic processes</p>	Excavators (300, 320 and 325 or similar)	20 (10)	Excavators (312 or similar)	7 (1)	Wide ditching buckets (for 320)	4	Bulldozers (D4-D6 or similar are being procured based on equipment requirements specified by each section)	13 (12)	Dump truck	5	Graders	(2)
Excavators (300, 320 and 325 or similar)	20 (10)												
Excavators (312 or similar)	7 (1)												
Wide ditching buckets (for 320)	4												
Bulldozers (D4-D6 or similar are being procured based on equipment requirements specified by each section)	13 (12)												
Dump truck	5												
Graders	(2)												

	already in place to ensure that delays in delivery of reinstatement materials do not occur.			
Deliverables with timing	<i>Detailed action</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	2.1 Reinstatement schedule planned within time and construction constraints.	2007 Reinstatement Schedule	SEIC-PDP Construction Support Manager/SEIC-PDP Environmental Manager	July 2007
	2.2 Procedures in place for issuing, approving and tracking reinstatement actions.	Procedure Document	SEIC-PDP Construction Support Manager	July 2007
	2.3 Resources identified for undertaking reinstatement work.	2007 Reinstatement Schedule	SEIC-PDP Construction Support Manager/SEIC-PDP Section Managers	July 2007
	2.4 Reinstatement scope of works executed under SEIC-PDP Reinstatement and Environmental coordinator supervision.	Mobilised dedicated crews and equipment	SEIC-PDP Section Managers	July – October 2007
Objectives and Success criteria	<p>Objective:</p> <p>The object for reinstatement in 2007 is to undertake as much permanent reinstatement works as possible given the overall construction timing and resource constraints. All areas that are not completed as part of final reinstatement works will be subject to a winterisation programme as described below with the remaining reinstatement to be completed in 2008.</p> <p>Success criteria:</p> <p>All critical technical reinstatement activities achieved prior to hydrotesting.</p> <p>50% of the total length of the RoW technically reinstated except where ongoing activities prevent completion (for example where the running track is required for hydrotesting, FOC splices, biological reinstatement, etc.)</p> <p>30% of Group 2/3 riverbanks permanently reinstated, remaining 70% to have adequate temporary stabilisation and erosion control measures installed. Remaining riverbank permanent reinstatement work will be</p>			

	completed during 2008.
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E-3 Spoil management

<p>Corrective action in detail</p>	<p><u>1. Existing excess spoil management</u></p> <p>A survey was executed in the Makarov area (October 2006 to accurately locate existing spoil tips containing approximately 1.3 million m³ of excess material removed from the RoW during construction (2004-2006). In August/September 2006 a focused effort was made to temporarily stabilise the more sensitive spoil tips by:</p> <ul style="list-style-type: none"> • Dedicating crews and machinery to spoil tip stabilisation works; • Assigning additional supervision at site (Geotechnical Engineers). <p>A programme has been put into place to manage the permanent stabilisation or removal (where required) of existing spoil tips. Work is ongoing for all spoil tips in terms of design, approval and/or removal.</p> <p>There are 100+ spoil tips that will either be removed or remain at permanent locations agreed with Forest authorities. Third-party companies “Averina”⁵ and “Inzaschita”⁶, both selected via the official Starstroi competitive tender process, are preparing the designs for the spoil tips in terms of environmental and geotechnical requirements; the designs are then submitted for approval to the Sakhalin Oblast Forestry Department. 16 spoil tips will remain as permanent spoil tips in approved locations. The remaining spoil tips have been identified for removal, of which to date 9 spoil tips have been completely removed in accordance with approved designs. The approval of the designs and liaison with appropriate authorities is the responsibility of the SEIC-PDP Special Projects Manager. The spoil transport, removal and storage works is supervised by the construction teams on site (including site based geotechnical engineers) and executed by main or local subcontractors.</p> <p>Spoil is either being reused on the RoW where required (i.e. for reinstatement of subsidence etc), or moved into approved permanent Forest storage locations near the RoW, or to other approved locations (e.g. quarries and landfills) as described under section 2 below.</p> <p>25% (by volume) of the total scope of work is expected to be completed in 2007, 50% during 2008 and the remaining 25% in 2009. This does not impact the ability to complete biological reinstatement of the RoW by the end 2008, since spoil tips are located outside the RoW.</p>
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⁵ Information on Averina is given on p.6 of the Plan

⁶ Inzaschita is a reputable Russian engineering company with an ample experience in geohazard studies, topographical surveys, processing geophysical and geological data, design of engineering protection structures, etc.

	<p><u>2. Spoil removal from fault crossings</u></p> <p>Fault construction will generate some 1.8 million m³ spoil. The project has considered various options for the storage of excess soil resulting from fault crossing site preparations and has accepted the invitation from owners or authorities to dedicate the excess spoil to the reinstatement of old quarries or borrow pits, landfills or for use in community improvement projects (i.e. Makarov paper mill). Excess spoil from fault crossings will be disposed of in remote sites as generated. Agreements with quarry or landfill owners or relevant authorities have been put in place in line with waste limits from Rostekhnadzor. Spoil removal from fault locations is currently ongoing in all sections.</p> <p>The construction teams on site (including site based geotechnical engineers) are responsible for supervising spoil transport and disposal carried out by local subcontractors.</p>			
	<i>Detailed action</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
Deliverables with timing	3.1 Finalise designs for remaining soil tips. Obtain regulatory engineering design approvals as appropriate.	Spoil management plan	SEIC-PDP Special Projects Manager	July 2007-2008 ongoing
	3.2 Spoil management implemented according to design approved by Sakhalin Oblast.	Spoil Management Procedures and Specifications	SEIC-PDP Special Projects Manager	2007 – 2008 ongoing
	3.3 Continue to investigate alternative uses of spoil particularly with regards to social improvement and community benefits (e.g. Makarov paper-mill).	Approved locations for excess spoil disposal	SEIC-PDP Special Projects Manager	2007-2008 ongoing
Objectives and success criteria	<p>Objective:</p> <p>All historical and new excess spoil stored in a permanent manner in approved locations.</p> <p>Spoil disposal sites engineered and approved in accordance with requirements.</p> <p>Success criteria:</p> <p>All historical and new excess spoil managed in compliance with HSESAP Table 2.5 No. 61.</p>			

E-4 Winterisation campaign 2007/2008

<p>Corrective action in detail</p>	<p><u>1. Determining scope of works</u></p> <p>The SEIC-PDP Environmental Manager and SEIC-PDP Construction Support Manager will coordinate a review of the reinstatement and temporary erosion control measures in place in autumn in order to determine the winterisation scope of works.</p> <p>SEIC-PDP Section Managers will be responsible for ensuring the scope of works for each of the sections is implemented by site Construction, Reinstatement and Environmental personnel.</p> <p><u>2. Winterisation Techniques</u></p> <p>A toolbox of winterisation techniques will be applied based on site specific requirements.</p> <p>The principle technical temporary erosion control measures are described in <i>E-1</i> above.</p> <p><u>3. Temporary seeding</u></p> <p>Seeding will be evaluated as part of the 2007 winterisation programme where final biological reinstatement has not been undertaken, taking into account the effectiveness of different seeding methodologies and seasonal constraints as discussed in <i>E-1</i>.</p> <p>Aerial seeding will be considered for 2008 at appropriate timing (i.e. early Spring as discussed with local forestry experts).</p> <p><u>4. Training</u></p> <p>A gap analysis will be carried out by site SEIC-PDP Reinstatement and Environmental Coordinators to identify training needs within crews and training will be carried out on site in the form of refresher sessions on winterisation techniques that will be lead by the coordinators.</p> <p><u>5. Dedicated crews and machinery</u></p> <p>Crews and machinery will be dedicated to winterisation works once the scope of works is determined. Resource requirements will be developed by SEIC-PDP Section Managers and SEIC-PDP Construction Support Manager.</p> <p><u>6. Implementation of winterisation scope of works</u></p> <p>Implementation of winterisation works will be supervised by the SEIC-PDP Reinstatement Coordinators who will ensure the works are carried out according to specification (compliant with technical procedures and typical drawings etc) and are fit for purpose.</p> <p><u>7. Tracking progress</u></p> <p>Information will be collected weekly regarding progress and will be</p>
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	forwarded to Reinstatement Lead in Yuzhno. Any indications of schedule slip will be communicated to the SEIC-PDP Environmental Manager and SEIC-PDP Construction Support Manager.			
Deliverables with timing	<i>Detailed action point</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	4.1 Determine winterisation requirements	Winterisation scope and specification	SEIC-PDP Environmental Manager/ SEIC-PDP Construction Support Manger	September 2007
	4.2 Identify need for and carry out training on site	On-site refresher training courses as needed	SEIC-PDP Reinstatement and Environmental coordinators	October 2007
	4.3 Dedicate resources (crews and materials) to execute the works.	Dedicated crews on site	SEIC-PDP Construction Support Manger /SEIC-PDP Section Managers	October 2007
	4.4 Track implementation	Progress reporting	SEIC-PDP Reinstatement Lead (Yuzhno)	October - December 2007
Objectives and success criteria	<p>Objective: Comprehensive erosion control measures in place at all priority areas on the RoW (where permanent reinstatement is yet to be completed) prior to snow cover of winter 2007.</p> <p>Success criteria: Completion of the Winterisation scope of work according to specifications. Winterisation work execution will be verified through the progress tracking register.</p>			

4 WETLANDS

4.1 Description of Issue

The pipeline right of way crosses through some 200 wetland areas (including peat bogs) as identified on the feature list, totalling around 80 km or 10% of the total length of the pipeline Right of Way (RoW). These wetland areas were classified on an engineering basis as Type I, II and III areas in the TEOC phase of the project, rather than on environmental criteria.

Specific construction techniques to minimise potential effects on the hydrology of these habitats have been developed (outlined in Chapter 3 of the Environmental Impact Assessment Addendum). As part of the construction process, temporary roads to enable access during pipeline construction have been built in some areas. Specific environmental commitments have been made to limit the types of materials used in construction and to ensure that any temporary roads are removed from wetland areas prior to snowmelt occurring.

Several non-compliances with respect to these commitments have been identified. The main target of this action plan is to set out measures to ensure that the observed non-compliances are addressed.

4.2 HSESAP Commitments

The HSESAP commitments relating to the non-compliances in wetlands are listed in Attachment 3.

4.3 Description of Non-compliance

In a number of instances, mainly in Construction Sections 2 and 4, imported material and tree stumps have been used to construct temporary roads, without being segregated by geotextile, to support equipment on the RoW.

There are also instances where hydrological flows in wetland areas had been visibly interrupted by the construction of temporary access roads and/or the RoW running tracks, resulting in noticeable flooding or drying of the wetland habitat either side of the road/RoW.

In many cases, due to the actual prolonged construction phase, roads have not been removed prior to the spring thaw and in some areas the surface vegetation was not removed and stored separately.

There is still some uncertainty in assessment of these non-compliances but their overall significance has been currently assessed as “amber” using the HSESAP matrix, but is subject to further review during the monitoring phase.

Individual non-compliances are included in Attachment 3, where relevant, below the corresponding commitment description.

4.4 Corrective Actions

It is SEIC’s policy to remove all temporary construction roads in wetlands unless there is a need to retain the road for operation and maintenance purposes or if the impact caused by removal of the road would likely be greater than leaving the road in-situ. In either of these cases, the remaining roads will be of a suitable construction and will include means of cross drainage such that the natural hydrology of the wetland is not adversely affected.

In order to achieve this policy, and to comply with the HSESAP commitments, actions are required with respect to:

- road removal (where practically possible);
- the upgrade of any retained roads, including drainage;
- the monitoring of the wetlands; and
- the remediation of the wetland, where necessary, both immediate and post-construction.

Where remediation cannot be fully implemented, the possibility of offsets will be explored.

The tables below present the corrective actions in a standardised form with the following components: the corrective action in detail, deliverables with timing and the objectives and success criteria.

W-1 Wetland road review and removal

<p>Corrective action in detail</p>	<p>Locations will be identified where roads crossing wetlands will need to remain as permanent roads for use during the Operations phase together with those temporary roads that need to be removed. In some cases, the physical disturbance to soil and peat horizons associated with road removal could lead to impacts on hydrology and vegetation in addition to those already sustained during construction. In instances where hydrological conditions have been little altered by the road (e.g. permeable materials may have been used in building the road) and ecological function has been largely maintained, then extraction of materials from the wetland may interrupt subsurface and subsurface flows, further damage soil structure and prevent the re-establishment of suitable flows following extraction. As a consequence, wetland vegetation re-growth may be compromised and ecological function (in relation to surrounding conditions) reduced. The final decision on whether to remove these roads will therefore need to take account of the construction materials actually used, the ecological sensitivity of the wetlands and the desired state of vegetation reinstatement.</p> <p>An assessment will be made of each wetland where a temporary road is to be removed, by means of a joint site visit by environmental, reinstatement and construction site management staff to determine the method and likely effect of road removal on the wetland. The temporary road will be removed in conjunction with the Technical Reinstatement Schedule to prevent</p>
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	<p>unnecessary movement of crews and machinery.</p> <p>Low ground pressure excavators will be required for road removal in the wetlands and the Contractor has around 50 machines on the project as mentioned in E-2 above. Swamp road matting is being leased from the military on Sakhalin to be used in wetland areas. Site reinstatement and environmental coordinators will closely supervise the works.</p>			
Deliverables with timing	<i>Detailed action points</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	1.1 Road requirement review	Road review report	SEIC-PDP Construction Support Manager	August 2007
	1.2 Road removal assessment and road removal. Site assessments will be staged across all wetlands on the RoW according to the Technical Reinstatement Schedule for each Section taking account of actual road construction type i.e. materials used and whether segregated by geotextile, the wetland type, depth, hydrology and the extent of surface re-vegetation.	Road removal	SEIC-PDP Construction Support Manager/SEIC-PDP Section Managers	December 2008 (linked to schedule performance)
Objectives and success criteria	<p>Objective:</p> <p>Removal of those temporary roads identified for removal, and that are physically possible to remove.</p> <p>Success criteria:</p> <p>Removal of the temporary roads identified for removal during winter conditions 2007-2008 or summer 2008.</p> <p>To be verified by the SEIC-PDP Environmental coordinators on site supervising works.</p>			

W-2 Wetland Reference Survey and Post-Construction Monitoring

This section only covers monitoring related to remedial work associated with wetlands and does not cover other monitoring activities during operations.

<p>Corrective action in detail</p>	<p><u>1. Identification of wetland locations based on ecological criteria</u></p> <p>For the purpose of environmental post-construction monitoring, wetlands are defined as areas where there is:</p> <ul style="list-style-type: none"> • Ongoing peat accumulation; • Typical wetland vegetation and community composition; • A specific hydrological regime. <p>Delineation of the wetlands affected by the construction will be fulfilled by the wetland experts of third party and include desktop studies by cross referencing between:</p> <ul style="list-style-type: none"> • The Type I, II and III engineering classifications; • Vegetation survey maps completed for provided for TEOC; • Soil survey maps completed provided for the TEOC but and updated in 2004; • Data from on hydrology, soil and vegetation contained included in existing various survey reports and databases prepared in 2004-2007; • Other (non-project) wetland information when available in open sources. <p>Upon completion of the work the third party will provide a Wetlands Register related to the pipeline sections and picket stations (KPs).</p> <p>The Wetland Register is to be collated with information of all construction impacts took place on the wetlands, i.e. duration of pipeline construction, access roads installation, AGI installation, wood debris burying, etc.</p> <p><u>2. Classification of wetlands</u></p> <p>Once the wetlands have been identified according to the ecological criteria above, a desktop study will be carried out by a third party wetland experts to describe the diversity of wetlands along the RoW and classify the wetlands into different classes based on criteria such as:</p> <ul style="list-style-type: none"> • Dominant vegetation species; • Soil types and underlying geology; • Hydrological regime (including surface water); • Topography, climate and latitude. <p>Wetlands are to be classified using best Russian approaches and international (Federal Energy Regulatory Commission - FERC) standards.</p> <p>When classified and outlined a number of typical wetlands will be a subject for special field observation to verify the results of desktop studies.</p> <p>Furthermore, field observations will be carried out by SEIC and third party team to supplement all of the above data. The following tasks will be completed during the field observation:</p>
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	<ul style="list-style-type: none"> • verification of desktop data; • assessment of actual construction impact and wetland tolerance (sensitivity) to the impact; • visual observation of vegetation cover, hydrology regime and soils. <p>Classification report, which contains the description of the classification principles and key classified groups of the wetlands along the RoW, will be submitted upon completion of the field observation.</p> <p><u>3. Reference Survey and Year 1 Post Construction Monitoring</u></p> <p>The aim of the reference survey and Year 1 post-construction monitoring is to:</p> <ul style="list-style-type: none"> • Record the reference conditions of the wetlands and the status one year after construction; • Define the monitoring parameters; • Establish the monitoring quadrants/transects (including control locations). <p>The scope of wetlands to be surveyed will be determined by selecting indicative wetlands from each class as determined above. The number of the key individual wetlands to be monitored will be determined based on classification of wetlands (see page 2) collated with construction activities – still to be determined (number between 20 and 30 is currently expected). Wetlands selected for surveying will be based on a combination of:</p> <ul style="list-style-type: none"> • HSESAP compliant wetlands; • HSESAP non-compliant wetlands; • Whether there is a permanent road, whether a temporary road was removed or whether there was no road (ice road). <p>Field surveys will be carried out by a suitably qualified Third Party Contractor(s) (yet to be determined) selected according to the following criteria: locally based, Russian and with experience in wetlands classification and vegetation monitoring and international wetlands classification experience. Permanent monitoring transects and plots will be established and GPS coordinates logged within the selected wetlands for subsequent monitoring.</p> <p>A number of biological and physical parameters will be identified that are critical for determining impacts due to construction. Qualitative assessments will include a general site reconnaissance of the wetlands and visual assessment of the overall condition of the site.</p> <p>Visual observations will be made and recorded on a variety of variables, including:</p> <ul style="list-style-type: none"> • Surface grade; • Hydrology (surface water and drainage patterns); • Soil type;
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	<ul style="list-style-type: none"> • Dominant plant species; • Vegetation cover; • Vegetation vigour; • Community composition; • Presence of stump re-sprouting; • Evidence of invasive exotic species; • Residual construction impacts (water bars, construction debris, rock fragments and topsoil/subsoil mixing); • Land use impacts (off-road vehicle damage, erosion and construction). <p>An assessment based on best professional judgment will be made in the field as to whether the wetland has been, or has not been, affected by construction activities.</p> <p>Quantitative surveys will be carried out on the plots/transects to monitor:</p> <ul style="list-style-type: none"> • Vegetation; vegetation descriptions will be compiled during the peak vegetation season. Vegetation descriptions will be made in accordance with standard methods and using pro-forma and field record sheets. All species will be registered. Special attention will be paid to the identification of species and gathering data on protected species where present; • Soils; monitoring will include description of soil profile and measurements of pH, nutrients (nitrogen, phosphorus, potassium), identification of peat type (vegetation content, degree of decomposition, wetness, mineral content etc.); • Hydrology; monitoring will include observation of water table in the course fieldwork. <p>Relevant photographs will be taken to illustrate all localities studied.</p> <p>Data will be analysed and reported using standard analytical methods (including statistical analysis). Reports will be issued and will include:</p> <ul style="list-style-type: none"> • The status of the wetland re-vegetation efforts; • The percentage cover achieved and will highlight problem areas (weed invasion, areas of poor re-vegetation etc). <p>Monitoring data and visual assessment reports will be reviewed by the SEIC Environmental team, primarily ecologists, to determine whether there is any indication of negative effects or potential long-term impact as a result of construction.</p> <p>Should any negative effects as a result of construction be identified, remediation measures will be designed and implemented as described below (in <i>W-3</i> Remediation).</p> <p><u>4. Post Construction Monitoring – second and third years after construction</u></p>
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A commitment has been made to carry out ecological monitoring for a minimum of three years (HSESAP Table 2.5 – 136).

A further commitment has been made to annually monitor and record the success of wetland re-vegetation for the first three years after construction or until wetland re-vegetation is successful (HSESAP Table 2.5 – 144 – see Attachment 3 for full text).

Wetland monitoring as described in item 3 above will be carried out annually to the same scope of work and will be reported annually.

The aim is to carry out adaptive monitoring during the post-construction period. Dependent on any one year’s monitoring results, the scope of work (number and locations of wetlands monitored) may be modified, as agreed with the SEIC-PDP Environmental Manager in conjunction with the ecological monitoring teams and the wetland expert. Changes in the scope of works may occur but can only be determined once annual monitoring reports are analysed. Where poor re-vegetation/hydrology is observed in wetlands that may be attributed to a particular construction event, the monitoring may be expanded to include other wetlands where this particular construction event was known to have occurred. Where poor re-vegetation/hydrology is observed in wetlands of any particular class, the monitoring may be expanded to include other wetlands of this class to determine whether that particular class of wetland is more sensitive to disturbance. Where successful re-vegetation/hydrological regime is observed in wetlands of a particular class, the locations where this class of wetland has been monitored may be changed to previously non-monitored, wetlands of the same class, to ensure the recovery is across the board.

Reports will be submitted annually until wetland re-vegetation is deemed successful, in accordance with the criteria given in Commitment 2.5-144.

Deliverables with timing	<i>Detailed action points</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	2.1 Appoint suitably qualified Third Party Contractor(s) for delineation and classification work.		SEIC-PDP Environmental Manager	July 2007
	2.2 Wetlands delineated on baseline data sets.	Wetland Register	SEIC-PDP Environmental Manager	Beginning of August 2007
	2.3 Wetlands classified by ecological and physical characteristics into wetland 'Classes'.	List of wetlands by class	SEIC-PDP Environmental Manager	August 2007
	2.4 Field observation for desktop studies verification and impact assessment.	Field report	SEIC-PDP Environmental Manager	August – September 2007

REMEDIAL ACTION PLAN

	2.5 Completion of classification work.	Classification report	SEIC-PDP Environmental Manager	September – October 2007
	2.6.1 Appoint suitably qualified Third Party Contractor(s) for carrying out field surveys.	Annual monitoring surveys and reports	SEIC-PDP Environmental Manager	June 2008
	2.6.2 Reference Surveys and Year 1 Post Construction Monitoring surveys completed.			July-August 2008
	2.6.3 Monitoring reports from Reference Surveys and Year 1 Post Construction Monitoring submitted to SEIC for review.			December 2008
	2.7 Post construction monitoring completed during the second and third years after construction.	Annual monitoring surveys and reports	SEIC-PDP Environmental Manager	2009 – 2010 or longer if monitoring results indicate this is required. Reports to be submitted to SEIC by December of each year.
Objectives and success criteria	<p>Objective: Understanding the ecology of the affected wetlands by means of a fully implemented monitoring programme.</p> <p>Success criteria: Ecological description and assessment of the vegetation and hydrology recovery of wetlands crossed during pipeline construction, such that the required extent of remediation can be accurately determined, as verified by the SEIC-PDP Environmental Monitoring manager on review of survey results.</p>			

W-3 Remediation

<p>Corrective action in detail</p>	<p><u>1. Immediate remediation</u></p> <p>A case-by-case study will be carried out on identified wetlands by SEIC Construction, Reinstatement and Environmental personnel to assess the level of preliminary remediation required.</p> <p>A 'toolbox' of possible immediate remediation measures will be developed under the responsibility of the SEIC-PDP Environmental Manager and SEIC-PDP Construction Support Manager. These will include but are not limited to:</p> <ul style="list-style-type: none"> • Re-contouring of the RoW and even spreading of any remaining peat piles; • Removal of any imported soil, rock or other construction debris including removal of temporary access roads (as detailed in action W-1) including specific attention being given to the Dolinsk wetland area and wetland between KP212 – 220 with respect to construction debris. Log roads may be left in situ subject to the approval by authorities and measures will be taken, such as the opening of drainage channels, to ensure that the hydrological regime is maintained. Remediation of the hydrological regime may include installation of trench breakers, if the wetland is being drained along the pipe trench into neighbouring rivers, and the installation or repair of surface water drainage where temporary roads have been removed or where permanent roads remain. Particular attention will be given to the wetland areas around Leonidovka River and KP 212-220 where some disruption of the hydrological regime has been observed; • Preliminary reinstatement of the peaty topsoil layer, where this can be recovered from an adjacent wetland area without resulting in additional negative impact, with particular attention being given to the wetland area at KP212 – 220. Should this not be possible, advice on long-term remediation of the peat layer will be sought from a wetland expert (Russian based wetland expert identified); • Transplanting; • Seeding of wetlands. <p>The preliminary remediation will be executed by dedicated site reinstatement crews during technical reinstatement activities and under the close supervision of the Reinstatement and Environmental Coordinators.</p> <p><u>2. Remediation Plan</u></p> <p>A Remediation Plan is to be developed when all the framework documents (Wetland Register and Classification Report) are finalised.</p> <p>It will contain the following information:</p> <ul style="list-style-type: none"> • Short description of the diversity of wetlands along the RoW and their classification; • Description of potential effects and impacts to the wetlands;
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	<ul style="list-style-type: none"> • Remediation measures to be implemented to minimise impacts; • Monitoring programme. <p>The Remediation Plan will be based on the RF Law requirements and FERC standards and take into account permanent access roads for AGI and Operations needs.</p> <p>Upon completion of Remediation Plan, it is to be reviewed by Subcontractor Wetland Expert who will provide written conclusion and comments to the plan.</p> <p>The Remediation Plan will be followed by a Prioritisation List which will indicate all wetland areas along the RoW and be based the following criteria:</p> <ul style="list-style-type: none"> • Class of wetland; • Timing of construction activities and remedial action implementation; • Targets to be achieved in terms of impact mitigation and remediation (reduce of impact). <p>The Remediation Plan and the Prioritisation List are to be used by the construction team for wetland remediation upon completion of the construction activities.</p> <p>Implementation of remediation will be executed by dedicated site reinstatement crews and under the close supervision of the Reinstatement and Environmental Coordinators.</p> <p>3. <u>Post-construction remediation</u></p> <p>It is acknowledged that additional remediation of wetlands may be required during the post-construction period in order to meet recovery commitments.</p> <p>The monitoring programme observations and reports will be reviewed annually by the SEIC-PDP Environmental Manager. If poor vegetation recovery/hydrology is identified at any wetland location then remedial measures will be planned.</p> <p>Due to the potentially sensitive nature of wetlands, a wetland expert (Russian based wetland expert already identified) will be consulted on the potential cause of poor recovery and advice will be sought on remediation measures to be implemented, taking into account the potential cause of poor recovery, accessibility issues, class of wetland and required results. The potential for transplanting of selected herbaceous/woody species and/or seeding will be investigated at this stage and sources of material identified if this measure is considered appropriate to the situation. However, for the vast majority of wetland vegetation communities allowing natural regeneration is the preferred and most effective course of action.</p> <p>Where remediation works are required, subcontractor crews and machinery will be mobilised. The crews chosen to carry out remediation will be dependent on location and time of works in the overall construction/operations schedule. The works will be supervised by a competent person assigned by the SEIC-PDP Section Managers.</p>
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REMEDIAL ACTION PLAN

	<p>The definition of successful wetland re-vegetation is as included in HSESAP Table 2.5 – 144: wetland re-vegetation shall be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction.</p> <p>In the event that it is considered that certain wetlands cannot be fully remediated, the possibility of appropriate offsets will be explored.</p>			
Deliverables with timing	<i>Detailed action points</i>	<i>Deliverable</i>	<i>Action party</i>	<i>Timing</i>
	3.1 Assessment of immediate remediation works required.	Assessment report	SEIC-PDP Environmental Manger	July – December 2007
	3.2 Development of practical tools to be used by the construction team for wetland remediation upon completion of the construction activities	Wetlands Remediation Tool box	SEIC-PDP Environmental Manger/SEIC-PDP Construction Support Manager	July – December 2007
	3.3 Immediate remediation measures implemented (as determined on a site by site basis) by SEIC Reinstatement and Environmental coordinators and carried out under their supervision.	Remediation measures implemented	SEIC-PDP Section Managers	July – December 2007
	3.4 Remediation Plan and Prioritisation list developed.	Remediation Plan and Prioritisation list	SEIC-PDP Environmental Manger/SEIC-PDP Construction Support Manager	Autumn 2007
	3.4 Remediation measures implemented under Reinstatement and Environmental Coordinators' supervision.	Remedial works executed	SEIC-PDP Section Managers	Commence autumn 2007

	<p>3.5 The need for post-construction remediation measures identified via inspection and monitoring and advice sought from wetland expert.</p> <p>Remediation measures implemented under Operations supervision.</p>	<p>Future remedial works executed as required.</p>	<p>SEIC-PDP Environmental Manager / transition to SEIC-HSE Manager / SEIC Pipeline Operations Manager</p>	<p>2008 – 2010</p>
<p>Objectives and success criteria</p>	<p>Objective: Appropriate remediation carried out on wetlands where and when required.</p> <p>Success criteria: Wetland re-vegetation compliant with HSESAP commitments Table 2.5 No. 144, and Table 2.3 No. 41. Integrity of hydrological regime in compliance with HSESAP commitments Table 2.5 No. 79. To be verified by the SEIC-PDP Environmental Manager on analysis of monitoring results.</p>			

Attachments

The following attachments list the relevant HSESAP Commitments for the remedial action plan topics of River Habitat, Erosion Control and Reinstatement and Wetlands.

Non-compliances are indicated in ***bold italics*** and parentheses, where relevant, below the corresponding commitment description.

Attachment 1 - HSESAP Commitments relating for River Habitat Non-compliances**2.5-16**

Construction timing shall be in accordance with the River Crossing Strategy Report and shall be detailed in the River Crossing Execution Plan.

[Some of the Group 3 rivers were crossed in the second half of April in 2005 and 2006, when there is an increased risk of potential environmental impact]

2.5-17

The following mitigation measures shall be implemented for wet cut rivers of medium and high ecological sensitivity:

- Crossing shall be executed in winter, with low flow and outside spawning period;
- Minimizing construction time;
- Optimize consecutive crossings;
- Adhere to industry standard practice;
- Implement erosion control measures;
- Proper reinstatement in a timely manner.

Rivers that are of high ecological sensitivity and that have a high potential extent of hydromorphological impact, the most optimal construction period (with regards to spawning areas and Sakhalin taimen) shall be selected (probably end of winter) and emphasis given to “as-close-as possible” simultaneous installation of the two lines. In addition HDD shall be considered as a possible crossing method for these rivers.

[Some near simultaneous crossings were not undertaken when possibly feasible and some crossings were carried out outside the winter construction period without considering low flow criteria]

2.5-18. The intent is to consecutively construct most oil and gas pipeline crossings for rivers that are of medium/high ecological sensitivity and/or have a high potential extent of hydromorphological impact. However, on the few occasions where construction of the two pipelines shall be undertaken by two different subcontractors, consecutive crossings may, for logistical reasons, not be possible. Efforts shall be made to plan the activities such that the period between the construction of each pipeline crossing is minimised. In

some cases this could be months, but in any event construction shall occur in the same season (i.e. the winter months).

[Some crossings of sensitive rivers with the oil and gas pipelines were not installed in the same season].

2.5-21. All crossings shall be attended by a SEIC representative who has awareness of both construction and environmental issues. Before the construction of the crossing can start, this representative shall ensure that:

- the proper erosion control materials are available on site prior to the start of construction;
- appropriate spill response equipment, including containment and recovery equipment, are available on site and that, if necessary, spill response measures are appropriately implemented;
- the local monitoring contractor is timely notified, present and adequately equipped to undertake all necessary measurements during construction of the crossing; and
- all personnel (including external observers) needed for the crossing are present and properly instructed and all necessary equipment is present and in good working order.

[In some instances the External Observer was not given sufficient advance notice to mobilize and was thus not present or adequately equipped, or only some of the required key people and equipment were present].

2.5-23a. Crossings of minor water bodies (<3 meters wide). Minor water bodies may be crossed using the open-cut crossing method, with the following restrictions:(a) except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours for each pipeline. Stream banks and unconsolidated streambeds may require additional restoration after this period.

[Installation time did not always meet the target duration].

2.5-24. Crossings of intermediate water bodies (>3 meters & < 30 meters from edge to edge). Where a dry-ditch crossing is not required, intermediate water bodies may be crossed using the open-cut crossing method, with the following restrictions: (a) complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours for each pipeline, unless site-specific conditions make completion within 48 hours infeasible; Where this is the case, suitably qualified staff from HSE shall be involved in the decision making process to justify the deviation in accordance with the SEIC deviation procedures. Conditions requiring a deviation shall be documented and works shall be undertaken in line with the objective of ALARP.

[Installation time did not always meet the target duration].

2.5-25. SEIC and its contractors shall structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors shall:

- a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills;
- b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;
- c. know the contact names and telephone numbers for all local, state, and Federal agencies that must be notified of a spill; and
- d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

[Spill response materials were not always available or not properly implemented but there were no incidents recorded when spills occurred and the spill response material was absent].

2.5-51. Project-related ground disturbance shall be limited to the width of the construction RoW along its entire length, extra workspace areas, pipe storage yards, borrow and disposal areas, access roads, and other approved areas (as determined through relevant RF Standards (SNiP), legislation and permitting). Any project-related ground disturbing activities outside these areas, except those needed to conform with necessary measures and procedures (e.g., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) shall require prior approval. All construction or restoration activities outside of the approved areas are subject to all applicable survey and mitigation requirements.

[In some instances spoil was put outside the RoW or other approved areas].

2.5-70. The actual footprint of the construction activity for river crossings shall be minimised as much as possible (within the confines of the RoW).

[In some instances construction activity took place and spoil stored outside the RoW].

2.5-71a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least (15 meters) 50 feet away from water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land.

[In some cases spoil was placed too close (within 3m) to the river edge].

2.5-72d. Maintain adequate flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

[A number of downstream drying-out incidents did occur].

2.5-73a. All spoil from minor and intermediate water body crossings (<30m), and upland spoil from major water body crossings, must be placed in the construction right-of-way at least (3 meters) from the water's edge or in additional extra work areas.

[In some cases spoil was placed too close (within 3m) to the river edge].

2.5-74. Install sediment barriers immediately after initial disturbance of the waterbody of adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. The following specific measures must be implemented at stream crossings:

- install sediment barriers across the entire construction right-of-way at all water body crossings, where necessary, to prevent the flow of sediments into the water body. In the travel lane, these may consist of removable sediment barriers or driveable berms. Removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;
- where water bodies are adjacent to the construction right-of-way, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way; and
- use trench plugs at all water body crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the water body.

[In some cases silt fences were not installed immediately after initial disturbance of water body, or not installed properly (i.e. poor shaping, improper or negligible toe-in, etc.)].

2.5-76. Silt fencing shall be installed on both banks of the stream, and along the limits of the Right of Way for a minimum distance of 20m from the stream banks, to minimise the effects of wash out of excavated spoil. Silt fencing on the banks around the crossing areas shall be left in place until vegetation has been successfully established (80% vegetation cover of reseeded and reinstated areas will be considered as successful and as determined by a qualified person).

Prior to the commencement of pipeline crossing activities of any river, sufficient quantities of all materials and equipment required for permanent reinstatement of the river and riverbank (including clean and suitably sized riprap, reno mattress and seed as appropriate) must be available and held in stock within the section.

All rivers and riverbanks will be reinstated upon completion of pipeline crossing activities.

The banks adjacent to all high and medium sensitive rivers through which both gas and oil pipelines were constructed will be permanently reinstated after the growing season has commenced across the full disturbed bank length, which shall be kept as a minimum.

[In some cases silt fences were not installed immediately after initial disturbance of water body, or not installed properly (i.e. poor shaping, improper or negligible toe-in, etc.)].

2.5-78. Trench plugs shall be placed between the watercourse and the excavated trench to prevent water from entering the trench and washing out sediment. Where water is pumped from trench areas during installation it shall be filtered through a geotextile or vegetation prior to entering the watercourse.

[In some cases trench plugs were not used or not used correctly].

2.5-92. Whenever possible machinery and equipment should avoid entering the watercourse. Where machines enter the watercourse, clean timber or textile mats shall be utilised to avoid excessive siltation.

[Sometimes clean timber or textile mats were not used for equipment entering the watercourse].

2.5-120 (1-4). All river channels, riverbeds and banks shall be restored to their original state as far as practically possible after construction (seasonality permitting) and within the same year as when construction occurs:

1. Use clean gravel or native cobbles for the upper 0.3m of trench backfill in all water bodies that contain coldwater fisheries. Where possible, the original native cobbles will be used in preference to clean gravel.
2. For open-cut crossings, stabilize water body banks and install temporary sediment barriers within 24 hours of completing in-stream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the water body channel.
3. Return all water body banks to preconstruction contours, as far as practicable, or to a stable angle of repose as approved by the geotechnical engineer.
4. Application of riprap for bank stabilization must comply with agency permit terms and conditions.

[In some cases silt fences were not installed immediately after initial disturbance of water body, or not installed properly (i.e. poor shaping, improper or negligible toe-in, etc.)].

[Gravel used to reinstate the riverbed was not always clean and rip rap was not always according to specification].

[Riverbanks were not always reinstated directly upon construction of the crossings].

2.5-122. Depending on ground, soil and weather conditions, these erosion control measures shall be installed directly after construction. It is however likely that additional

repair work shall be necessary. This shall be executed during the summer months (outside the fish restriction period).

[In some cases silt fences were not installed immediately after initial disturbance of water body, or not installed properly (i.e. poor shaping, improper or negligible toe-in, etc.).

2.5-141. To fully assess fluctuations in turbidity and suspended sediments during an individual river crossing, high-frequency sampling shall be undertaken during the pipeline installation period (dependent upon the practicability of undertaking the works in the prevailing conditions). Turbidity may be measured in the field using a portable turbidity meter, so that the necessary frequency to quantify magnitude and duration of the turbid responses, including initial turbidity spike during cuts, can be determined. Sampling shall be undertaken at points in the river channel 50 m upstream; at the crossing point; 20 m, 150 m, 250 m and 500 m downstream. The frequency of suspended sediment concentration sampling shall be less than that for turbidity.

For the upstream sampling points, current velocity, suspended sediment concentration and turbidity shall be measured once prior to construction and once post-installation of the pipeline. Suspended sediment concentrations shall be analysed in line with relevant Russian regulations. Turbidity measurements will be used for the adaptive management process.

All monitoring shall be executed by a Russian monitoring contractor. SEIC shall review the capacity of the selected company to assess if additional equipment and/or monitors shall be necessary. The local monitor shall be notified about planned crossing on an agreed timescale (usually a week in advance).

[In some cases no (turbidity) sampling was undertaken].

Attachment 2 - HSESAP Commitments and Non-compliances relating to Erosion Control and Reinstatement

2.5-22. SEIC is committed to implement the following sediment source control measures:

- Minimise the width of the RoW where practicable and only use the middle section of the RoW for construction traffic;
- Utilisation of on-site resources such as willow (*Salix, sp.*) branches for riverbank stabilisation, where appropriate;
- Ensure that the right equipment and sufficient erosion control materials are available on site in preparation for the river crossing. Farming equipment will be available in each section and used where appropriate;
- “Track-walk” slopes where feasible;
- Construct slope breakers at intervals, with the gradient of the slope breaker no greater than 1:100. Outlets for slope breakers should be provided with suitable energy dissipation material (*e.g.* riprap) and directed towards vegetated areas to the side of the RoW and not directed into areas of stockpiled soil or unstable slopes. Silt fences shall not be used in place of slope breakers;
- Regularly inspect silt fences (and other sediment controls), particularly after rainstorms and clean them out when they are 1/3 full, repaired or replaced. Sandbag materials shall also be inspected regularly and replaced prior to any degradation;
- Implement a topsoil preservation policy for areas that have not been cleared yet and
- Protect existing windrowed stockpiles of soil to prevent erosion and subsequent suspended sediment loads to streams. Stockpiles shall be protected where necessary by silt fencing, mulch, grass seeding, or geojute to prevent sediment laden runoff.

[In some cases sediment control measures were not installed according to requirements and were not maintained in a timely manner]

2.5-26b. Construct equipment bridges to maintain unrestricted flow and to prevent soil from entering the water body. Examples of such bridges include:

- (1) equipment pads and culvert(s);
- (2) equipment pads without culverts;
- (3) clean rock fill and culvert(s); and
- (4) flexi-float or portable bridges (N/A for wetland crossings).

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

[A number of cases of poor bridge design or lack of maintenance of sediment control measures on bridges occurred]

2.5-55 Where chipped deforestation debris is available, re-use cut vegetation during restoration to promote soil stability and reduce the erosion potential of the otherwise bare ground.

[Although mulch improves revegetation, the use of mulch and fertilizer is not allowed by the Forestry Department, except when hydroseeding]

2.5-57 Each Section shall be provided with the necessary equipment to implement an effective combination of both temporary and permanent drainage control, sediment control, erosion control, and re-vegetation practices. This equipment shall include, but not be limited to:

- Hydroseeders;
- Farming equipment will be available in each section and used where appropriate;
- Bulldozers, with preference given to the smallest equipment available;
- Lighter equipment will be used for berms such as sheeps-foot rollers and small light excavators;
- Hand tools, such as shovels, rakes, picks, hammers, saws, etc. for installing silt fence, erosion control blankets and other soil conservation practices;
- A woodchipper shall be purchased or other equivalent method employed for mulching or otherwise stabilising bare slopes. Geo-jute or hydroseeding with mulch and starch are considered equivalent.

All relevant equipment for both temporary and permanent reinstatement must be available at each Section and shall remain present up to the point of completion of reinstatement activities.

[Light equipment and farm machinery is not available on site for erosion control and reinstatement works]

2.5-58. Each Section shall be responsible for obtaining the necessary materials to implement an effective combination of drainage control, sediment control, erosion control, and re-vegetation practices.

Such stocks must be sufficient to perform both temporary soil stabilization measures (e.g., temporary seeding using fast growing species suitable for the circumstances, silt fencing, installation of erosion control blankets, hay mulching, etc.) and/or immediate reinstatement of all areas of RoW in which both pipeline installations have been completed.

Stocks of materials shall include amounts sufficient to treat all currently disturbed areas of the RoW and those areas projected to be disturbed.

[Materials for erosion control, such as silt fencing and rolled erosion control products were not available when required in some instances]

2.5-60. In all areas maximise topsoil preservation. Preserved topsoil shall be stockpiled and backfilled separately from subsoils, to avoid mixing of soil types.

In deep soils (more than 30cm of topsoil), segregate at least 30cm of topsoil.

Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

Segregated topsoil may not be used for padding the pipe.

[Preservation of topsoil along the RoW has been limited]

2.5-61 All excavated soil for onshore pipelines shall remain on the RoW or at spoil disposal sites on additional land. All disposal areas and procedures must be approved by the geotechnical engineer for slope stability purposes (i.e., to avoid existing landslides). Further, the geotechnical engineer shall approve all soil disposal areas and procedures to ensure that the soil is disposed in a way that avoids mass wasting.

[On several occasions excavated soil was placed outside the RoW. Excess spoil disposal sites were not approved prior to disposal and a majority of soil piles are not stabilised]

2.5-64. Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be routinely inspected by suitably qualified personnel, particularly after rainstorms, and properly maintained throughout construction (on a regular basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

Prior to the onset of winter, temporary surface stabilization measures shall be applied to areas of bare soil on slopes and water protection zones (WPZs) along the RoW. Such measures shall include temporary seeding, track-walking, mulching and drainage controls (slope breakers) – see below for installation requirements.

[Temporary erosion control measures have not always been maintained in a timely manner. Limited surface stabilisation took place prior to the 2006/07 winter]

2.5-65 RoW conditions shall be re-examined as to the applicability of temporary and permanent drainage control, sediment control, erosion control, and re-vegetation practices. For example:

- (i) Water Protection Zones (WPZ) will require the following practices:
 - Erosion control products (ECPs) for bank, slope and/or bridge abutment protection;
 - Silt fence for sediment control at toe of slopes;

- Tillage and seeding for temporary or permanent re-vegetation on slopes leading to streams;
- Bioengineering (e.g., willow wattling) for protection of streambanks;
- (ii) Steep slopes where pipeline construction is incomplete will be stabilised using an appropriate combination of the following:
 - Track-walking by bulldozers up and down slopes;
 - Temporary seeding;
 - Temporary mulching (as part of hydroseeding);

In addition the following drainage and sediment controls will be applied:

- Construction of slope breakers;
 - Stabilization of outlets from slope breakers and down drains;
 - Installation of silt fence at toes of slopes.
- (iii) Newly-disturbed areas within the RoW will be stabilised using an appropriate combination of the following:
- Timely removal of vegetative cover (e.g., only in advance of immediate pipeline trenching and placement);
 - Track-walking of slopes;
 - Temporary mulching of disturbed areas and pipeline cover (as part of hydroseeding on steep slopes).

In addition silt fence will be placed at toes of slopes.

[Temporary drainage control, sediment control and erosion control measures have not always been maintained or installed in a timely manner]

2.5-67 Temporary slope breakers shall be used to reduce runoff velocity and divert water off the construction right-of-way. Earthen slope breakers will be constructed to an appropriate size and must be driveable. Synthetic materials such as (EnkaMat and Rubulon Green) materials have already been purchased and are available on sections. Bio-options such as jute and straw will be utilized for future purchases where possible.

Install temporary slope breakers on all disturbed areas, as necessary, to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing should be used if necessary): Slope (%) Spacing (feet) 5 - 15 300 >15 - 30 200 >30 100. It is recommended that the gradient of the slope breakers should be no greater than 100H:1V.

Slope breakers must afford drainage protection across the whole width of the RoW.

Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device (e.g. properly sized riprap) at the end of the slope breaker and off the construction right-of-way. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive resources.

[At many locations slope breakers were not installed according to the commitment. Slope breakers were infrequently spaced, installed at a high angle, did not extend across the entire RoW and outflow areas were inadequately located]

2.5-68 Steep slopes adjacent to rivers that remain undisturbed for more than 14 days (this period of days may not be appropriate during winter conditions when there is snow on the ground) must be track walked.

If any construction area remains undisturbed for more than 21 days (this period of days may not be appropriate during winter conditions when there is snow on the ground), it shall be track-walked (up and down) or disked/tilled on the contour (slopes less than 3:1), temporarily seeded and/or mulched.

[At many locations steep slopes adjacent to rivers were not track walked. Track walking did not occur in all areas where the RoW was undisturbed for more than 21 days]

2.5-69 Sediment barriers shall be used to stop the flow of sediments and to prevent the deposition of sediments into sensitive receptors. They may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g. driveable berms across travelways), sand bags, or other appropriate materials.

At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, to prevent sediment flow into the wetland or waterbody.

Silt fences must be constructed such that any runoff water is retained, settled and filtered.

All temporary sediment controls shall be routinely inspected by the suitably competent personnel, particularly after rainstorms and cleaned out when they are 1/3 full, repaired or replaced.

The Contractor shall remove all temporarily installed silt fence after final re-instatement and the establishment of a permanent, erosion control effective vegetative cover.

[There are some locations where silt fences have been incorrectly installed and several instances where they have not been adequately inspected or maintained]

2.5-76 The commitment and relevant non-compliances are listed in Attachment 1 - HSESAP Commitments relating for River Habitat Non-compliances.

2.5-113 Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (temporary slope breakers and sediment barriers) until conditions allow completion of cleanup. A winterization plan if construction will continue into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring shall be developed.

A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed and inspected and maintained. When access is no longer required, the travel lane must be removed and the right-of-way restored.

Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench should be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

Grade the construction right-of-way to restore preconstruction contours and leave the soil in the proper condition for planting.

Remove construction debris from all construction work areas unless the landowner or land managing agency approves otherwise.

Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

[Limited technical reinstatement has been completed and temporary erosion control measures have been inadequate or poorly maintained in some locations]

2.5-120 The commitment and relevant non-compliances are listed in Attachment 1 - HSESAP Commitments relating for River Habitat Non-compliances.

2.5-122 Depending on ground, soil and weather conditions, these erosion control measures shall be installed directly after construction. It is however likely that additional repair work shall be necessary. This shall be executed during the summer months (outside the fish restriction period).

[Erosion control measures have not always been repaired in a timely manner and in some cases were not installed directly after construction]

Attachment 3 - HSESAP Commitments and Non-compliances relating to Wetlands

2.5 – 31 It is currently the intent to remove all roads constructed during undertaking wetland crossings prior to the thaw. However, consideration will be being given to the longer term use of some sections of wetland roads during operation and maintenance, subject to agreement with RF authorities and commitments with respect to managing access to previously undisturbed or ecologically important areas.

[In many cases, due to the actual prolonged construction phase, roads have not removed prior to the thaw].

2.5 – 36(i)

- (i) Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction Right of Way unless fully segregated from the wetlands by geotextile.
- (m) Remove all roads constructed during undertaking wetland crossings. However, consideration will be being given to the longer term use of some sections of wetland roads during operation and maintenance, subject to agreement with RF authorities.

[There have been instances where rock and soil from outside the wetland have been used in temporary road construction. There have also been some roads constructed without the use of underlying geotextile].

2.5 – 80 The affected surface vegetation (e.g. Sphagnum communities) shall be removed, stored separately from peat and mineral soil and then reinstated as close to their original position as possible, to reduce the possibility of longer-term change to wetland vegetation along the RoW, once the pipeline has been installed. When construction in wetland areas takes place during the winter months, replacement of surface vegetation may be assisted by the fact that the surface layer should be frozen, thus maintaining vegetation and underlying soil layer as an integral block for replacement.

[In some instances the surface vegetation was not removed and stored separately].

In addition to relevant commitments above, reference is made in this document to the commitments 2.5-144, 2.3-41 and 2.5-79:

2.3 – 41 Ecological monitoring shall take place on an annual basis, for a minimum of three years. After this period, the need for continued monitoring shall be evaluated. This analysis will be largely determined on the vegetated condition of the RoW and re-establishment of characteristic plant species/assemblage. Re-vegetation shall be considered successful if herbaceous and/or woody species present in the applied seed mixture comprise at least 80 percent of the vegetated RoW and are present in a

distribution and density that would be considered representative of the species composition of the original seed mixture. Results from the monitoring programme shall be used to determine the need for remedial action should re-vegetation of the RoW to specified requirements not occur.

2.5 – 79 Ensure that measures are undertaken during the excavation works to maintain the long-term hydrological integrity of wetland habitats. The construction methodology for pipeline installation (e.g. burial in mineral soil underlying peat where feasible) and the design of the route itself have been developed specifically to reduce the potential effects on hydraulic functioning.

2.5 – 144 Ensure that all disturbed areas successfully re-vegetate with wetland herbaceous and/or woody plant species. Monitor and record the success of wetland re-vegetation annually for the first 3 years after construction or until wetland revegetation is successful. At the end of 3 years after construction, file a report identifying the status of the wetland re-vegetation efforts. Include the percent cover achieved and problem areas (weed invasion issues, poor re-vegetation, etc.). Continue to file a report annually until wetland re-vegetation is successful.

Wetland re-vegetation shall be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland areas that were not disturbed by construction. If re-vegetation is not successful at the end of 3 years, develop and implement (in consultation with a professional wetland ecologist) a remedial re-vegetation plan to actively re-vegetate the wetland. Continue re-vegetation efforts until wetland re-vegetation is successful.