

Sakhalin II River Crossing Report - Revision of 4 November 2005: a review

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1. Introduction

We present below the requested brief review of the revised SEIC River Crossings Report dated 4.11.05, with hard copy arriving 7.11.05. We begin with the positives, then turn to the areas where, in our view, further work, or additional rigour and/or clarification are required. Only brief comment is passed on the new material sent to us, which arrived very late, on Friday 11 November. Given the very short timescales given, these comments must be considered as preliminary.

Lawler and Milner (2005, pp.4-5) summarised some of their recommendations for further attention as follows:

'However, a number of important limitations in the RXR are also evident, and we are recommending a major revision of the document to produce an international-standard strategy and degree of environmental protection. We focus our report on the following issues where substantial revision is required.

- *Evidential basis*
- *Understanding of river system operation in Sakhalin*
- *Monitoring needs*
- *River crossing strategy*
- *River classification strategy*
- *Types of disturbances*
- *Sediment influences on pink and chum salmon spawning beds*
- *Impacts on other fish species*
- *Role of hatcheries*
- *Effect on benthic communities*
- *Poaching*

We also make several positive recommendations where and how this might be achieved.'

Our brief report here is guided by this summary. Note that decimal page references are given for ease of access (e.g. 52.5 is 50% down page 52).

2. Positive points

A number of improvements can be identified, and some examples are given below.

The background fluvial and hydrological material (baseline-environment text and graphics akin to an EIA approach) specific to Sakhalin is a welcome addition, and this now serves to convey something of the operation of the Sakhalin river systems, which can be used to help formulate and/or justify proposals (e.g. for crossing methods and timing) and mitigation measures. The graphics on river flow hydrographs and seasonal temperature changes are a good example of this, as indicated in Lawler and Milner (2005), and the table on Freezing characteristics in the recent (11.11.05) material also helps.

A greater recognition of spatial, principally north-south, differences in river behaviour (and hence response) is apparent, which should help to inform crossing proposals and timings.

Increased recognition of year-to-year variability, for example in river flows, temperatures and freeze dates has been integrated, and this will be useful to all concerned with the project, from crossing design to risk and impact assessment.

The mapping of route and crossing locations, differentiated according to oil and gas, and to completions, usefully provides a 'state of play' overview for all concerned.

It is valuable that the surveys undertaken in connection with this project are summarized in a Table (3-4), with full references.

The report has been considerably strengthened ecologically by discussions of the silver and cherry salmon and additional data on pink and chum salmon.

3. Areas requiring further work and clarification

However, many of the issues raised in earlier feedback, including the Lawler and Milner (2005) report, remain to be addressed, or addressed satisfactorily in our view, and these are itemised below.

3.1 Aims of the RXR and its relation to other documents and Execution Plans

It is appreciated that the RXR is essentially a strategy document. However, given that it is stated explicitly (p.2) that the RXR 'forms the basis for the ongoing development of a River Crossing Execution Plan', and presumably also the Monitoring Plan (p.2) and other documents, it is assumed that the RXR occupies an important 'parental' position. It is therefore *vital* that the RXR clearly sets out a position which is clear, robust, defensible, entirely transparent to all (including the authorship teams for derivative documents), based on supported crystal-clear arguments, information and commitments which are readily transferable into a set of drivers for the Execution Plan and Monitoring Plan, without any transfer misunderstandings introduced.

In our view, the RXR is only partially successful here.

This is especially relevant because the Execution Plan has apparently not yet been drafted. Both documents need to be read in tandem to understand fully the crossing

rationale, likely impacts and mitigations and monitoring schemes proposed. The reader is left with the question: *what guarantees are in place to ensure that the Execution Plan will adequately address all the key issues omitted or discussed very briefly from the RXR?*

It would be difficult to recommend the RXR in isolation, without sight of the derivative documents, including the Execution Plan(s).

In particular, there is a distinct tendency for loose or vague expressions to be used in the RXR which are not helpful to those seeking to understand precisely what commitments are being made, or will be made in future documents. For example, in too many places, rather vague or *conditional* statements are made, such as: (a) Mitigation measures ‘may be applied’ (p.68.9); (b) SEIC is committed ‘to be aligned with the intent of the (FERC guidelines)’ (p. 72.4): does this mean ‘follow to the letter’? (c) monitoring/sampling will be undertaken ‘dependent upon the practicability of works in the prevailing conditions’ (pp. 85-86).

It is unclear (a) how many documents and plans will be/have been produced which relate to river crossings, and (b) how these relate to each other. For example, it is normal on major pipeline schemes which cross rivers to produce a strong EIA followed by a River Crossings Document, Method Statements, Monitoring Plan, Hydrotest Plan and an Oil Spill Response Plan. With so many documents, it is essential that a relationship structure is established.

We recommend, therefore, that SEIC produce a document map which shows graphically all the documents related to river crossings, including their issue dates, full references and availability/source (e.g. LiveLink reference). It should clearly establish how each builds on, or relates to, each other, so that it is clear which document deals with which aspects – and if any inconsistencies emerge, which document should prevail.

Furthermore, although chapters 2 and 3 in RXR 4.11.05 improve on its predecessor, they do not fulfil the aims established on p.6, in that key environmental and ecological receptors are not *identified* (e.g. by name), and impacts are not *analysed* (i.e. quantified). Only general, qualitative comments are offered. The proper place for these is in the EIA and given its limitations, it is hard to escape the conclusion that the weaknesses should have been addressed in 2003 following the Fitness for Purpose outcome. A key challenge now, however, is the issue of future crossings, though those completed will need to be embraced retrospectively by any plans formulated.

Given our earlier feedback (Lawler and Milner, 2005) and comments received from other quarters, we recommend that these issues are examined in considerable detail as soon as possible.

3.2 Evidential basis

Although this is much stronger here than the earlier version, important gaps remain.

Sediments. The RXR says nothing useful about the character of the materials in the river beds or banks at the sites (despite the qualitative clause on p.40.5), and quantitative data on particle size distributions of these materials is needed so that we know the percentages of sand, silt and clay in the sediments. This is essential before we can begin to estimate likely sediment generation effects and impacts.

Also, the potentially very promising St Petersburg SHI study on sediment generation predictions for several Sakhalin rivers, as discussed at length at the Shell telecom, has not been made available. Indeed, all reference to it has been deleted, despite its possible usefulness to estimate sediment plume effects in Sakhalin rivers, and therefore impact zones on fish and habitats, to help guide mitigation measures.

In addition, it is unfortunate that no extra turbidity, suspended sediment concentration, or suspended sediment load data for Sakhalin rivers have been incorporated, despite this being the dominant variable group for ecosystem impact analysis here.

It is valuable that the surveys undertaken in connection with this project are summarized in a Table (3-4) although it states in introductory material that “ in total 221 different water courses have been surveyed...” but in the Table it states that “survey of 239 rivers of the highest fish category not previously surveyed” so more than 221 have been surveyed. This needs clarifying.

Other omissions and confusions are discussed below.

3.3 Life-cycle information inconsistencies

Significant inconsistencies exist between the written text on salmonid life cycles and the summary figure (Figure 3-14). Fig 3-14 needs to be amended in all places itemised below to reflect the more accurate *textual* information: this is crucial because this diagram is likely to inform crossing schedules and techniques later. *It is stressed that Fig 3-14 should be amended to agree with the text, not the other way round.*

- *For chum salmon* it shows that the summer run can commence in late June (Table 3-8) but the figure shows mid July and that *chum fry* emerge early April but the figure shows mid April.
- Table 3-8 also shows that *pink salmon* start spawning in early June in the East but the summary figure shows July.
- With respect to *silver salmon* the text suggests spawning through December but the figure shows it ending in November.
- Also, since this summary figure is so important, we *strongly recommend* that it be redrawn with separate lines for each life stage so that they can *overlap*
- A diagram for each region or areas river grouping is also needed to reflect spatial shifts in life-cycle timings: north-south differences are mentioned in the ext, but not reflected in Fig 3-14. For example, *silver salmon* fry do not end being free swimming at the end of August but remain free swimming

throughout the winter before potentially migrating to the ocean in the spring as 1+ fish.

3.4 Impacts (Chapter 4)

It is not clear how spoil will be stored. Trench spoil (p. 52.5) for river *bed* materials (normally coarse) should arguably be kept separate from the *bank* materials, which are often very fine-grained, and should not be introduced to the bed. Bed materials generally should be used to backfill bed trenches.

Information on typical footprint areas (p. 52.7), including maximum and minimum, is needed.

Sediment plumes and therefore impact zones continue to be underestimated (p. 54.8), despite the information we presented earlier (and integrated in the RXR 4.11.05 elsewhere).

The accelerated erosion point is unworkable in its present form (p.57.3): how will this be identified, and what additional measures will be taken if monitoring confirms this to be occurring?

The Execution Plan needs to confirm *explicitly* that cumulative impacts (p. 57.6), identified partly through a drainage basin and river network analysis, will be discussed, and satisfactory mitigation measures employed.

The same comment applies to delivery of sediments and contaminants downstream (perhaps to sensitive rivers) and to tidal systems, including lagoons and nearshore zones (pp. 57-58).

Example satellite imagery of sediment plumes should be supplied (p. 58.8), to facilitate independent judgements.

Sediment *resuspension* is almost totally ignored in the RXR (e.g. p.50.2). Sediment liberated during crossings may travel significant distances then be deposited. Sediments are often repeatedly entrained every time a competent flow event occurs, i.e. as a jerky, stop-start, conveyor belt mentioned previously (Lawler and Milner, 2005). Thus, travel distances may be much longer than a short-term, short-distance monitoring programme would identify, and the effects can be prolonged beyond the initial turbidity 'spike' produced when a drag-line hits the bed.

What evidence exists that fish can move away from turbid waters (p. 60.2) out of possibly confined subglacial pools in frozen rivers under low-flow conditions, such as in Sakhalin? This mechanism may exist in temperate rivers, but what about in cold environments: does the concept translate?

Fines are described (p. 61.8) as particles <6.4 mm? This is gravel. Should this be 0.064 mm, i.e. silt and clay particles, which are one hundred times smaller in diameter? The wider issue here affecting the report (though improved in this respect) is that we have to be sure of definitions when reports are to be intelligible to all

concerned, and to enable seamless links and policies to be forged with derivative documents.

3.5 River Classification and Strategy Development (Chapter 5)

3.5.1 River classification

One of the major areas of revision involves river classification, and we present a number of points here.

We highlighted the confusion of four different classifications in the original Rivers Crossing Report and requested further clarification of the inclusion of the “most sensitive” list within the Group III rivers of the SEIC classification. Group III was based on the quantity of spawning habitat (>10,000 m²) and was therefore focused on the commercial species.

The revised report now presents, in far too little detail and with confusions and ambiguities - *another* classification system termed the “sensitivity classification and impact rating” with the highest fish category of Sakhrybvod now being divided into 3 types (Type 1, 2 and 3). This needs a solid and coherent chapter of its own, which will be intelligible to all (SEIC division personnel and contractors; lenders and their advisors; stakeholders; NGOS etc.), before it can be considered robust and defensible.

Clarity is needed to understand how the new “high ecological sensitivity” Type 3 classification relates to the 68 Group III rivers, or dovetails with the “most sensitive” list in the September RXR, except that the new classification includes “*potential spawning ground for Taimen*” rather than “*possible presence of taimen*”.

On p. 68.1 and Fig 5-1, how do we *know* that 329 rivers have no spawning grounds? Have all these rivers been actively surveyed and *confirmed* to have no spawning grounds, or is it that no surveys and data exist to confirm or refute (see our important ‘*absence of evidence*’ point in Lawler and Milner (2005))? This needs confirming.

Where are the spawning grounds *located*, as previous classifications have involved spawning grounds within the crossing area, < 100 m downstream and < 50 m upstream (Averina B2a) and 100 m downstream and 50 m upstream (Averina B1a)?

Type 3 is now approximately 20 rivers (an increase over the 9 in the “most sensitive” category) although 36 rivers are known to support Taimen and 8 potentially support (Table 3-5). This is difficult to understand and therefore justify. It appears that the 2005 survey of Sakhalin Taimen will inform this process, but are the results not yet known so that the exact number in this new group can be clarified? Presumably if 36 rivers are known to support taimen then they also have the potential for spawning? Some justification here is needed.

It also seems like the main difference between Type 2 and 3 is the “quality of spawning ground” (*which is still not defined in the new report*). We need hard information on the *quality* of spawning habitat. and in which context this is being reviewed to obtain a clearer picture of the difference between Type 2 and Type 3.

The added concept of biodiversity now appears in the equation. This biodiversity includes benthos and freshwater mussels. Mussels apparently are present in approximately 4 streams according to the report. With respect to the example summary sheet provided in the recently revised material (Fig. 5-3) it is not clear why this example is not a high sensitivity (group 3) site except that the good spawning criteria only applies to Taimen and not other species or that other salmon species (silver, cherry, Dolly Varden) are not present (i.e. the biodiversity question). If biodiversity has to come into the question (i.e. as Type 2 plus...), then under the new scheme it could put into Group 2, key spawning and rearing habitat for a single species (e.g. Taimen) which would not be a best-practice approach.

We assume that this method is downplaying the single-species approach, and therefore clarification is required.

The report has been considerably strengthened ecologically by discussions of the silver and cherry salmon and additional data on pink and chum salmon. Is the proposal that the focus will move away from the pink and chum salmon in determining highly sensitive streams, as in the original report, to the Sakhalin Taimen as discussed above?

There is still need for a justification for not considering silver salmon apart from being typically non-commercial but it is now included in the biodiversity component of Type 3 rivers. Is the silver salmon component based on juvenile habitat or presence of juvenile fish?

3.5.2 Hydrogeomorphology incorporation

It is useful to see that this has now been more explicitly addressed. However, Steps 1-3 of the hydromorphological impact assessment (note that *Hydrogeomorphological* is the preferred term to *hydromorphological*) are vague, especially Step 1, e.g. 'channel parameters'. These should be declared, and their importance justified.

Only 20 rivers now appear in the high sensitivity bracket. Will the effect of applying the hydromorphological assessment process reduce this number? This is unclear, and should be made crystal clear, before any recommendation is made. This highlights the need to see the complete Execution Plan before any assessment is made.

One of the major recommendations of our review was that Group I rivers flowing into critical salmon spawning streams would be reviewed. It is essential that this is addressed through the assessment, and details given on how "hydromorphological impact" will still be applied to the Group 1 rivers of the new classification. However, in Table 5-1, it suggests that Type 1 rivers, no matter the extent of hydromorphological impact, will be cut outside the spawning season but not necessarily in winter. This appears to be an inappropriate approach, not least because of downstream rivers of higher sensitivity.

It is also necessary to include turbidity curtains for all sensitive streams (68 Group III rivers in the original classification), as an absolute minimum.

Execution Plans: will there be one Execution Plan, or one plan for each sensitive river, such as a Crossing Pack?

HDD crossings: KPs are needed to aid location.

The concepts of working vs total hours for crossing times are still confused, despite our earlier recommendation. Thus, does '48h' (p. 72.5) mean 6 days at 8h per day, or does it mean non-stop cutting activity for 48h whether day or night? In the September RXR it mentioned daylight working only, so this is an important area of confusion. It is vital that this is *clarified* because (a) it is fundamental to sediment injection characteristics to rivers, and (b) crossing-time minimisation is cornerstone of SEIC river crossing proposals and Sakhrybvod permits.

What mitigation measures *exactly* will be employed when there is a time separation between oil and gas pipeline crossings? How will partly-completed crossings be left, e.g. before a gas crossing is added to the oil crossing, and full reinstatement becomes possible?

Wetlands have again been ignored, and it is not sufficient to state that as they do not source streams, they are unimportant. On a number of occasions it has been mentioned by observers that wetland areas associated with the rivers support juvenile fish populations and this could be critical rearing habitat and important for overwintering. This needs reconsideration.

Hatcheries should be addressed in this report and not in the River Crossing Execution plan.

Poaching needs more information under 4.3.3 to the extent of the problem currently. The mitigation section (5.5.3) appears to be a step in an appropriate direction.

Section 6.3 does not correspond to the SEIC response of stating fishery characteristics will be monitored for four years as it states that "at least two years" inferring that it could be shorted than the 4 years.

This is an important point, and we *strongly recommend* absolute clarity here.

Fish and egg mortality is highlighted much more strongly now, but some quantification of impact here is still necessary (e.g. p. 74.7).

3.6 Monitoring

It is essential that full details are given. The Monitoring Plan should include a full list of variables and frequencies and methods, but a summary at least of the key determinands, methods, frequencies, timings should be given in the RXR – and all other aspects clearly addressed in Lawler and Milner (2005). This should definitely include Data and Results handling, such as storage, analysis, publication and disclosure.

We strongly recommend that this is addressed rigorously as soon as possible, and not left till after the crossings are completed. Construction monitoring itself should be

agreed before further crossings are attempted, but this also applied to longer-term Post-project appraisal monitoring.

Vague statements such as monitoring/sampling will be undertaken 'dependent upon the practicability of works in the prevailing conditions' (pp. 85-86) are difficult to support. Many years of experience in the Sakhalin environment, and adoption of standard cold-region river measurement techniques (e.g. as developed by the US Geological Survey, or by the Icelandic authorities), should ensure that the correct methods are chosen and the appropriate instrumentation provided for the conditions.

Given that 50% of oil crossings and 15% of gas pipeline crossings for the Sakhalin II project have been completed (p.6), we are assuming that monitoring of these should have already been achieved under *existing* strategies and plans. Indeed, it was confirmed at the Shell meeting that some (limited?) monitoring has been achieved. However, monitoring details or results for existing crossings have not been presented in the revision: these may have helped to guide the development of the river crossings strategy and other plans, but until they become available, this is impossible to ascertain.

We *strongly recommend* that these monitoring results are integrated and discussed in any future revised documents.

We also *strongly recommend* that full-scale and appropriate monitoring begin *immediately* for future crossings, especially for turbidity and/or suspended sediment concentration, as apparently there is no information available on likely suspended sediment concentration increases attributable to pipeline crossings on Sakhalin itself. Instead, much is made of the Reid and Anderson reports, which have not been exposed to the full Peer Review process for publication in scientific or engineering journals.

Amendments here should have the added benefit of providing reassurance to all concerned that, given that (a) half of the oil crossings have already been completed before a strategy has apparently been agreed (including some sensitive river crossings), and (b) only limited monitoring of the construction or post-construction monitoring has taken place, existing wet-cut practices are appropriate.

Suspended sediment concentration monitoring is mentioned under hydrochemistry and fishery characteristics: this needs to be clarified and restructured, and sampling/monitoring details clearly described and justified in one place (e.g. Table 6-10).

3.7 Other points

Lawler (2005) should be Lawler and Milner (2005) throughout, as clearly stated on our report of 21 October, and full reference details given in the bibliography.

We are also missing the following documents which, as agreed at the meeting at Shell on 2005, would be sent to us.

Letter from Sakhrybvod declining the permission to undertake dry crossings (which are normally to be preferred, as also acknowledged in RXR September 2005).

A DVD of the ROW *with audio or textual commentary* to make the imagery useful (e.g. to pinpoint cross-sections which appear not to have been reinstated satisfactorily)

3.8 References

Lawler, DM. and Milner, A.M. 2005. **Sakhalin II Pipeline Project: River Crossings Report - Initial Review**, Report to AEAT, 21 October 2005, 31 pp + 2 tables, 11 Figures + Appendix