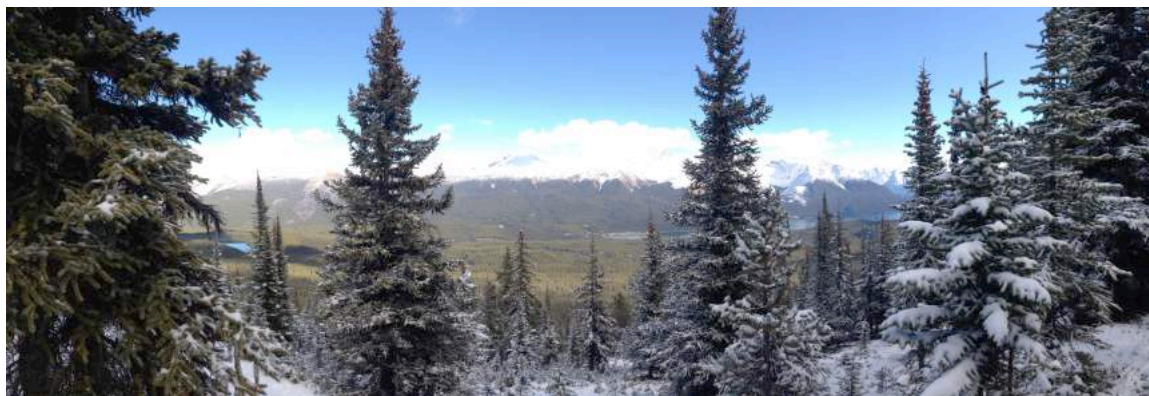




The Trans Mountain Legacy Fund: a Programme Evaluation

Wild Business Ltd



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Project : Trans Mountain Legacy Fund Programme Evaluation

Submitted to : Salmo Consulting Ltd

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Cover photograph: view near Evelyn Peak, Jasper National Park (credit: J.W. Bull).

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Executive Summary

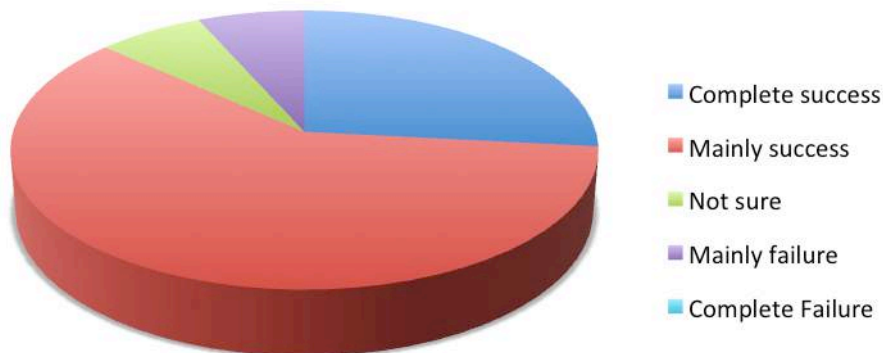
The Trans Mountain Legacy Fund, originally proposed in 2004, was established as part of the implementation of the Anchor Loop Pipeline Project by Terasen and subsequently Kinder Morgan Canada. The rationale for the creation of the Trans Mountain Legacy Fund was to ensure that, overall, Project activities resulted in a net benefit to the ecological integrity of the region. Regulators, resource managers, and environmental organizations both within Canada and further afield are increasingly considering the merits of biodiversity offset schemes with a similar focus on ecological integrity. As such, it is important to establish which elements of the Legacy Fund model are worth replicating for future biodiversity offset or net benefit type initiatives.

The Trans Mountain Legacy Fund Steering Committee commissioned an independent review of the program that evaluates the strengths, weaknesses and lessons learned from the implementation of Trans Mountain Legacy Fund in western Canada. This document is the result of that Programme Evaluation. The evaluation was intended to determine to what extent the implementation of the Legacy Fund has been successful, and which elements of the program might be successfully replicated elsewhere. Further, the evaluation establishes modifications that would have potentially enhance the programs effectiveness, or address any weaknesses identified; and additionally, suggests other proven options that could be recommended. The primary **activities** required as part of the evaluation were to:

1. Review background information;
2. Conduct verbal interviews with Legacy Fund representatives, contractors, and advisors to the Steering Committee; and,
3. Obtain relevant information on other comparable offset schemes.

This report is split into three main sections corresponding to these three activities.

During interviews, interviewees were asked what their overall impression of the TMLF was at this point. Responses were grouped into the categories: 'complete success', 'mainly success', 'not sure', 'mainly failure', and 'complete failure'. The vast majority thought the project had been successful, and none thought it a complete failure (see the Figure below). Note of course that some inherent bias towards a favourable outcome would be expected in an assessment like this, when primarily interviewing participants in the TMLF process itself.



The table below breaks down the key themes that arose through the background literature review and interview process – and, for each theme, highlights key strengths, weaknesses and lessons learned. The final column captures important examples of projects that could inform enhancements of the TMLF (shaded orange), and overall areas in which the TMLF could inform other projects (shaded green). Detailed comments in relation to all themes are given in the main body of the report.

Theme	Strengths	Weaknesses	Lessons Learned	Other projects
Stakeholders	Engagement and consultation process	Expected more compensation	Importance of engaging stakeholders extensively and early in the process	Other offset projects could learn from the approach taken to stakeholder engagement on the Anchor Loop and by the TMLF
Net Benefit	Clear and ambitious objective specified from the start Best practice - at the time, and even now	No counterfactual specified No loss-gain calculations to demonstrate Net Benefits	Need a process for determining ecological gains that are greater than losses	Many methodologies exist for loss-gain calculations, particularly in Australia (e.g. Parkes et al., 2003), and in the Guidance Notes to PS6 (IFC, 2012) Of interest is the Oyu Tolgoi mine in Mongolia, basing the size of its offset fund on loss-gain calculations, and as a result requiring ~ 0.6% of project investment for compensation (similar to the TMLF proportionally).
Process	Compensation project selection was systematic, rigorous and appropriate	No process for choosing new projects once all options in parks were exhausted	Time taken to choose and implement projects much longer than expected	Design and implementation of offsets for specific projects often takes this long (<i>J. W. Bull, unpublished data</i>). See also the length of time taken for offset policies to mature in Germany, the US, and Australia, where >10 years is common
Governance	TMLF and project management was strong Generally good communication	Process relied more upon skilled and motivated people than structure Limited criteria for choosing new members for Steering Committee	Put in place structured governance procedures, designed to last for an extensive time period	The Oyu Tolgoi mine in Mongolia has extensive governance measures in place for managing associated biodiversity offsets
Finances	Compensation projects represent good value for money	Arrangements for holding the TMLF were expensive	More care in making financial arrangements for holding and investing such funds	The Umeå railway project (Sweden) involved the creation of a foundation to manage compensation funds and activities over a period of 100 years. In addition, the BBOP website contains numerous documents providing guidance on the financial component of implementing biodiversity offsets. Also, the US Wetlands Policy has established much experience in financial arrangements. Beyond Oyu Tolgoi, the Reventazón project (Costa Rica) provides an example of a project with cost estimates for offsets: \$2.7m (USD) in this case. Although hard to compare directly, this suggests that the TMLF was not overly expensive for compensation

				Note: MRPP have a good financial arrangement for investing their one-off payment from the Anchor Loop
Indirect benefits	A range of indirect benefits of the TMLF and the Anchor Loop were noted by interviewees	Indirect benefits have not been collated and described anywhere	Interesting that a project of this nature can give rise to incidental and unexpected positive indirect benefits	Other offset projects could consider this issue of positive indirect benefits when making NNL calculations
Monitoring & tangibility	Compensation projects visibly have tangible benefits Clear case for additionality	Monitoring programme. This was not designed from the outset, which will make it more difficult to demonstrate Net Benefits	Design monitoring programme from the outset, including pre and post implementation monitoring	The Umeå railway project (Sweden) has been designed to last for up to 100 years, and has correspondingly long term monitoring programmes. Also involved pre-implementation monitoring. The same is true of the QMM mine in Madagascar, which started evaluation before construction began, and has monitoring activities planned through to 2065
Risk	The TMLF itself was a highly successful risk management strategy process for the Anchor Loop	No prior agreement on who should accept liability for compensation projects Little accounting for uncertainties in compensation project design	Be clear from the outset in compensation project selection who will accept liability Use multipliers to incorporate consideration of project uncertainties	Lessons for transferring liability for compensation projects can be learned via habitat banking mechanisms (US, Australia). A good example of the use of multipliers (aka compensation ratios) is the Sydney Olympic Park (see Pickett et al., 2013). The theory has been developed by Moilanen et al. (2009) and Laitila et al. (2014)
Transparency	Very good level of transparency (e.g. documents in public domain, TMLF website)	Some key details not transparent: e.g. how TMLF was calculated, where parks invested their one-off payments	Transparency is powerful in terms of stakeholder opinion. But low TMLF website traffic	Other biodiversity offset projects could learn from the level of transparency demonstrated by the Anchor Loop
Other issues	Equity in shared benefits between two parks	No species widely considered 'charismatic' were included in the compensation measures, which would have interested some stakeholders	For ecological and management reasons, some compensation outside of the parks is defensible	Examples of inclusion of charismatic species in offset projects include the Oyu Tolgoi mine (Mongolia), and the Simandou mine and infrastructure (Guinea) which involves impacts upon great apes The findings about out of kind, out of park compensation might be relevant for other projects

Key requirements were extracted from the Terms of Reference for the Steering Committee, and interview responses were used to judge whether each criterion had been met. As outlined in the Table below, it was established that the majority of criteria had indeed been met, with the notable exception of the implementation of a monitoring programme – which the Steering Committee intend to implement in the near future.

Requirement		Requirement achieved	Evidence
Projects must:	focus on ecological connectivity	Yes	<i>Triton (2012) Project summary Meeting minutes</i>
	be outside the normal course of business for the parks	Yes	<i>Interviews</i>
	be feasible	Yes	<i>Triton (2012) Project summary</i>
	ensure both JNP and MRPP benefit ecologically	Yes	<i>Triton (2012) Project summary Interviews</i>
The Steering Committee were required to develop an implementation plan identifying actions, timelines and budget		Yes	<i>Implementation plan Meeting minutes</i>
The Steering Committee were required to hold regular meetings and vote on any expenditures by majority		Yes	<i>Meeting minutes</i>
The original timeline for all projects to be completed was December 2014, although in the case of unanimous agreement by the Steering Committee the deadline could be extended		Yes	<i>Project summary Meeting minutes</i>
The Steering Committee were required to initiate a post project monitoring program “to assess the effectiveness of mitigation actions”		No	<i>In progress</i>

In relation to Stage 3 of the Programme Evaluation, we present information on comparable biodiversity offset projects in Canada, Europe, Africa, Australia and Asia, as well as regional offset policies in the US, Europe and Australia. Whilst financial information is limited for other biodiversity offset project and policies, the information available suggests that it is common to spend up to 1% of total development costs on biodiversity compensation for offsets, meaning that the TMLF was a reasonable amount of compensation to pay as a proportion of the cost of the Anchor Loop project. The technical approaches now being employed to achieve Net Benefits on other projects could have enhanced the TMLF. Similarly, there are finance, risk and liability management approaches being utilised for other biodiversity offset projects which could inform the gaps in the TMLF.

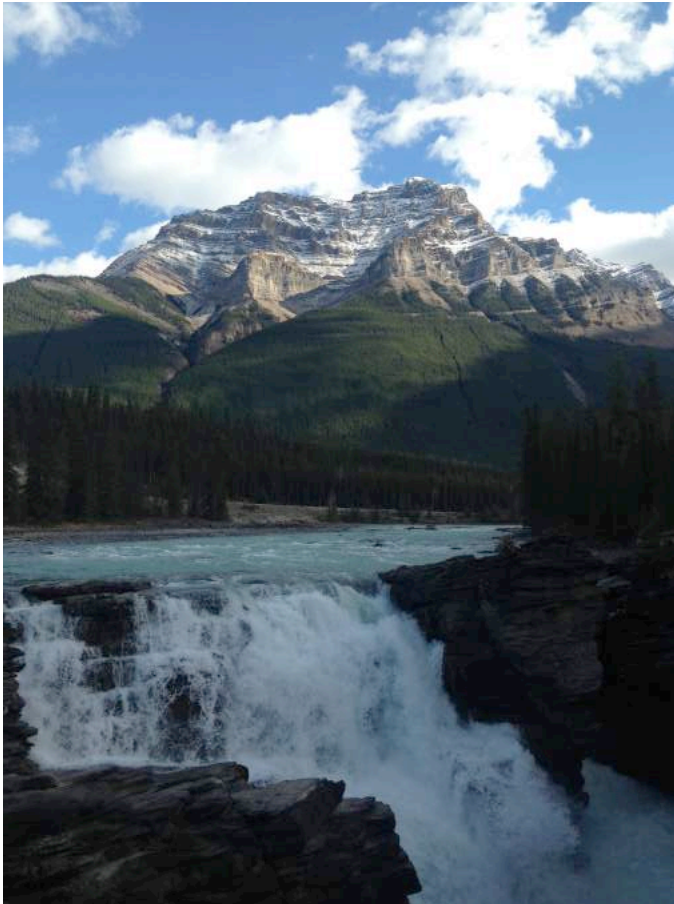
The TMLF is not a perfect example of a biodiversity offset project and would have to fulfil certain additional criteria to be considered one, but then, it was never originally intended to be a biodiversity offset to contemporary standards. The TMLF is, though, a very good example of an ecological compensation and restoration project – and one could argue that it exemplifies how it can be possible to implement a large scale industrial project within an ecologically sensitive area, simultaneously and satisfactorily meeting the requirements of a highly diverse set of stakeholders.

1. Introduction

The Trans Mountain Legacy Fund, originally proposed in 2004, was established as part of the implementation of the Anchor Loop Pipeline Project – originally by Terasen, and then subsequently by Kinder Morgan Canada after they purchased Terasen. The history of the Project is discussed in more detail in Section 3.4. The rationale for the creation of the Trans Mountain Legacy Fund was to ensure that, overall, Project activities resulted in a net benefit to the ecological integrity of the region – specifically, the Mount Robson Provincial Park and Jasper National Park¹. The program was developed in consultation with regulators, environmental groups and key experts (see Section 3).

In line with current good practice – having mitigated the ecological impacts associated with the Anchor Loop Pipeline Project as far as possible, and fulfilling regulatory requirements – the Fund allows the implementation of projects that improved ‘ecological integrity’ (conceptualized here, but not defined, in terms of freedom of movement for wild species), intended to more than compensate for any remaining residual impacts associated with the Project. The objective of the Fund is to achieve ‘Net Benefits’ for both parks.

Mt Kerkeslin from the Athabasca Falls (credit: J.W. Bull)



The governance structure set up to deliver projects through the Trans Mountain Legacy Fund, and the focus of objectives upon ecological integrity, are both relatively novel for such compensation programs within Canada. Regulators, resource managers, and environmental organizations in Canada and abroad are exploring the merits of biodiversity offset schemes with a similar focus on ecological integrity. It is thus important to establish which elements of the Legacy Fund model are worth replicating for future biodiversity offset or net benefit initiatives.

The Trans Mountain Legacy Fund Steering Committee therefore wished to conduct an independent review of the program that evaluates the strengths, weaknesses and lessons learned from the implementation of the Trans Mountain Legacy Fund in Canada. This document is the result of that Programme Evaluation.

The Program Evaluation was intended to determine to what extent the implementation of the Legacy Fund has been successful, and which elements of the program might be successfully replicated elsewhere. Further, the evaluation establishes modifications that would have

¹ <http://www.transmountainlegacyfund.com/about/>

potentially enhance the programs effectiveness, or address any weaknesses identified; and additionally, suggests other proven options that could be recommended.

The primary **activities** required as part of the evaluation were to:

1. Review background information;
2. Conduct verbal interviews with Legacy Fund representatives, contractors, and advisors to the Steering Committee; and,
3. Obtain relevant information on other comparable offset schemes.

This report is thus split into three main sections corresponding to these three activities.

Note that projects aiming to improve ecological integrity commenced very recently (2013/14). It is consequently too early to assess the efficacy of the projects themselves, rather, the aim of the evaluation is to understand the efficacy of:

- Legacy Fund negotiations;
- The Steering Committee Terms of Reference and overall objective of the Fund;
- The process and procedures used to select and implement specific projects; and,
- Perceptions of overall success relative to desired outcomes.

Key topics included within the program evaluation were:

- Any implications of the evolving nature of the Legacy Fund initiative, including changes in Steering Committee representatives and advisors;
- Any implications of legal requirements associated with projects in National Parks and Provincial Parks;
- Perceived success in operationalizing the original ecological integrity concept;
- Legacy Fund effectiveness with respect to environmental group and park expectations;
- Legacy Fund effectiveness with respect to the negotiated Terms of Reference;
- Cost-effectiveness of the Legacy Fund initiative relative to other approaches adopted for comparable offset schemes;
- The strengths and weaknesses of the project selection, implementation and management systems; and,
- Recommendations on opportunities for improvement for future offset schemes.

2. Methodology

To emphasize, the primary activities carried out as part of the program evaluation are represented by the following three Stages:

1. Review background information;
2. Conduct verbal interviews with Legacy Fund representatives, contractors, and advisors to the Steering Committee; and,
3. Obtain relevant information on other comparable offset schemes.

Before commencing with Stage 1, Wild Business arranged a kick-off meeting with Salmo Consulting, and independent contractor N. Wilson, to discuss project requirements so as to ensure that the evaluation was carried out to meet the Steering Committee requirements as closely as possible.

2.1 Stage 1: review background information

Wild Business carried out a comprehensive desktop review of information directly relevant to the program, including:

- The relevant Terms of Reference;
- Publications by D.W. Poulton, both specific to the program and his more general work on biodiversity offsetting in Canada;
- Historic Steering Committee meeting notes, available online;
- Project reports, including progress reports (e.g. annual reports) and technical reports (e.g. Clevenger et al. 2009);
- Project proposals for new initiatives aiming to meet Trans Mountain Legacy Fund objectives.

Equally, Wild Business included in the desktop review for Stage 1:

- (a) recent updates to Canadian policy and legislation on biodiversity offsetting;
- (b) information available in the public domain on other private sector organisations that are carrying out large biodiversity offset projects in Canada; and,
- (c) a comprehensive search for peer-reviewed literature on the topic of 'no net loss' or 'net gain' in Canada (e.g. well-established examples of such literature include the work of Quigley & Harper, 2006 and Habib et al., 2013).

All information available from the Trans Mountain Legacy Fund website was included in the review, along with any information provided at the project outset by the Steering Committee, Salmo Consulting, and Kinder Morgan Canada. Wild Business also performed web searches on both the project and on biodiversity offsetting in Canada. Finally, authors of key reports and papers were contacted to request any further information or unpublished reports.

A database was created of all relevant and accessible information. All documents contained within this database are listed in the 'Relevant Literature' section of this report, and a summary of key points contained within Steering Committee meeting minutes is captured in Appendix I.

2.2 Stage 2: conduct interviews

Building upon the review detailed in Stage 1 above, Wild Business created a list of relevant program stakeholders for interview (Appendix II). Interviews were carried out in a semi-structured manner, i.e. a set of core questions (Appendix III) – relating to priority topics established during Stage 1 – were used to lay out the scope of the interview, but interviewees were also encouraged to discuss other issues surrounding these key topics. The proposed interviewees and draft set of questions were shared with N. Wilson, refined based upon

comments, and finalized. All stakeholders to be interviewed were contacted well in advance, and a schedule for conducting the interviews established (Appendix IV).

The Wild Business project lead, J.W. Bull, travelled to Canada for a period of 2 weeks, and completed as many interviews as possible during that time, face-to-face. Whilst in Canada, Wild Business also visited a number of the restoration projects completed for the project, and the pipeline itself. Any interviews not completed face to face were conducted verbally via teleconference. These were otherwise the same as face-to-face interviews.

Wild Business recorded extensive notes during all interviews, and these notes were grouped into key themes (Section 4) that emerged during the interview process. The summary will feature some numerical analysis of responses where appropriate. A comprehensive set of interview notes was originally intended to be included as an Appendix to this report – however, permission was not granted by all interviewees to have all comments made on record, so this was not possible. All comments made that were relevant to the Programme Evaluation are contained within Section 4.

2.3 *Stage 3: comparable offset schemes*

Wild Business compiled information on comparable biodiversity offset schemes implemented in Canada and overseas. We took ‘comparable’ to mean ‘biodiversity offset schemes that have been implemented in relation to a large development project, generally involving linear infrastructure (e.g. pipelines, roads, railways)’. We did not limit consideration to offsets implemented for equivalent habitats to those in the Mount Robson Provincial Park or Jasper National Park, as we believe lessons can be learned from offsets applied in very different habitats (e.g. desert habitats, coastal marine habitats). Neither did we limit consideration to offsets focused upon ecological integrity. However, to be comparable to the initiatives implemented by the Trans Mountain Legacy Fund, all schemes considered have an overall objective of ‘no net loss’ or a ‘net benefit/net gain’ for biodiversity.

There are numerous development projects around the world that have implemented biodiversity offset schemes, although finding detailed information on these schemes was difficult. Furthermore, since this report is to be made publically available, case studies were further limited by the requirement that all information included in this report is already in the public domain. Wild Business endeavored to include a meaningful number of case studies for use in the evaluation, capturing information for use in the program evaluation in three ways:

- (i) by collating information on large and comparable offset projects for which records are publically available;
- (ii) by extracting relevant information from the offset database that Wild Business have begun to build globally, representing information that is in the public domain but which no other organization has yet collated;
- (iii) by collating any permissible information on those offset projects which Wild Business is currently working on or has previously worked on, but which are less widely known or for which information has yet to be published online.

Having established the main themes emerging from the interview process in Stage 2 (above), Wild Business gather information against all themes for each case study offset scheme identified (i – iii). This provided the basis for carrying out a qualitative comparison between the Trans Mountain Legacy Fund and a variety of other offset schemes globally.

The comparison allowed Wild Business to assess:

- Cost-effectiveness of the Legacy Fund initiative relative to other approaches adopted for comparable offset schemes; and
- Recommendations on opportunities for improvement for future offset schemes, based upon international experience.

3. Review of background information

Reports detailing both the background to the Trans Mountain Legacy Fund (TMLF) and Anchor Loop pipeline, as well as the context for biodiversity compensation, already exist (e.g. Clevenger et al., 2009; Poulton, 2014; 2015). Equally, highly relevant reviews exist in the academic literature (Madsen et al., 2010; 2011; McKenney & Kiesecker, 2010; Bull et al., 2013; Calvet et al. 2015). As such, the purpose of this section is to provide basic context for the subsequent sections, rather than to present an exhaustive literature review. We list relevant documents, including but not limited to those cited in the report, in the Section on Relevant Literature.

3.1 No net loss, and net gain

The environmental policy principles of No Net Loss (NNL) and Net Gain (NG; called 'Net Benefits' by the TMLF) have existed in relation to biodiversity mitigation and compensation for a number of decades. Policies requiring NNL of certain habitat types or fauna species alongside development have existed in the US and Germany since the 1970s. For the remainder of this section, we refer to NNL and NG together, as they are related concepts, but it should be noted that they do have some fundamental differences (Bull & Brownlie, 2015).

Trans Mountain pipeline, near Jasper (credit: J.W. Bull)

NNL and NG policies tend to be delivered through the use of a 'mitigation hierarchy' for development impacts, i.e. predicted impacts are sequentially avoided, minimized, remediated and finally offset. This last stage of the hierarchy – biodiversity offsetting – is a compensation measure. It involves quantifying residual losses and gains of biodiversity incurred during the course of a development project and associated compensation measures, and ensuring that they balance out such that the overall impact of the project upon nature is neutral (NNL) or positive (NG).

Whilst the TMLF was not initially designed explicitly to be a biodiversity offset, it represents a comparable attempt to achieve Net Gains. This Programme Evaluation is partly designed to evaluate the extent to which the TMLF constitutes a biodiversity offset.



Policies enabling biodiversity offsets exist or are under development in at least 60 countries worldwide (Wild Business Ltd, *unpublished data*). Numerous companies have voluntarily made commitments to ensuring NNL or a NG for biodiversity associated with their activities. The financial sector, in addition, often makes project co-finance dependent upon projects

meeting certain performance standards, and increasingly this involves achieving NNL or a NG of biodiversity.

However, the inclusion of NNL and NG principles into environmental policy, in relation to nature, remains relatively new. As such, few empirical assessments have been possible to date of the outcomes of such policies – with the exception of those completed in the US and New Zealand (for a review see Bull et al., 2013).

3.2 *Biodiversity offsetting in Canada*

A description of policy and legislation relating to biodiversity offsetting in Canada is provided elsewhere in the literature (Noga, 2014; Poulton, 2014), and in these reports it is done so much more knowledgeably and comprehensively than we would be able to achieve here. However, again for context, some key pieces of legislation and policy that are relevant to the TMLF are as follows:

Fisheries Act (1985)

The main legislation leading to existing biodiversity offsets in Canada is the 1985 Fisheries Act. This is relevant for the TMLF as, although ecological compensation implemented through the TMLF itself was not associated with the Act, a separate set of offsets were implemented by the Project in relation to the Act – with implications for the Net Benefits objective overall.

The Act “*provides powers and authorities to regulate the impacts of development projects on fish habitat in all of its freshwater and marine fisheries*”. “*No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat*”. This policy established that human impacts on fish habitat – harmful alteration, disruption or destruction (HADD), although the acronym was discontinued in 2012 – should be governed by the principle of NNL of the productive capacity of habitats.

According to Hunt et al. (2011) and Olszynski (2015), since the Habitat Policy was introduced in 1986, several thousand compensation projects have been undertaken in Canada, but these are poorly monitored and habitat losses and gains are not being measured/recorded.

Poulton (2014) notes: “*In 2012, the Canadian government significantly amended the fish habitat protection provisions of the Act as part of the controversial omnibus Bill C-38. The amendments...potentially could magnify the use of offsets in this arena. They require the Department to consider “whether there are measures and standards to avoid, mitigate or offset serious harm to fish.” This explicit reference to offsetting elevates the concept from policy preference to legislated mandate*”.

Federal Guide to Wetland Conservation (1996)

In 1996, the government released the Federal Guide to Wetland Conservation (see Lynch-Stewart et al., 1996). This is not a legally binding document as such, and is limited in its application (despite that it “*should be applied to all policies, plans, programs, projects, and activities carried out by the federal government*”). The guide suggests that further degradation of the wetland resource is not acceptable, but recognizes that all wetland loss cannot be avoided. The “no net loss” goal suggests a structured approach to land management decisions involving wetlands, requiring project proponents to work through a strict sequence of mitigation alternatives – avoidance, minimization, and compensation – with clear criteria and defined outcomes. Compensation can take place in the form of replacement of lost wetland functions, through enhancement or rehabilitation of existing wetlands, or creation of new wetlands. Theoretical frameworks for implementing conservation offsets in Canada on the basis of this guide have been developed (see Croft et al., 2011; Poulton, 2014), although again the guide has seen limited application in practice.

Operational Framework for Use of Conservation Allowances (2012)

The 2012 Operational Framework was released at the same time as amendments were made to the Fisheries Act (see above). Environment Canada introduced the concept of ‘conservation allowances’, to replace biodiversity offsets, in this Framework. The document

summarises previous national experience around offsetting in fish habitat and wetlands, consequently describing principles for implementation going forward.

The report by Noga (2014) incorporates a survey-based analysis of the general perception of biodiversity offsets from different stakeholder groups in Canada (Fig. 1).

Figure 1: extracted from Noga (2014)

	Stakeholder				
	Landowners	Conservation	Government	Consultant	Industry
Does the stakeholder group favour regulated offsets	No	Yes	Yes	Yes	No, but believe it is coming
Permanence	Prefer temporary, ability to adjust to changing market	Prefer permanent offsets	Designed program to be temporary for a temporary disturbance	N/A	Prefer temporary because the disturbance is temporary, but because the site is reclaimed, some question why offset at all.
Does the stakeholder group support conservation offsets?	No	Yes, if it preserves habitat	Yes	Yes	Yes, because of belief it will become mandatory

Regional policies

Environment Canada (2012) and Poulton (2014) discuss the following provinces having established their own regional mechanisms for>NNL:

Alberta

- Alberta Land Stewardship Act
- Lower Athabasca Regional Plan
- Pilot project on southwestern grassland reclamation
- Alberta Wetland Policy
- Cumulative Environmental Management Association
- Terrestrial Ecosystem Management Framework

British Columbia

- Draft Environmental Mitigation Policy

Manitoba

- Compensation for road projects impacting Northern Waterfowl Management Plan areas.

New Brunswick

- Wetlands Conservation Policy

Nova Scotia

- Operational Bulletin Respecting Alteration of Wetlands

Prince Edward Island

- Wetland Conservation Policy

Alberta

In addition, in Alberta: the Land Use framework in 2008 suggests offsets; the Responsible Actions: A Plan for Alberta’s Oil Sands strategy (2009) contains offsets as a recommended approach; two pilot projects being developed in the region (running from 2012-2017).

Alberta Land Stewardship Act (2010)

This policy, which is enabling legislation that has yet to be implemented, applies to development in Alberta only. The language is around ‘counterbalancing’, rather than

achieving NNL or a NG. After avoidance, minimization, rectifying and reducing, this includes: “*compensating for an activity by replacing, providing, acquiring, using or extinguishing stewardship units as described in regulations made under this Part*”. The Act outlines the possibility of “conservation offsets”.

Conservation offset policy has all been voluntary, so is less extensively implemented than compensation under the Fisheries Act. There have been 3 or 4 large *ad hoc* voluntary offsets related to tar sands development, such as those implemented by COSIA (2011) and Cenovus (ongoing) (T. Habib, pers. comm.; Poulton, 2015).

Alberta Wetland Policy

The policy has resulted in money being collected from developers for approximately 15-20 years. This is held in a fund by regional authorities, and then spent by enabling Ducks Unlimited to implement habitat restoration and creation measures. A considerable proportion of this money has yet to be spent, especially in the City of Calgary. In the near future, other organisations may be chosen to implement these funds too.

It is mainly housing developers who have to fund offsets under the policy, as it applies to private land – unlike extractive activities, which involve leases on public land. A forthcoming policy will eventually apply to public land too. Compensation under the Fisheries Act is separate, as it applies to different land, different habitats, including “navigable waters” (T.Habib, D. Farr; pers. comm.).

3.3 *Implementation of offsets in Canada*

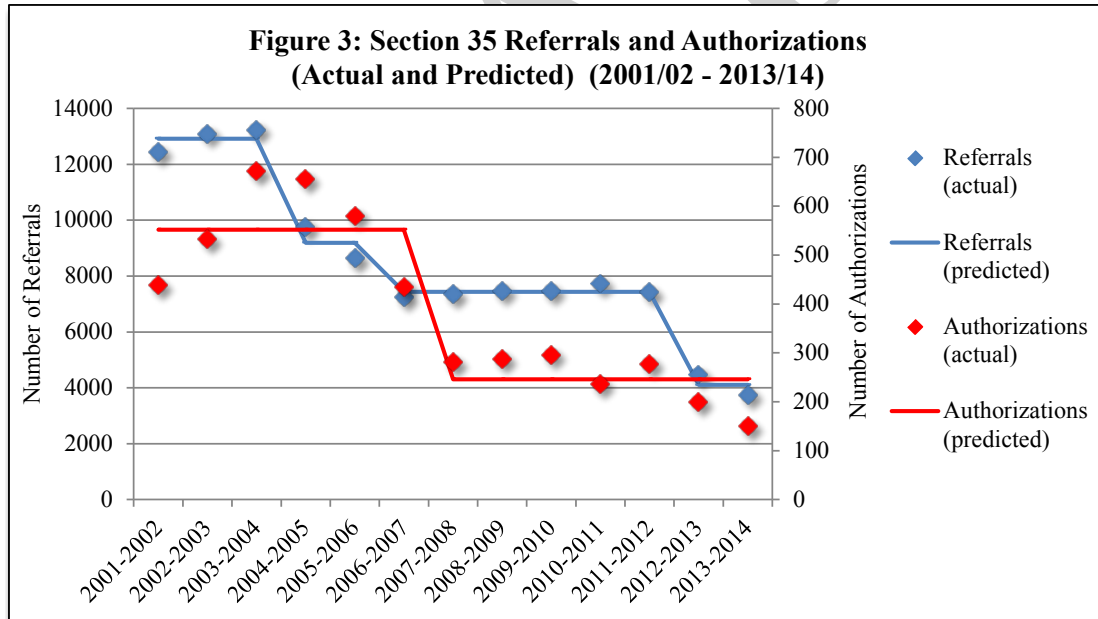
“Most offsets will be through the Fisheries Act, unquestionably” (J. Quigley).

Again, to date, offsets in Canada relate mainly to compensation under the Fisheries Act. In the mid 2000s, the implementation of such compensation was studied extensively by the DFO, culminating in the article by Quigley & Harper (2005).

Later on, Carter et al. (2012) analysed fish habitat compensation in British Columbia: exploring 284 instances of fish habitat disturbance between 2002-2006, and finding that 1,482,198 m² of impacted areas were compensated for with 1,162,254 m² of restored areas. Transport was the main sector involved (25% of instances) followed by urban development (23%), agriculture (17%), and extractives (10%). In-kind, on-site habitat creation was the most common compensation activity (48% of instances), followed by in-kind off-site compensation (21%). Hunt et al. (2011) describe a number of case studies of habitat banks providing compensation, which have been established throughout Canada.

An article by Olszynski (2015) shows the extent to which fish habitat disturbance associated with compensation projects has been authorized (Fig. 2). The vast majority of these are apparently contained within two DFO regions: the Central & Arctic region, and the Pacific region.

Figure 2: extracted from Olszynski (2015)



In addition to compensation under the Fisheries Act, all big development projects allegedly lead to offsetting on a development-by-development basis, representing “dozens, if not hundreds” of offsets across Canada (J. Quigley, pers. comm.). However, there does not seem to have been any attempt to collate data on these offsets and make it readily available online, and creating such a database is beyond the scope of this project.

Two final points to note from the general literature: firstly, avoidance is considered by many to be the most important part of the mitigation hierarchy (made in relation to Alberta wetlands by Clare et al., 2011). Secondly, although many challenges exist to successful biodiversity offsets (Bull et al., 2013; Poulton, 2014), one key challenge that is highly relevant to offsetting in Canada is the need for better monitoring. This was a key finding from the work by Quigley & Harper (2005). It should be noted, though, that the lessons from that report, and associated reports, are to some extent being taken on board: e.g. 1.8% of the DFO budget was spent on monitoring at the time the reports were finished, and within a couple of years this was closer to 20% (J. Quigley, pers. comm.).

3.4 Review of project-specific documentation

History

The background to the TMLF project is documented in Poulton (2012; 2014). The Trans Mountain pipeline, constructed in 1952/53, is 1,146 km long, and passes through Jasper National Park (JNP) and Mt Robson Provincial Park (MRPP). Both fall within the Canadian Rocky Mountains system, which was designed a UNESCO World Heritage site in 1984. The pipeline follows the same route through park as Highway 16 and the railway, including along the course of the Fraser River.

In 1995, the Trans Mountain was taken over by Terasen, who decided to expand the pipeline around 2000. The first expansion was in 2006/07, involving pump stations along the eastern edge, resulting in little controversy. The second stage was more difficult – the Anchor Loop project which involved looping the pipeline for 158 km, 140km of which were contained within the JNP and MRPP (80km in JNP, 60km in MRPP).

In the absence of the original pipeline, such a project would not be allowed in a World Heritage site. However, clauses in the legislation from the 1950s enabling the original pipeline allowed for a subsequent expansion of capacity. Terasen (and Kinder Morgan Canada, when they took over the project) consulted Environmental Non-Governmental Organisations (ENGOS) before any regulatory process started. As both sides were unsure of their legal position on the project, they agreed to find a mutually agreeable solution.

“ENGOS [Environmental Non Governmental Organisations] were well-networked and conversant with the ecological, logistical and legal issues arising from linear transportation and utilities corridors” (Poulton, 2012). In December 2004 a meeting was held with many stakeholders to establish the way forward. This is when the requirement for ‘net environmental benefit’ or Net Benefits was initially agreed. “The predominant concern of the participants was not the pursuit of a “like for like” arrangement, but rather upon the addressing of the major issues facing Jasper National Park and Mount Robson Provincial Park at the time” (Poulton, 2012).

It was decided that Kinder Morgan Canada would establish a Trans Mountain Legacy Fund (TMLF), to fund the implementation of restoration measures that ensured Net Benefits were achieved for the parks. This funding package totalled just under CAD \$3m, although of that, \$700k was split directly between the two parks to spend in any way the parks management saw fit. As such, the TMLF proper can be said to have had an initial value of \$2.2m. The validity of the process for naming this figure is discussed in subsequent sections.

The following points should be noted, in relation to issues with biodiversity offsetting more broadly:

- Terasen contacted the ENGOS relatively early in the process, to gauge interest and/or potential opposition;
- Regional expertise in ecology was sought on how to achieve Net Benefits, rather than resorting directly to generic metrics;
- There was a potential problem with changing ownership of the project – in 2005, Kinder Morgan Canada bought Terasen, and there was no obligation for the new owners to proceed with the same agreement. As it happened, Kinder Morgan Canada did decide to do so, which was fortunate from the perspective of the TMLF;
- There was some difficulties in maintaining independence between park regulators and discussions on Net Benefits;
- The perception that compensation would be less straightforward for the Anchor Loop than for other offsets because it is linear infrastructure is now no longer a concern, as much experience with offsets globally is with compensation for linear infrastructure (e.g. Jones et al., 2014).

The ‘Clevenger’ report, and the Terms of Reference

The next step was to set up a Net Benefit Advisory Committee (later the TMLF Steering Committee). This included: *“ENGOS, Parks Canada, Mount Robson Provincial Park, and Aboriginal representatives, with Kinder Morgan Canada participating as observer”*. Note that a separate engagement process was put in place by Kinder Morgan Canada for Aboriginal communities, hence the observer status. Compensation measures designed to lead to Net Benefits were scoped on the basis of an assessment report completed by Clevenger et al. (2009). *“The goal of this work is to identify and prioritize projects that address key ecological issues in JNP and MRPP in a transparent manner that will satisfy stakeholder concerns”*.

17 participants (interviewees) were chosen to suggest projects that might lead to a Net Benefit. Projects that promoted ecological connectivity were highly ranked, and a summary of some key suggestions from the report are contained in Figure 3.

Figure 3: extracted from Clevenger et al. (2009). Note that AHP stands for Analytical Hierarchy Process, and was the method used by Clevenger et al. to prioritise projects

Step	Project suite associations (AHP score)	Cumulative AHP score
1. Develop a long-term population monitoring program.	<ul style="list-style-type: none"> Baseline population monitoring and resource inventory (0.037) 	0.037
2. Perform a regional connectivity analysis and take management actions to restore critical linkages.	<ul style="list-style-type: none"> Improving regional habitat suitability around lands adjacent to human use areas (0.058) 	0.095
3. Create a mitigation toolbox and identify specific actions to maintain connectivity across transportation corridors.	<ul style="list-style-type: none"> Improving ecological connectivity across transportation corridors and right-of-ways (0.374) Decrease human-caused wildlife mortality (0.065) Localized improvements to habitat restoration (0.178) Ungulate management (0.164) 	0.876

Subsequently, with the Steering Committee in place, a structured Terms of Reference (2009) was drafted and agreed for the implementation of projects. Some key points associated with the Terms of Reference are as follows:

- The size of the fund is specified (but it is not clear how this was determined);
- Projects associated with the TMLF must:
 - involve tangible ecological improvements
 - focus on ecological connectivity
 - be outside the normal course of business for the parks
 - be feasible
 - ensure both JNP and MRPP benefit ecologically
- The Steering Committee were required to develop an implementation plan identifying actions, timelines and budget
- The Steering Committee were required to hold regular meetings and vote on any expenditures by majority
- The original timeline for all projects to be completed was December 2014, although in the case of unanimous agreement by the Steering Committee the deadline could be extended
- The Steering Committee were required to initiate a post project monitoring program “to assess the effectiveness of mitigation actions”; however,
- The Steering Committee were not required to develop any measure for calculating or otherwise demonstrating “Net Benefit”.

The ‘Triton Environmental’ and ‘Huijser’ reports

The report from Triton Consultants (2012) was commissioned to identify specific restoration projects associated with aquatic connectivity that would meet the Terms of Reference, informed by the Clevenger report. It does so, ranking 11 potential projects based upon the consideration that “Clevenger et al. (2009) were retained by KMC on behalf of the TMLF to identify a range of suitable EIPs that corresponded with a series of guiding principles requested by environmental stakeholders. Ideal projects would be:

- consistent with park mandates;
- beneficial to both parks;

- *ecologically oriented;*
- *beyond the scope of normal park operations; and*
- *feasible to implement.*

As described by Clevenger et al. (2009), candidate projects were considered to make an ecologically significant contribution if they satisfied at least one of the following criteria:

- *Native biodiversity is maintained and restored;*
- *Improved habitat quality and/or quantity results;*
- *Adverse human/wildlife interactions are reduced (may include vegetation management);*
- *Interrupted landscape connectivity (either terrestrial or aquatic) is restored; or*
- *Natural trophic flow patterns are restored”.*

Similarly, a report from Huijser et al. (2012) was commissioned to explore projects that the TMLF might support associated with wildlife (specifically mammal) mortality in the parks. The report did not lead to recommendations that were subsequently implemented, which is discussed further in the next section.

Other documentation

Additional documents have been generated through the lifetime of the fund, all of which are referenced in the Section on Relevant Literature, key ones including: decision documents (2012); 2012 summaries of the rationale for including or not including specific aquatic projects (2012, 2013, 2015); and, meeting minutes (2012 – 2015) which are summarised in Appendix I; the implementation plan; and, a draft communication plan.

Important issues raised in these process documents include:

1. Selecting projects within an overall budget is actually slightly back-to-front from a biodiversity offset perspective. If the goal is Net Benefit, then this should be achieved as efficiently as possible. The danger with selecting projects within a budget is losing sight of the Net Benefit objective;
2. The presence of all key groups was not always maintained at Steering Committee meetings;
3. A significant amount of money was spent on fund administration;
4. It appeared common to hugely under- or over-estimate costs for projects;
5. Monitoring was emphasized many times, however, has yet to start. The decision to monitor at 1, 2 and 5 year points is based primarily on available funds;
6. An ongoing challenge was around who held liability for projects in the parks;
7. Only one individual (Niki Wilson) attended all meetings captured in the minutes, lending continuity. It is not clear what would happen if that individual left the project.

Budget

Actual projects undertaken (costs of project design, construction, and monitoring to date) have at the time of writing used up approximately \$1.5m of the fund, i.e. about 67% of the total initial fund available for these projects (Table 1). Note, additional detail on each of the projects incorporated in this Table is included in a datasheet prepared by N. Wilson (Appendix V).

Table 1: summary of projects implemented to date*, including description, cost (CAD) and status. 'Ecological Gains' were estimated by TMLF Steering Committee, and not confirmed independently by Wild Business Ltd.

Project	Cost (CAD)	Description	Ecological Gains	Status
Mile 9	372,100	Lake outlet in Jasper NP. Note: estimated cost was \$85k. Project chosen because of a high chance of success, required little monitoring, has been clearly identified of having very positive ecological gains, was considered relatively inexpensive and was favoured by the Park. It involved construction of a passable weir downstream of the Highway 16 culvert outlet to increase depth in the culverts and provide year-round fish passage.	Lake area = 31ha. <u>Species potentially affected:</u> Northern Pike; Lake Whitefish; Mountain Whitefish; Pygmy Whitefish; Burbot; Longnose Sucker; Bull Trout.	Complete (Spring 2014)
Whistlers Creek	699,384	The culvert that runs underneath Highway 93 in Jasper, on Whistlers Creek, was a velocity barrier limiting seasonal migration upstream. Less of an issue for bull trout, but more for rainbow trout. Upstream the sampling team identified rainbow, brook and bull trout. Downstream, brook trout, mountain white fish and bull-trout only. Step pool design was suggested to remedy this, and implemented.	Stream length = 12km (2 nd order). Stream area = 30,000m ² (assuming 2.5 mean wetted width).	Complete (Autumn 2014)
Packsaddle	232,212	Packsaddle Creek (the Upper Reaches of Canoe Arm of Kinbasket Lake) had compromised fish habitat due to hanging culverts and blocked fish passages. The project would involve providing access for Kokanee and Bull Trout.	Stream length = 6099m. <u>Species potentially affected:</u> Rainbow Trout; Bull Trout; Kokanee; Brook Trout; Mountain Whitefish; Longnose Dace; Northern Squawfish; Longnose Sucker; Torrent Sculpin; Mottled Sculpin.	Complete (Late 2013)
Sites 26, 66	37,305	An unnamed tributary to Fraser River in Mt Robson PP. Note: estimated cost \$80k. This site was chosen for its relatively low cost, and high conservation value. It involved construction of a passable rock weirs downstream of the CN rail culvert outlet to increase depth in the culverts and provide year-round fish passage. Support of CN Rail, including in-kind contribution, was required at this site.	High quality fish habitat identified upstream. But, since no fish were captured in downstream, likely that productive capacity of the upstream habitat would be low if connectivity was restored.	Complete (Autumn 2013)

Site 93	3,831 (estimated 56,000 by end 2015)	An unnamed tributary to Yellowhead Lake in Mt Robson PP. Note: estimated cost was \$34k. This site was chosen because it is relatively inexpensive, and the site is easy to access. It involved deactivation of the unused road crossing. The primary benefit of doing the work is it will remove a large, man-made sediment source (i.e. road fill material) that would inevitably have ended up in the creek and eventually Yellowhead Lake, since the existing structure was failing badly. Since multiple fish species have been documented in the creek, that failure would have a detrimental impact on habitat quality.	Improved habitat for Mountain Whitefish, Rainbow Trout and Bull Trout	Complete (Spring 2013)
Yellowhead Brook Trout Eradication	71,075	The project is intended to remove and subsequently exclude the invasive Brook Trout population in the Yellowhead Watershed, which is outcompeting the endangered Bull Trout. Involves weir construction and electroshocking to remove Brook Trout.	Improved habitat and survivability for Bull Trout. Preventing invasive species spread downstream.	Ongoing
Highway 16 East Jasper National Park; Snaring, Jasper National Park	183,726 (combined estimate from TMLF Steering Committee)	Manage hanging culvert, to restore fish passage between the Athabasca River and Talbot Lake. Manage hanging culvert to restore fish passage between Upper Mile 9 Lake and main body of Mile 9 Lake.	Lake area = 349ha Species potentially affected: Northern Pike; Lake Whitefish; Mountain Whitefish; Pygmy Whitefish; Burbot; Longnose Sucker; Bull Trout; Spottail Shiner. Lake area = 31ha. Species potentially affected: Northern Pike; Lake Whitefish; Mountain Whitefish; Pygmy Whitefish; Burbot; Longnose Sucker; Bull Trout.	Complete (Autumn 2015)

* Note that three further projects are being funded by the TMLF, and are considered in progress by the Steering Committee. These are: (1) the Swift Creek Sockeye Assessment (which involves establishing an inventory of Sockeye juvenile rearing habitats in Swift Creek and the McLennan River); (2) the Swift Creek Habitat Restoration project (which involves on-going in-stream restoration and bank stabilization works in Swift Creek, to benefit the Chinook Salmon); and, (3) the MRPP Whitebark Pine project (which involves taking measures to recover Whitebark pine – an endangered species in JNP and MRPP – and protect where it still exists. Whitebark pine are threatened by White Pine blister rust, the Mountain Pine Beetle, and fire). In total, these projects are estimated to have costed 81,795 CAD, but are still in progress.

4. Interview Outcomes

Over the course of the programme evaluation, 21 people were interviewed. Two of these – Dave Poulton and Lexa Hobenshield – were interviewed twice, so as to fully clarify comments made in the first interview and follow up on unresolved questions. Interviews primarily took place between the 12th – 30th October. A document containing a list of all individuals considered for interview along with rationale, as well as the schedule of interviews carried out, are contained in the Appendices (Appendix II, IV). The timeline of the involvement of specific individuals in the project is captured in Fig. 4.

Key outcomes from the interviews are grouped in Table 2, divided into key identified Strengths, Weaknesses, and Lessons Learned (the latter being both in terms of improving projects like the TMLF, and in terms of what different biodiversity offset projects could learn from the outcomes of the TMLF).

The findings contained within that Table are subsequently expanded upon, along with related considerations, in a section that pulls out the majority of pertinent comments made during interviews. This section is grouped into: general points, strengths, weaknesses, and lessons learned. Each sub-section is divided up amongst common themes that emerged over the course of the interviews:

- stakeholders;
- net benefit; process;
- governance;
- finances;
- indirect benefits;
- monitoring & tangibility;
- risk;
- transparency; and,
- other issues.

During interviews, all relevant interviewees were asked what their overall impression of the TMLF was at this point. Responses were grouped into the categories: 'complete success', 'mainly success', 'not sure', 'mainly failure', and 'complete failure'. The vast majority thought the project had been successful, and none thought it a complete failure (Fig. 5). Note of course that some inherent bias towards a favourable outcome would be expected in an assessment like this, when interviewing participants in the TMLF process.

Figure 5: overall impression of the TMLF outcomes, from interviewees

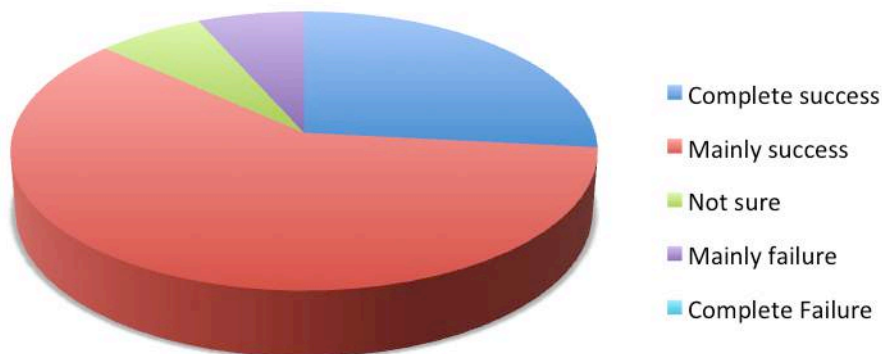


Table 2: a summary of key Strengths, Weaknesses, and Lessons Learned associated with the TMLF, for each theme. Table includes existing projects or policies that might inform future versions of the TMLF (orange) or lessons that other offset projects or policies could learn from the TMLF (green)

Theme	Strengths	Weaknesses	Lessons Learned	Other projects
Stakeholders	Engagement and consultation process	Expected more compensation	Importance of engaging stakeholders extensively and early in the process	Other offset projects could learn from the approach taken to stakeholder engagement on the Anchor Loop and by the TMLF
Net Benefit	Clear and ambitious objective specified from the start Best practice - at the time, and even now	No counterfactual specified No loss-gain calculations to demonstrate Net Benefits	Need a process for determining ecological gains that are greater than losses	Many methodologies exist for loss-gain calculations, particularly in Australia (e.g. Parkes et al., 2003), and in the Guidance Notes to PS6 (IFC, 2012) Of interest is the Oyu Tolgoi mine in Mongolia, basing the size of its offset fund on loss-gain calculations, and as a result requiring ~ 0.6% of project investment for compensation (similar to the TMLF proportionally).
Process	Compensation project selection was systematic, rigorous and appropriate	No process for choosing new projects once all options in parks were exhausted	Time taken to choose and implement projects much longer than expected	Design and implementation of offsets for specific projects often takes this long (<i>J. W. Bull, unpublished data</i>). See also the length of time taken for offset policies to mature in Germany, the US, and Australia, where >10 years is common
Governance	TMLF and project management was strong Generally good communication	Process relied more upon skilled and motivated people than structure Limited criteria for choosing new members for Steering Committee	Put in place structured governance procedures, designed to last for an extensive time period	The Oyu Tolgoi mine in Mongolia has extensive governance measures in place for managing associated biodiversity offsets
Finances	Compensation projects represent good value for money	Arrangements for holding the TMLF were expensive	More care in making financial arrangements for holding and investing such funds	The Umeå railway project (Sweden) involved the creation of a foundation to manage compensation funds and activities over a period of 100 years. In addition, the BBOP website contains numerous documents providing guidance on the financial component of implementing biodiversity offsets. Also, the US Wetlands Policy has established much experience in financial arrangements. Beyond Oyu Tolgoi, the Reventazón project (Costa Rica) provides an example of a project with cost estimates for offsets: \$2.7m (USD) in this case. Although hard to compare directly,

				<p>this suggests that the TMLF was not overly expensive for compensation</p> <p>Note: MRPP have a good financial arrangement for investing their one-off payment from the Anchor Loop</p>
Indirect benefits	A range of indirect benefits of the TMLF and the Anchor Loop were noted by interviewees	Indirect benefits have not been collated and described anywhere	Interesting that a project of this nature can give rise to incidental and unexpected positive indirect benefits	Other offset projects could consider this issue of positive indirect benefits when making NNL calculations
Monitoring & tangibility	Compensation projects visibly have tangible benefits Clear case for additionality	Monitoring programme. This was not designed from the outset, which will make it more difficult to demonstrate Net Benefits	Design monitoring programme from the outset, including pre and post implementation monitoring	<p>The Umeå railway project (Sweden) has been designed to last for up to 100 years, and has correspondingly long term monitoring programmes. Also involved pre-implementation monitoring.</p> <p>The same is true of the QMM mine in Madagascar, which started evaluation before construction began, and has monitoring activities planned through to 2065</p>
Risk	The TMLF itself was a highly successful risk management strategy process for the Anchor Loop	No prior agreement on who should accept liability for compensation projects Little accounting for uncertainties in compensation project design	Be clear from the outset in compensation project selection who will accept liability Use multipliers to incorporate consideration of project uncertainties	<p>Lessons for transferring liability for compensation projects can be learned via habitat banking mechanisms (US, Australia).</p> <p>A good example of the use of multipliers (aka compensation ratios) is the Sydney Olympic Park (see Pickett et al., 2013). The theory has been developed by Moilanen et al. (2009) and Laitila et al. (2014)</p>
Transparency	Very good level of transparency (e.g. documents in public domain, TMLF website)	Some key details not transparent: e.g. how TMLF was calculated, where parks invested their one-off payments	Transparency is powerful in terms of stakeholder opinion. But low TMLF website traffic	Other biodiversity offset projects could learn from the level of transparency demonstrated by the Anchor Loop
Other issues	Equity in shared benefits between two parks	No species widely considered 'charismatic' were included in the compensation measures, which would have interested some stakeholders	For ecological and management reasons, some compensation outside of the parks is defensible	<p>Examples of inclusion of charismatic species in offset projects include the Oyu Tolgoi mine (Mongolia), and the Simandou mine and infrastructure (Guinea) which involves impacts upon great apes</p> <p>The findings about out of kind, out of park compensation might be relevant for other projects</p>

4.1 General observations

Stakeholders

The stakeholder engagement process associated with the TMLF endeavoured to capture any group that was in any way involved with JNP and MRPP, ending up with 20-25 groups. Many either were not interested or merely wished to keep abreast of developments. Some had no capacity to deal with the issue, or felt it was outside of their jurisdiction. There was eventually no formal representation for ENGOs, who seemed content to allow CPAWS and the Fraser Headwaters Alliance (in Alberta and British Columbia, respectively) to represent their interests.

Not all ENGOs were in favour of the approach taken. But whilst some, even the membership of CPAWS, were 'lukewarm' towards the TMLF – as it involved essentially accepting development in the parks – nobody challenged it directly. The only associated legal challenge was First Nations (SIMC), from the British Columbia side: a representative sat in on meetings but the group felt they were not sufficiently consulted.

ENGOs had expected more money for the fund: for instance, one proposal was ~ 2% of project cost, which would have been ~ \$15m. As it was, the value of the fund was ~ 0.4% of the total project cost.

For high profile and potentially controversial projects such as this, there is a perceived need on the corporate side to get better at strengthening stakeholder engagement. Some projects (e.g. Keystone pipeline) may well not go ahead at least partly for stakeholder reasons. As one corporate interviewee commented: "We see ourselves as guests" (P. Reicher).

From the point of view of engagement and working with stakeholders the project was highly rated by many involved, to the extent that one interviewee (previously involved in the TMLF, now working at the regulatory body for oil and gas in Alberta) called it "probably the best project I've ever worked on" (R. McManus).

Net Benefit

Generally, the projects were considered to be having considerable ecological benefit (those working for nature conservation in the parks all said they felt that it was like that the restoration projects resulted in improved aquatic connectivity), and to be good value for money (no interviewees thought that the projects were too expensive).

The case for additionality in terms of projects implemented is primarily built upon the consideration that impacts upon aquatic connectivity caused by separate developments (i.e. highways) would not have been mitigated otherwise.

Note that in addition to activities funded under the TMLF, there were various entirely separate compensation measures implemented as a result of the Fisheries Act, particularly for the Fraser crossing. Three known such compensation projects include:

1. Yellowhead culvert and steps
2. Yellowhead Lake culvert replacement
3. Fraser river backchannel.

Further, a number of other restoration measures were claimed to have been implemented outside of TMLF activities, on a project-by-project basis, during and immediately after expansion of the pipeline. Although the magnitude of this additional expenditure upon mitigation has not been calculated, but estimated in the region of \$5-10m (I. Thomas, pers. comm.). Ideally, the project would not have dealt separately with compensation arising through different mechanisms (e.g. TMLF, and Fisheries Act), but practically speaking these involved different goals and different stakeholders.

When considering all restoration and compensation measures implemented – not only the TMLF, but the aforementioned compensation under the Fisheries Act and others, some interviewees were extremely positive about the influence of the Anchor Loop project on the

parks. Indeed, in terms of Net Benefits overall, one interviewee working for Parks Canada in JNP said that one “could make a credible argument that the park is better off than it was before the pipeline went through” (I. Thomas).

However, despite it being possible that the Net Benefits objective was achieved, a key problem with the project is that those biodiversity losses and gains associated with the project were not fully measured and quantified, and the TMLF was always based upon a monetary figure that was not generated through loss-gain calculations. As such, even if Net Benefits have been achieved, there are not sufficient data in place to be able to *demonstrate* that the ecological gains are greater than the losses. As one interviewee stated, the “\$3m figure is the point at which the equivalency argument was lost” (D. Poulton).

Process

The process for seeking agreement on how to proceed with compensation for the pipeline expansion was kicked off with 4 two-day workshops that brought together all identified stakeholders – at that stage, the Environmental Impact Assessment hadn’t commenced. Stakeholders discussed potential options for compensation amongst themselves, D. Poulton became their representative on the compensation programme. The key message that was eventually agreed upon by stakeholders was: “this project can’t just minimize impacts, it has to enhance the ecological integrity of the park” (D. Poulton, pers. comm.), i.e. a very clear statement of Net Benefits. This was seen as a “critical breakthrough” in the project, as this was a vision everyone could agree with – then it just became the mechanics of how to do it (R. MacManus, pers. comm.).

The discussion around how to administer the TMLF was a serious discussion point e.g. how to spend money, on what, and who should administer it. After a while, Kinder Morgan Canada started to become quite frustrated with the speed progress was being made on discussions amongst stakeholders, and decided simply to give the TMLF a fixed amount of money. Interestingly there was disagreement amongst interviewees as to: (i) who was the main negotiator with Kinder Morgan Canada in developing the TMLF, and (ii) who came up with the Net Benefits requirement. This perhaps reflects either that people viewed the process differently, or that people remember it differently – or both.

Kinder Morgan Canada stood back purposefully, and let the TMLF Steering Committee decide what to do with the money, with the whole process intended to be science-led. The Terms of Reference were developed to ensure there was due process being applied to the way the TMLF was spent on projects, using themes arising in the Clevenger et al. (2009) report.

Note: of the original pot of money that eventually formed the TMLF (just under \$3m), \$700k was split between the parks straight away. Management team at JNP thought that conservation gains would be best achieved through a youth education centre at the Pallisades centre, which was originally for warden training until the 2000s, when it became a youth centre. Whilst some of those involved saw this as an excellent education and awareness initiative, others saw it as departing from the concept of tangible benefits. Consequently, whether to use money on developing the Pallisades centre became a point of disagreement in relation to the fund. Conversely, MRPP money invested \$350k in the Vancouver Foundation, a 10-year investment for restoration in the park. Annual interest used to undertake conservation activities. There are rules for how this can be used (determined by a Committee, headed by the relevant Minister). Could be recreation, cultural heritage, or ecosystem benefits. None of the money has been spent yet. The rationale was that MRPP wanted a mechanism that would fund projects in the long term, and having a little bit of money each year would be more beneficial than spending it all at once. The 10 year period is almost complete, meaning decisions on spending this money will be made in the near future – it seems likely that it will go into a cultural benefits programme, again meaning this is a departure from the ‘tangible ecological benefits’ vision.

Monitoring & tangibility

Again, most interviewees are optimistic that Net Benefit has been achieved via the TMLF and other mechanisms. Some think it will be possible to demonstrate tangible benefits e.g. the

presence of Whitebark pine or absence of brook trout. Monitoring is planned to be in place for up to 5 years (a few of those interviewed consider that it would be unreasonable if monitoring was required beyond then).

A general finding from the Huijser et al. (2012) report was the difficulty of agreeing on appropriate measures for success. This is a broader problem with biodiversity offset schemes, and indeed any mechanisms employed as part of corporate biodiversity strategies – see, for instance, Wild Business (2015).

Other

In retrospect, aside from it being considered appropriate practice, the whole process and implementation of the TMLF is seen by Kinder Morgan Canada as having been a good business decision.

‘Connectivity’ was eventually chosen as the key focus for the Net Benefits programme by common agreement amongst those involved (and a common theme for conservation in the region, see e.g. the Yukon to Yellowstone conservation initiative at <http://y2y.net/>), although it was Howard Heffler who originally suggested it. Connectivity is often discussed as being important in the context of biodiversity offset programmes, but is rarely explicitly incorporated into metrics.

It seems as though a number of stakeholders involved in implementation of the TMLF were sceptical about dealing with wildlife mortality on roads as a theme for projects. This was genuinely likely to be because suggested measures for managing mortality on the roads was both potentially hugely expensive, and furthermore not seen as the most pressing problem.

An interesting note was that much of the parks are highly undisturbed, so in fact there are not as many obvious opportunities for restoration activities as might be found outside parks.

4.2 Strengths

The TMLF, on the basis of direct and indirect observation, appears to have been generally well received. Overall strengths are captured in Table 2, and in this section, a range of observations made by interviewees are also captured.

An overall strength of the TMLF was the achievement of having multiple stakeholders spend a significant amount of time working together, with the goal of ensuring tangible ecological benefits through restoration projects, and seemingly achieving that.

This was facilitated by: (a) the developer not leveraging the funds for political gain and allowing the Steering Committee essentially free reign; (b) good cooperation amongst the members of the Steering Committee; and, (3) the long term commitment of a number of knowledgeable individuals to the Steering Committee.

“Mile 9” TMLF project, Highway 16, near Jasper (credit: J.W. Bull)



Stakeholders

Stakeholders from a range of organisations continue to speak positively about the TMLF – including those in certain ENGOs, government and industry.

Net Benefit

'Net Benefits' type objectives not only remain best practice standards a decade after the discussions were first held for the Anchor Loop project – the objective also means that many working for the parks do not see the TMLF as being a 'license to trash'.

Process

The process for project selection was considered to have worked well: logical, systematic, data-driven, and led to net gains. The Triton (2012) report was comprehensive, and essentially provided a programme in a box.

Governance

The decision-making process within the Steering Committee was considered effective.

The appointment of N. Wilson and T. Antoniuk was considered a good decision: especially in terms of ensuring money was spent in a transparent way (TA) and that information was exchanged where necessary (NW). This applies more broadly to project management within the Steering Committee.

The Steering Committee was considered, overall, to work well – as individuals were able to work effectively together towards consensus.

Finances

The projects represent good value for money in terms of 'bang for the buck'. They needed to be done from the point of view of conservation in the parks, but the money would otherwise not have been available (financial capital being more challenging to raise than human resources).

Indirect benefits

Kinder Morgan Canada regularly refer back to the TMLF work for compensation when developing new projects, including the current stage of the pipeline expansion. Whilst they are almost certainly not going to scale the same approach up to 980 km of pipeline (the current phase), the approach is similar in terms of the method and seeking community benefits. The TMLF provides valuable reference material.

Monitoring & tangibility

The projects achieved clearly represent tangible outcomes. Furthermore, they are all considered projects that would likely not have been implemented in the near future in the absence of the TMLF, hence a valid claim can be made for additionality.

Due to the process for selecting projects, it is the more high priority ones that were targeted. Furthermore, using the example of JNP, of the ~ 50 culverts that the park is keen to restore, 5 or so have been supported by the TMLF, which is a significant proportion (J. Deagle, pers. comm.).

Risk

No additional comments.

Transparency

The TMLF Steering Committee has made details of all projects, and information on the approach taken to select them, freely and publically available online. Transparency is arguably a strength of the process.

Furthermore, it should be noted that information from the TMLF approach and outcomes has not been used in any way to campaign against current phase of pipeline expansion in

Western Canada, despite the noisy opposition there – implying the TMLF approach was robust and has been widely seen as appropriate.

Other

The project won an ‘Emerald Award for Environmental Achievement’ (see <http://www.transmountain.com/emerald-award>).

An important point to note in relation to offsets more generally: because the legality of the Anchor Loop project wasn’t clear, the TMLF cannot be considered a “license to trash”. That is to say, there was some legal basis for allowing the project to proceed, so it was not only made possible because the ENGOs were ‘bought off’ with compensation.

One of those involved in the project (R. McManus) now works for the environmental regulator, and feels as though these kind of principles should be included within regulatory requirements much more strongly, and that companies should have opportunities to get credit for implementing NNL type projects. In turn this implies that the TMLF was a positive experience.

4.3 Weaknesses

Despite being a success overall in relation to its objectives, the TMLF approach had some areas which potential could have been improved – for want of a better word, these are here called ‘weaknesses’.

In general, it was more difficult to spend the \$2.2m than was expected and was perhaps necessary. This led to many of the problems identified (e.g. large cumulative administrative fees, turnover of individuals within the Steering Committee, etc.). Whilst it is not necessarily clear how this could have been done differently, this is nonetheless clearly an area for recommendation.

Stakeholders

The biggest challenge identified in the negotiation process for the TMLF was accommodating Parks Canada’s (reasonable) requirement to retain responsibility and control for conservation activities in JNP.

Furthermore, as discussed, those involved in negotiating the fund clearly expected more money to be paid in compensation (e.g. on the order \$10 – 20 million).

Some project stakeholders suggested that they would have liked to see more projects focusing on charismatic species (e.g. large mammals), rather than being entirely focused on aquatic connectivity. Whilst the latter this is more usual from the perspective of offsetting approaches, it is interesting to note that more charismatic species could carry more weight with non-specialists.

Net Benefit

Throughout the process, there is a challenge around the meaning and definition of Net Benefits as a term. Aside from initially defining it as an objective for the project, it is clearly still understood differently by different groups (e.g. whilst the scientific perspective is that ‘Net Benefits means the parks end up better off from an ecological perspective than they would have done even in the absence of the Anchor Loop project’, some project stakeholders consider Net Benefits to mean more that ‘compensation went above and beyond all regulatory and policy requirements’).

Process

It would have been better to negotiate more structure and rigour from the outset e.g. start with the Terms of Reference, then go on to how the magnitude of funds is calculated. Having something like the BBOP PCI (2012) or the PS6 standards (IFC, 2012) to structure the TMLF would have perhaps helped.

The money spent on exploring wildlife crossing and compensation was essentially wasted, according to some amongst the Steering Committee, as associated compensation projects were never likely to be funded (due to the cost of standard approaches, the state of knowledge of mammals in the park, etc.). The events leading up to the delivery of the Huijser report – the outcomes of which were controversial, chiefly due to some disagreement on the methodology used, and consequently the validity of the results – are somewhat disputed, and perhaps rested partly on insufficient communication between those commissioning the report and those delivering it.

There could have been a more structured process in place for how to choose new projects for the TMLF after the Steering Committee ran out of those that met the initial criteria. At this stage, it became unclear how to proceed.

The process that led to the establishment of the fixed budget for the TMLF was not designed in such a way as to ensure Net Benefits was achieved – rather, it appears to have been based more upon how much money was available.

Some stakeholders felt frustration about the length of time it took to implement projects under the TMLF, although this was not necessarily time wasted as there was due process to be followed.

Governance

A potentially significant challenge to the establishment of the TMLF was the project changing hands before implementation, as it was not immediately obvious whether Kinder Morgan Canada would take the same approach to compensation agreed by Terasen. Fortunately Kinder Morgan Canada did so, but this was partly good fortune.

There was substantial turnover of people on the Steering Committee, which was not helpful from a continuity perspective. For instance, it was not always clear to everyone from the MRPP side which of their representatives was most involved, who was in charge, who was supposed to make decisions if needed? Furthermore, in joining the Steering Committee it has been said that it took a while to get used to the dynamic of the personalities involved – all with their own drivers for being involved, and their own interests.

A few interviewees commented that there could have been a formal decision making framework for the Steering Committee – it was fine in practice as everything seemed to work for the TMLF, but this was down to the specific personalities on the committee, and might have been a problem if more people got involved. Equally, some commented that the Steering Committee should have had a more structured selection process for choosing new members.

Finally, some suggested that the whole process relied upon trust that the Steering Committee was truly representing all stakeholders: should a project really rely upon personal relationships, rather than well-established process and regulatory expectations?

Finances

The costs of projects were consistently underestimated. This was for various reasons, but largely because Triton had less experience of both working in Alberta and JNP, and of the engineering side of the compensation projects. Triton were excellent by all accounts – but it would have perhaps been useful to inform their costs estimates with estimates from an engineering firm.

The Alb-Eco Trust used to store the fund charged huge administrative fees, which became a serious cost over the timescale of the project. In doing it again, a better way would have to be found to hold the fund, and invest it so as to cover fees.

Indirect benefits

No additional comments.

Monitoring & tangibility

Some pointed out that a long period of monitoring is necessary to confirm whether disturbance from the Anchor Loop has been fully mitigated, but it seems unlikely that monitoring will be undertaken for that long.

Others went further, saying that relative lack of monitoring has been the primary weakness of the TMLF process. When the Steering Committee drew up the initial budget, little was set aside for monitoring of outcomes, and whilst it was always intended that monitoring would be carried out following implementation, no detailed plan was established for monitoring – e.g. a before-during-after evaluation. Equally, there is no baseline or counterfactual developed for evaluation, which is a classic problem for biodiversity offset projects in general.

Risk

Whilst risks associated with compensation projects were assessed in the Triton report to some degree, there appears to have been little incorporation of measures to manage risks and uncertainties (e.g. the use of multipliers, which are common in offset projects).

A substantial and unexpected problem was that, because the TMLF was not legal entity, it could not spend money and take on liability for problems with the compensation projects – so Salmo Consulting had to do so on its behalf.

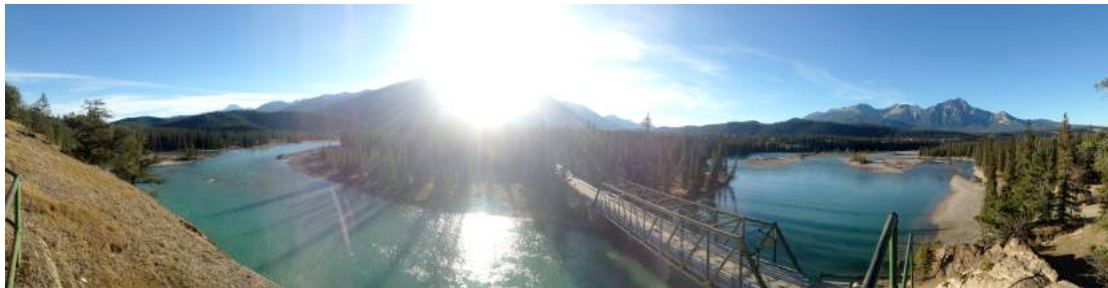
Note that some local ENGOs are deeply concerned about the risk of a spill associated with the pipeline in the park.

Transparency

There has been very little traffic on the TMLF website – although this is not necessarily the fault of anyone involved in the project.

Other

No additional comments.



View from Old Fort Point, Jasper National Park (credit: J.W. Bull)

4.4 *Lessons Learned*

Stakeholders

The importance and effectiveness of robust stakeholder engagement is a key lesson from the Anchor Loop. But there has not been a concerted and systematic attempt to find out what all stakeholders now think of the project. Perhaps it would be useful to share with stakeholders the outcomes of the TMLF, and obtain their feedback.

Kinder Morgan Canada chose stakeholders to lead the TMLF process – it was understandably uncomfortable for the company to adopt a process that didn't have guidelines as there would be unclear and uncertain outcomes, indeed an element of risk for Kinder Morgan Canada. However, the TMLF demonstrates that the company could trust stakeholders to deliver in this case.

Net Benefit

An important lesson, if the goal is demonstrable Net Benefits, is to choose compensation based on ecological requirements for a net gain and not dictate compensation based upon a fixed budget.

Having said this, comments were made that the calculations necessary to determine Net Benefit requirements for biodiversity offset projects elsewhere are not always particularly straightforward to understand, so care needs to be made not to make such calculations too complex.

Interestingly, there were two strong arguments for implementing compensation measures outside of the parks: (i) there is more opportunity for ecological gain, and (ii) it seemed likely that the projects would not experience as much resistance. However, on the other hand, it is harder to ensure that compensation is 'like for like', outside the parks.

The degree to which Net Benefit can be seen as meaning different things to different stakeholders, even within a project, is an important lesson to take away from the TMLF. For instance, the perception from some was that the TMLF-funded compensation projects would not have happened anyway, and were over and above the regulatory requirements, therefore satisfying the principle of net gain. This is a fundamentally different perspective on Net Benefits from that often discussed in the academic literature on offsetting (e.g. Bull et al., 2014).

Process

The Steering Committee originally thought that the TMLF would be spent quickly, which in turn meant there was little need to formalise meeting minutes, designate the TMLF as a legal entity, etc. Understanding the length of due process on schemes such as this is an important lesson learnt, especially in the context of administrative costs necessary for managing the fund. The length of time taken to implement projects was by most accounts necessary, e.g. to systematically identify and rank projects.

A challenge to the suggestion throughout that it is important to start with ecological needs for Net Benefits, and then cost those up as a means for determining the necessary size of compensation funds: from a project management point of view, compensation costs need to be established early on so that they get approved in the budget. Unless this is done, pragmatically, the money might never be provided. So a lesson for NNL projects in general is the need for a balance between extensive loss-gain calculations to demonstrate NNL or Net Benefits, and agreeing or negotiating funds in good time to fit in with project schedules.

A few interviewees commented that it would have been useful in the project to have technical guidance on approaches to these type of compensation measures, which do now exist e.g. PS6 (IFC, 2012), or the BBOP PCI (BBOP, 2012). Such guidance might also have helped facilitate agreement within the Steering Committee.

Finally – there was no real process in place for how to change objectives for funding once project opportunities ran out, and the Steering Committee started looking outside the parks. This suggests the need for more robust contingency planning.

Governance

It was suggested that, despite leading to extended and at times fraught discussion around compensation priorities, it was useful in some respects for a third party to work on the TMLF with the parks (i.e. other than parks management). The reason is that this may have facilitated additionality, making it easier to identify projects that were outside of the existing parks strategy. This is perhaps a general finding applicable to other projects.

Given the amount of money spent on administrative fees, in retrospect, the Steering Committee could have hired a full time project manager – which some would advise doing in the future.

Finances

Whilst, as mentioned, some of the committee members felt that more money should have been provided for the TMLF, they recognised that leverage had been lost in negotiating this (due to the long process of disagreement, fatigue on the part of Kinder Morgan Canada, and potentially the aforementioned change of ownership from Terasen to Kinder Morgan Canada).

A key lesson learnt was to set up compensation funds so that they have their own existence. International experience exists which could inform methods for doing so.

Indirect benefits

No additional comments.

Monitoring & tangibility

No additional comments.

Risk

In future cases, it would be crucial to establish a better way of managing liability for compensation projects.

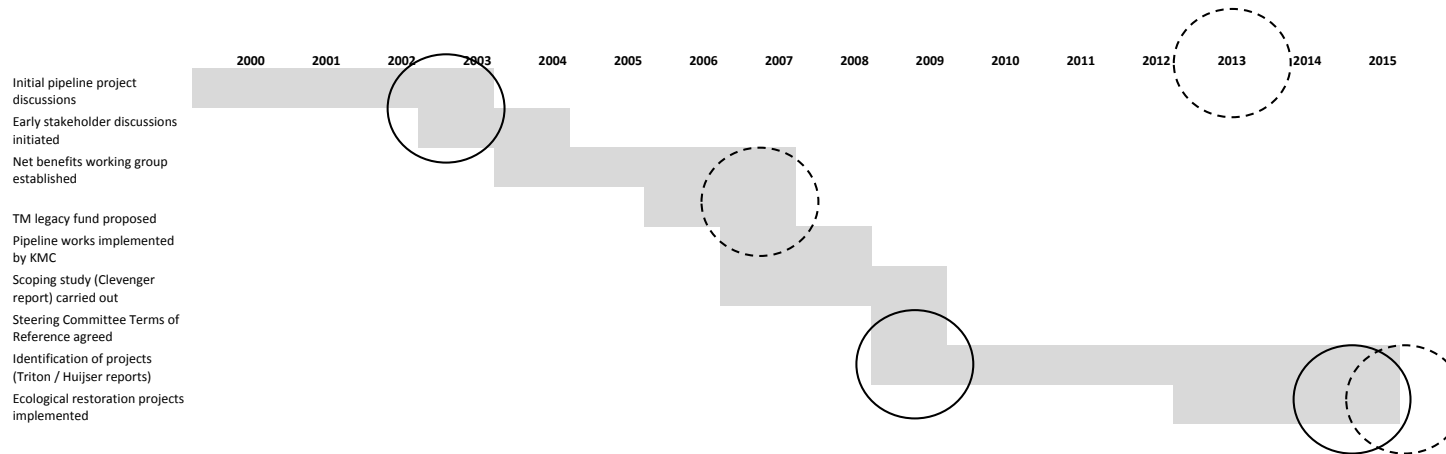
Transparency

Website traffic is very low. Whilst transparency is a principle of good practice offsetting, the cost of ensuring transparency needs to be better balanced against the actual level of desire from stakeholders to find out about outcomes.

Other

In retrospect – could also have taken a target charismatic species to focus on for some of the TMLF projects, although it can be hard to agree on specific species in the absence of structured guidance for doing so. Ecological integrity was considered by some to have been too large and vague a target.

Figure 6: timeline of TMLF from Anchor Loop project through to fund creation, development and implementation, including selected key strengths and weaknesses



Strengths

- Stakeholder consultation
- Project identification and selection process
- Tangible benefits delivered through projects

Weaknesses

- Time taken after pipeline expansion to implement projects
- Limited or no ecological basis for calculating size of fund
- Monitoring

4.5 Outcomes against Terms of Reference

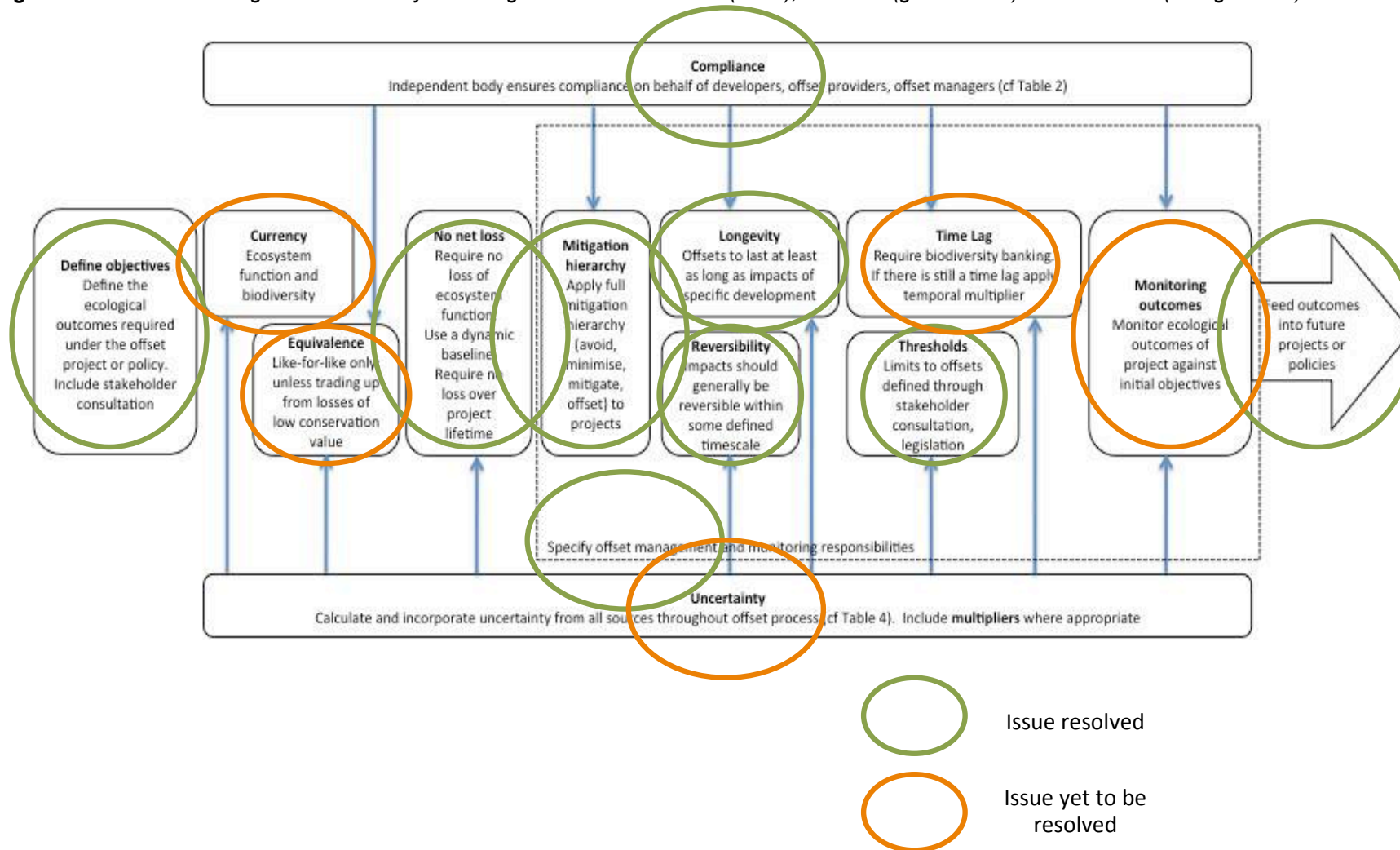
Key requirements were extracted from the Terms of Reference for the Steering Committee, and interview responses were used to judge whether each criterion had been met. It was established that the majority of criteria had indeed been met, with the notable exception of the implementation of a monitoring programme (which will be implemented in the future) (Table 3).

Table 3: core requirements from Terms of Reference, and whether these have been achieved

Requirement		Requirement achieved	Evidence
Projects must:	focus on ecological connectivity	Yes	<i>Triton (2012) Project summary Meeting minutes</i>
	be outside the normal course of business for the parks	Yes	<i>Interviews</i>
	be feasible	Yes	<i>Triton (2012) Project summary</i>
	ensure both JNP and MRPP benefit ecologically	Yes	<i>Triton (2012) Project summary Interviews</i>
The Steering Committee were required to develop an implementation plan identifying actions, timelines and budget		Yes	<i>Implementation plan Meeting minutes</i>
The Steering Committee were required to hold regular meetings and vote on any expenditures by majority		Yes	<i>Meeting minutes</i>
The original timeline for all projects to be completed was December 2014, although in the case of unanimous agreement by the Steering Committee the deadline could be extended		Yes	<i>Project summary Meeting minutes</i>
The Steering Committee were required to initiate a post project monitoring program “to assess the effectiveness of mitigation actions”		No	<i>In progress</i>

Again, whilst the TMLF was not designed as a biodiversity offset project *per se*, the Steering Committee wish to compare and contrast the achievements of the fund against existing offset projects. To do this, we use the framework for challenges to true offsets developed by Bull et al. (2013). This is presented in Figure 7.

Figure 7: standard challenges to biodiversity offsetting taken from Bull et al. (2013), resolved (green circle) or unresolved (orange circle) for TMLF



It is noted in Table 2, certain unexpected ecological impacts associated with the Anchor Loop were identified during the interview process, both positive and negative. These are contained in Box 1. Note that those impacts listed here are not considered even close to a comprehensive set of impacts – rather, they represent interesting comments that arose during interviews.

Box 1: unexpected indirect impacts of the Anchor Loop project and TMLF, noted by interviewees

Positive

Kinder Morgan Canada undertook numerous small mitigation or compensation projects on the side that were not part of the TMLF. They also lent equipment to the parks on a number of occasions. JNP in particular considered them to be a very “good neighbour” (J. Deagle, pers. comm.). None of this is recorded anywhere at all.

The right of way corridor created for and maintained for the underground pipeline is apparently good for coyotes, as wolves avoid it – and coyotes avoid wolves. The cleared rights of way also mean that people do have better sight lines for vehicles (better wildlife viewing, and fewer wildlife collisions) as well as more food in spring for the grizzly bears.

Kinder Morgan Canada funded additional Parks Canada employees in some cases, to make sure that they were sufficiently funded to carry out their work properly.

Data and analyses collected by Kinder Morgan Canada from the Impact Assessment baselines were made freely available to the parks, and are incredibly useful to the park now (e.g. ecology, habitat, soil, hydrology, aerial photos, etc. – all within 1 km of the pipeline). This information is used at least “a couple of times a month” (J. Deagle, pers. comm.).

Seed mixes were created by Kinder Morgan Canada for restoration on different lengths of the pipeline (based on habitat – Kinder Morgan Canada undertook extensive research on what seed mixes were appropriate, and also which seeds do not attract wildlife to the road whilst it is being re-vegetated, etc.). These mixes have become standards for the park, which previously just had one generic seed mix. This is used in restoration projects for completely unrelated compensation/restoration.

The existence of the TMLF is said to have definitely jumpstarted some projects not listed as being directly funded, opening the door to partnerships and collaboration that would otherwise not have existed.

Negative

The pipeline has had some negative impacts on the park that cannot be ignored. These include that the rights of way have been cleared, so there is a huge loss of ‘natural habitat’ on forested sites, and some wildlife will in turn avoid these areas.

It could also be that lots of the plants that have returned are non-native. So Kinder Morgan Canada haven’t necessarily effectively mitigated all impacts. Mistakes were also made during construction: e.g. Kinder Morgan Canada at one point ran over into sheep-breeding season, for which they paid fines.

5. Biodiversity offset projects elsewhere

Very little detailed information is available on the implementation of biodiversity offsets globally, a fact that has been recognized in the literature as a shortcoming for research in the field (Bull et al., 2013). Those data that are in the public domain and published in academic papers are sparse. In this section, we include relevant information from some of these case studies: primarily for individual projects. The examples included here are intended to provide relevant information in terms of the implementation and evaluation of the TMLF, and in terms of any future projects that might benefit from lessons learnt from the TMLF.

5.1 Within Canada

There is now extensive experience of the implementation of habitat restoration and compensation under the Fisheries Act in Canada, which is relevant to the lessons learned from the TMLF process in certain ways: firstly, it demonstrates that expertise in setting up and delivering NNL restoration projects exists in regions across Canada; secondly, it provides methods for quantifying ecological losses and gains (which in this context are often measured in relation to area and functionality); and thirdly, it demonstrates the use of multipliers to overcome risk or uncertainty associated with restoration projects (with compensation ratios employed going up to 10:1).

Hunt et al. (2011) provide a set of examples of habitat banks designed as fish habitat compensation under the Fisheries Act, which provide the information above. These include the following.

Bay Of Beauport Tidal Marsh Habitat Banks (Québec)

A restoration project, near Québec City, in which areas of tidal marsh habitat have been reconstructed at an old landfill site along the Mill Creek. Restoration of the bank was completed in 2011. The habitat bank is intended to provide nursery and feeding areas for several fish species, including yellow perch, walleye and Atlantic tomcod. The total area of the bank is approximately 2.4 hectares of marsh habitat.

Cheverie Creek Salt Marsh Restoration Project (Nova Scotia)

A project involving the restoration and enhancement of historically damaged salt marsh and coastal marine habitat, by replacing culverts, dyke breaching, shoreline armouring/stabilization, and channel dredging. The bank was completed in 2005. A total of 43 hectares worth of habitat credits have been awarded.

Lawrencetown Lake Salt Marsh Restoration Project (Nova Scotia)

A project again involving the re-establishment of salt marsh habitat conditions similar to the salt marsh habitat currently found in the Lawrencetown Lake system. Restoration work was completed in 2007. Habitat credits were measured based on the area of marsh flooded during high tide events as a result of culvert replacement, totaling 1.78 hectares.

North Fraser Harbour Habitat Compensation Bank (BC)

The purpose of the habitat bank was to create new intertidal marsh habitat adjacent to natural fringe marsh habitat in the North Fraser Harbour, to be used as compensation for future developments in the harbour. The project involved the conversion of intertidal mud and sand flats to intertidal marsh habitat with the primary criteria for success being the establishment of intertidal marsh vegetation. The project was completed as far back as 1993, but it is not clear from Hunt et al. how large an area was restored.

North Saskatchewan River Habitat Bank (Alberta)

The City of Edmonton proposed the creation of a spawning reef for sturgeon in the North Saskatchewan River, which could be used as a habitat bank to compensate numerous small

authorizations for fish habitat impacts in the region. The project was completed in the late 2000s. The total area of the spawning reef established was 945 m².

Pipestone Creek Habitat Bank (Manitoba)

A habitat bank established in the rural municipality of Sifton, in southern Manitoba. The activities involved fish habitat improvement work in the Pipestone Creek, and were completed in 2006. Credits were established by measuring the footprint of the area excluding cattle access, from the fence to the waters edge, which totaled 29,040 m². Interestingly, a multiplier (or compensation ratio) is applied to all credits sold by the bank, which at 10:1 is one of the higher compensation ratios known internationally (*J. W. Bull, unpublished data*).

Yarrow Creek Restoration Project (Alberta)

The Yarrow Creek project involved the removal of two perched culverts in the creek, replacing them with a clear span bridge that would allow fish passage. This work, similar to a number of the projects suggested for or implemented by the TMLF, was completed in 2004. Credits were signed off totaling an area of 198 m².



View over Jasper town, Jasper National Park (credit: J.W. Bull)

5.2 Offsets required by the IFC

One of the leading examples of NNL guidance available internationally is the performance standard developed by the IFC, PS6 (IFC, 2012). However, according to conversations with those working at the IFC, few projects currently exist that have actually implemented biodiversity offsets as a result of receiving IFC project finance. These include the following.

Simandou (Guineau)

The Simandou Project is a highly significant mining project in Guinea, comprising: (i) an iron ore mine, approximately 600 km from the Guinean coast, (ii) a railway of approximately 670 km for transporting the ore to the coast; (iii) a new port facility; and, (iv) various associated developments providing utilities and infrastructure to the project including construction

workforce facilities, roads, quarries, power generation and distribution and water supply. The first production was expected in 2015.

The 2012 Social and Environmental Impact Assessment (SEIA) completed for the project is considered by many to be an example of international best practice. The mine site is located within the Pic de Fon forest, one of 14 'Classified Forests' within southeast Guinea. Pic de Fon covers 252 km² of which approximately 35% remains as natural habitat (Conservation International, 2002). Pic de Fon is also a Key Biodiversity Area (KBA), as recognized by Conservation International and IUCN. Based on screening and detailed assessment of 1,200 vascular flora species and approximately 600 fauna species against the selection criteria, the project identified 59 species of high biodiversity value. Twelve of these species qualified Pic de Fon as critical habitat from a species perspective, including six IUCN Red List endangered (EN) species.

These species include an amphibian known at seven sites globally, and a herb known at only three sites globally. Also associated with the forest is a small population of West African chimpanzees (~ 50 individuals). An estimated 25% of the core of the chimpanzees' range would be permanently and irrecoverably lost to mining (Kormos et al., 2015). A management plan for the Pic de Fon forest, and conservation zones have been established. Bushmeat hunting is prohibited in areas of the classified forest, and a hunters' confederation of 'ecoguards' are assigned to patrol the area. Bushmeat hunting has reportedly decreased due to these efforts and monitoring of bushmeat sales in local markets is ongoing.

Areas of grassland and forest in Pic de Fon will be lost due to mining activities, and other habitats, such as lowland forests and forest-savanna transitional habitats, are at risk of significant degradation due to project-related impacts on groundwater and surface water. Along the rail route, areas of important lowland forest and woodland habitat will also be lost. Potential biodiversity offset sites have been identified following an initial screening process of likely candidates sites in the region and along the rail route. One of the biggest challenges will be to ensure the effective implementation and long-term management of these areas given the political environment. Simfer is committed to building institutional capacity within Guinea and developing partnerships with conservation organizations. Simfer, in collaboration with the Guinean Environment Ministry, has formed the Simandou Offsets Working Group. This technical group has representatives from Simfer, the Environment Ministry and the National NGO, and will ensure any project-related offsets are aligned with Government biodiversity plans.

"Mitigation proposed for the chimpanzees in the Simandou mountains includes controlling hunting, protecting habitat currently within the chimpanzee's range that will not be lost to mining, and creating additional habitat for chimpanzees both prior to and during mining activities. The SEIA predicts that, despite mitigation efforts, the sub-montane forest habitat where chimpanzees are living will be impacted, and the project is therefore investigating an offset site to compensate for residual damage to this unique habitat and other species living there. Simfer has formed a technical group called the Simandou Offsets Working Group with representatives from Simfer, the Environment Ministry, and the NGO Guinée Ecologie.

Both GAP and the Simandou project have provided a short list of potential offsets sites, indicating that their offsets will also consider "averted loss" as the counterbalance to actual loss on site. In these cases "no net loss" is working from an assumption of a pre-existing baseline rate of loss, assuming that habitat in the offset site is under threat or will be in the future" (Kormos et al., 2015).

The Simandou project is relevant to the TMLF because:

- Its existence supports the contention that projects which are at least as controversial as the Anchor Loop, perhaps even more so, can look to successfully engage stakeholders if mitigation and compensation measures are pursued in an appropriate manner;
- It demonstrates that offsets can and are being used for linear infrastructure impacts on a scale much larger than the Anchor Loop, so the latter is not unique and the approach taken can be scaled up; and,

- It emphasizes the difficulty in implementing offsets as quickly as the corresponding development (a problem identified with the Anchor Loop), since the Simandou development is already far underway, whilst offset projects have yet to be agreed.

Oyu Tolgoi (Mongolia)

The project (OT) is a \$12 billion investment to develop a copper and gold deposit at Oyu Tolgoi in the South Gobi desert, Mongolia. It is one of the world's most famous examples of an offset project. OT is located 600 km south of Ulaanbaatar, and the main deposits cover an area of 84.96 km².

Much has been written about OT and is freely available online (see documentation at <http://ot.mn/environmental-social-impact-assessment/>). Salient points here though include that proposed offsets include to reduce non-project related hunting by 25%, and to increase condition of 10% of landscape habitat by 7.5% (using carefully calculated habitat metrics). In contrast with TMLF, OT offsets are primarily averted loss, rather than active habitat restoration or creation – this is not necessarily to be encouraged, as the robustness of averted loss offsets are currently the subject of some debate amongst academics and policymakers.

Multipliers to be used on the OT offsets are of the order 0.3 – 4.0. This gives an idea of the magnitude of multiplier used on other offset projects, and which could potentially be applied to projects such as the TMLF when calculating gains required to achieve Net Benefits compared to losses (although research would be needed to justify the actual size of any multipliers used).

Note also that about \$70m (USD) has been recommended set aside for offsets for OT, based on loss-gain calculations: whilst this is much larger than the TMLF in absolute terms, it is approximately the same proportionally i.e. ~ 0.6% of project cost, compared to ~0.4% for the TMLF. In turn, this suggests that the amount spent on the TMLF by the Anchor Loop project was not unusual or unreasonable, which is a useful finding.

Reventazón (Costa Rica)

The Reventazón Hydropower Project (for which the Spanish acronym is PHR) comprises the construction and operation of a dam and 305.5 MW hydroelectric power plant (HPP) on the Reventazón River, 8 kilometers southeast of Siquirres. The PHR includes a 130-m high dam, a 6.9 km² reservoir, a 700 m diversion tunnel, and hydroelectric generation facilities. In addition, the PHR requires ~20 km of internal access roads, a 1.8 km long transmission line, and a construction camp. Construction started in 2009, with river diversion taking place in 2012.

According to the Inter-American Development Bank (IDB), Costa Rica's national power company (the Instituto Costarricense de Electricidad, ICE), the IDB, and an international conservation organization are turning the PHR from a potential environmental liability into a net gain for habitat protection. Offsets from the project will lead to (1) safeguarding critical habitat to ensure the survival of jaguars, and (2) the protection in perpetuity of a free-flowing river system with largely intact ecosystems.

(1) A concern in designing the project was loss of habitat connectivity caused by its reservoir, which is 8 km long and covers 6.9 km². This new barrier would cut through the Barbilla Destierro Biological Subcorridor (SBBBD) – a critical pathway for jaguars. The ICE will restore habitat to preserve the subcorridor's role in safeguarding the movement of jaguars and their genetic flow. ICE will meet these requirements by taking measures to protect land along the southern, eastern, and western portions of the reservoir at higher and more permanent levels than at present. The project will also help restore degraded lands and improve local understanding of the need to maintain this key biological corridor. In addition, the project will set protection goals and measure compliance by carrying out an initial Rapid Ecological and Social Assessment, establishing monitoring indicators, and undertaking regular third-party monitoring. Included will be payments to forest owners for environmental services as well as support for environmental education, restoration of degraded lands, agroforestry, and technical support.

(2) The PHR, in conjunction with the other projects upstream, will substantially reduce the ability of the Reventazón River to support three migratory fish species. The IDB requires an offset for the river's loss of capacity to support these species. ICE will protect migratory routes for these fish species in perpetuity in the ecologically similar Parismina River, which joins with the Reventazón on the coastal plain. The offset agreement guarantees that artificial modifications, including dams that would block migrations, will be prohibited and that the Parisminas natural flow pattern and its biological integrity will be preserved or restored where required. Throughout the Parismina and Reventazón watersheds, ICE will work with landowners to reduce erosion, sedimentation, and pesticide runoff into the rivers.

Interestingly, the PHR uses BBOP documentation to guide its design of biodiversity offsets for the project – supporting the utility of this guidance.

Note that in the PHR project documents, costs for offsets of approximately \$2.7m (USD) are suggested – it is not clear if this will be the final cost. The overall project budget is not known. The project is not directly comparable to the TMLF, the currency is different, compensation costs are likely different in Canada and Costa Rica, etc. – these are all significant differences which make comparison difficult on a financial basis. Again, Reventazón involves compensation on the order of millions of \$ (CAD), which suggests that the TMLF (\$2.2m CAD, excluding payments made directly to the parks) was not unusually expensive for an offset.

5.3 Other selected international offset projects

Sydney Olympic Park (Australia)

The Sydney Olympic Park development is the site of one of Australia's biggest urban remediation projects. Biodiversity offsets were put in place for development impacts upon habitat for a threatened frog species (*Litoria aurea*) found throughout the park. Long-term monitoring was commissioned by the Sydney Olympic Park Authority throughout the development period, and was then maintained through the post-development period. This is described in detail in a paper by Pickett et al. (2013), one of the few detailed assessments of a biodiversity offset project available in the peer-reviewed literature.

The development, in 2000, resulted in the loss of 9 of 26 ponds through creation of a water reservoir, equating to a loss of 3351 m² of pond surface area and 775 m of pond edge. As a biodiversity offset, 19 ponds were constructed within that part of the site, and an additional 24 ponds were constructed throughout Sydney Olympic Park (a requirement of the development was that these ponds were successfully colonized). These changes equated to the creation of 64,757 m² in total throughout Sydney Olympic Park. Multipliers (compensation ratios) for the compensation areas, broken down by specific pond type, were between 0.7 – 19.3.

NNL was not measured against a fixed baseline, but against an increasing population size for *Litoria aurea*. That is, the population after compensation had to be greater than the one before development, for NNL to have been considered achieved. This reflected uncertainty in population size and growth for *Litoria aurea*.

Monitoring was carried out over a 13 years, and it was found that the larger multiplier of 19.0 was necessary to demonstrate NNL. Pickett et al. (2013) concluded, which is of relevance to the TMLF (particularly in relation to the issue of necessary monitoring): "*habitat offset* [sic] *aimed at achieving and detecting no net loss can only be successful where the offset ratio is large, monitoring is long-term, robust and precise and funding is available to substantially increase the amount of habitat if monitoring indicates that this is necessary. This is the major short-fall of most offset programs, and this paper illustrates that even for species that are perceivably ideal for habitat offset, a large amount of effort is required for successful outcomes*".

QMM mine (Madagascar)

The Rio Tinto ilmenite mine in Madagascar, operated by QIT Madagascar Minerals (QMM), is a classic example of a large biodiversity offset project. The approach to be taken to biodiversity mitigation and compensation on site has been described in detail by Temple et al. (2012). The project will result in various impacts including the loss of important forest habitat. The total footprint is anticipated to be ~ 8,000 hectares over the lifetime of the mine, and mining activities began in 2009. The forest contains numerous species of conservation concern, including a very high number of endemic species. Temple et al. forecast biodiversity losses and gains for the period 2004–2065, where the target for QMM is a Net Positive Impact on littoral forest and 'High Priority' species. The report emphasizes the importance of avoidance, minimization and rehabilitation measures (i.e. the other components in the mitigation hierarchy) – including the fact that Rio Tinto are foregoing extraction of 8% of available ilmenite reserves to avoid certain biodiversity impacts.

As for biodiversity offsets: Rio Tinto is implementing averted loss offset measures, by seeking to reduce deforestation from other activities at a number of sites covering ~ 6,000 hectares. In addition, Rio Tinto is carrying out a number of conservation actions (e.g. environmental education, capacity-building, livelihoods alternatives, etc.) with the aim of making a positive contribution to sustainable development in the region and reducing human pressure on biodiversity.

Net impact on forest is forecast to be an increase in extent and quality of 13% in comparison to 2004. The overall ratio of gain to loss (multiplier) is approximately 2:1. Of the 90 High Priority terrestrial species, 83 are forecast to show a Net Positive Impact by 2065. However, seven species show residual negative impacts.

Overall, the analysis by Temple et al. (2012) suggests that Rio Tinto could achieve a Net Positive Impact on biodiversity by 2065, provided that certain assumptions are accurate. These assumptions, which are useful in terms of understanding how Net Benefits could be demonstrated on a project such as the TMLF, include that:

- The assumed background rate of habitat degradation is either accurate or precautionary;
- Sustained investment in conservation action is assured; and,
- Rigorous monitoring and independent verification are implemented to ensure that biodiversity gains are achieved.

Umeå Railway (Sweden)

A development of the Botniabanan West Rail Link, near the town of Umeå in Sweden was granted permission in 2011. The development impacts upon the Natura 2000 protected area of the Umeå Iven delta and surrounding fields. The Swedish authorities consulted the European Commission, in accordance with the EU Habitats Directive, regarding the need for compensation for impacts upon a Natura 2000 site – legislation that incorporates a NNL principle for impacts. The area cleared is 6.3 hectares, with a wider area impacted of 42 hectares.

In particular, the development was expected to remove wetlands providing seasonal habitat for migratory birds. Compensation was designed to replace the lost habitat with suitable wetlands nearby – by temporarily flooding agricultural fields at the appropriate times of year.

A new foundation was created with the mission of managing the necessary compensation actions for impacts upon migratory birds, for a period of 100 years. Permission was granted to the development conditional upon payments to the foundation. The foundation holds payments made by the developer, and manages the money so as to enable compensation activities to continue over the lifetime of the offset. The financial and legal structures put in place to manage this foundation over such a long time period are instructive in terms of financial planning for other offsets – and relevant to the TMLF, given the challenge of establishing how best to set up the fund itself.

The foundation also supports monitoring activities, which were started before construction and are to continue for the same length of time as the offset, and which are carried out by the

nearby Swedish university for agricultural sciences (SLU). Again, this project gives an idea of the extent to which monitoring must be planned and designed into offsets from the beginning, which is relevant for the TMLF. The information contained here was based on personal communication from those involved with the offset at SLU (*J.W. Bull, unpublished data*).

5.4 National no net loss policies

At least 60 countries around the world have national policies in place that contain some form of NNL or NG principle and therefore enable biodiversity offsets for development impacts. These are not discussed in detail here, as (i) they are landscape policies and consequently not comparable to the TMLF, and (ii) they are covered in detail elsewhere (particularly Madsen et al., 2010; 2011). However, elements of these policies are of interest in relation to the TMLF.

Annette Lake, Jasper National Park (credit: J.W. Bull)



The most well established policies (in terms of age and maturity) are arguably those in the US, Australia, and Germany. In all three cases, the policies are being continually modified and improved as experience grows, and it is of note that the US and German policies are based on legal mechanisms dating back to the 1970s – this provides some insight as to how long biodiversity offset policies can take to mature.

The US has extensive experience in financial and legal arrangements for offsets (e.g. conservation easements), which provide potential models that future projects of the nature of the TMLF could learn from (see in particular the Guide prepared by Carroll et al., 2012).

The Australian policy (in particular the regional native grassland policy in Victoria) is renowned as one of the most effective global examples of an offset policy. The system for quantifying and measuring losses

and gains of 'biodiversity' (Habitat Hectares; Parkes et al., 2003) is detailed, and provides one option for designing loss-gain calculations for projects such as the TMLF. It is the Australian model on which e.g. the Oyu Tolgoi and QMM loss-gain calculations (see above) are based. Further, regional policies in Australia use detailed assessments of background ecological trends to inform counterfactuals for measuring NNL (see Maron et al., 2015), which was also a gap in the case of the TMLF.

The German policy is less extensively discussed in the English language literature, but is very well established and represented by hundreds of habitat banks incorporating thousands of hectares (*J.W. Bull, unpublished data*). In this policy, averted loss offsets are rarely if ever implemented, meaning that all offsets involve active compensation (i.e. habitat creation or restoration). Based upon interviews, it seems likely that Canadian offsets would tend to involve restoration rather than averted loss offsets (which are more popular and appropriate

in Australia). The German policy may therefore have useful lessons to teach offset policy development in Canada. Further, the German policy has a strong emphasis on avoidance and restoration measures being considered over offsets – an example of good practice that should inform future offset projects in Canada and elsewhere.

Compensation for the negative impacts of development upon nature is also required, by law, in Brazil (Madsen et al., 2010; 2011). Brazilian offsetting policies are informative in relation to the TMLF as, in a survey of participants in Brazilian compensation projects in practice, Morandau and Vilaysack (2012) note that "*In Brazil, the sum required as environmental compensation corresponds to a percentage (degree of impact), which can vary between 0% and 0.5% of the total cost of the project. This percentage is based on several criteria such as the state of the biodiversity, the intensity of the impact, the influence on protected areas, etc. In practice, the maximum limit of 0.5% is often attained*". Note that the well established biodiversity markets website www.speciesbanking.com states that this practice has recently been revised – but it is of note in relation to the amount of funding provided to the TMLF as a proportion of the total Anchor Loop project.

Equally, in Paraguay, there exists a policy around Environmental Services Certificates (PES law 3001/06), which provides a compensation mechanism for impacts on nature. In this, similarly to the Brazilian case above, "*owners of large impact projects must also invest 1% of their total project budget in ESCs as compensation*" (www.speciesbanking.com). Again, the 1% figure is of the same order of magnitude as a proportion of project cost as the TMLF was for the Anchor Loop Project, suggesting that the size of the TMLF was no inappropriate.

6. Conclusions

This report captures the outcomes of a Programme Evaluation of the implementation of the Trans Mountain Legacy Fund (TMLF), as a means of achieving Net Benefits overall for ecological integrity, associated with the Anchor Loop project in the Jasper National and Mt Robson Regional Parks. The Evaluation involved three stages: a review of relevant documentation; a programme of interviewees with key stakeholders in Canada; and, an exploration of comparable 'biodiversity offset' type projects elsewhere.

It was found that the TMLF has so far met the majority of requirements specified in the project Terms of Reference, with the exception of the monitoring component (which it is intended will be carried out in the near future). Overall, those individuals interviewed were positive regarding the implementation and outcomes of the TMLF.

The project has been characterised by strengths including early and extensive stakeholder engagement, a robust process for selecting and implementing restoration measures that met the original objectives of the project, a highly motivated group of core individuals driving the creation and implementation of the fund, and transparency around the activities associated with the fund. In many respects, if it had been specifically designed as a biodiversity offset project, it would be an excellent example of one. However, there were also some important gaps in the project in this regard: primarily, that losses and gains associated with the Anchor Loop have not been numerically quantified to the extent that Net Benefits can be demonstrated, there was little consideration of counterfactual scenarios or risks and uncertainties, and the financial and risk management mechanisms initially put in place around the TMLF turned out to be unsuitable.

The experiences associated with the implementation of the TMLF are instructive for those designing biodiversity offsets elsewhere, particularly the aforementioned areas in which the TMLF demonstrated real strengths. Similarly, the identified gaps or weaknesses in the TMLF approach – particularly technical gaps around measuring and monitoring, demonstrating Net Benefits against established counterfactuals, and managing risk and uncertainty – could be filled by experiences from other projects. These other projects include the extensive set of schemes implemented across Canada in relation to compensation and restoration under the Fisheries Act, as well as large and controversial developments in a variety of other countries.

It is equally worthy of note that, for those few other compensation projects for which headline financial information on the implementation of biodiversity offsets is currently available and accessible, the TMLF is neither materially more or less expensive as a proportion of overall development project budget. This is also true of known national biodiversity offset policies that require a proportional spend of development costs on compensation. A spend of up to 1% of total project cost on biodiversity compensation for large projects with a NO net Loss goal appears to be common.

In summary: the TMLF is not a perfect example of a biodiversity offset project and would have to fulfil certain additional criteria to be considered one, but then, it was never originally intended to be a biodiversity offset to contemporary standards. The TMLF is, though, a very good example of an ecological compensation and restoration project – and one could argue that it exemplifies how it can be possible to implement a large scale industrial project within an ecologically sensitive area, simultaneously and satisfactorily meeting the requirements of a highly diverse set of stakeholders.

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Appendices

[All appendices accompany this report as separate documents].

Appendix I: Summary of key points from meeting minutes (2012–2015)

Appendix II: Rationale for selecting interviewees

Appendix III: Interview questions

Appendix IV: Interview schedule

Appendix V: Further details on projects implemented through the TMLF (N. Wilson)



View over Maligne Lake, Jasper National Park (credit: J.W. Bull)