

# Chapter 6 • Habitat management

## ■ Introduction

Early on in this Inquiry, an overarching theme emerged: the role of the Government of Canada in managing fish habitat. Habitat management encompasses many different topics, spans both the freshwater and marine environments, includes aquatic and terrestrial areas, and crosses jurisdictional boundaries from federal to provincial to regional. In this chapter, I summarize the evidence about habitat management.

I received many public submissions on issues of habitat management:

- Habitat loss is negatively affecting Fraser River sockeye salmon.<sup>1</sup>
- Destruction of salmon habitat by development is a cause for the decline of Fraser River sockeye.<sup>2</sup>
- Less than 5 percent of salmon smolt habitat remains in the North Arm of the Fraser River.<sup>3</sup>
- Very few salt marshes remain in the Fraser River estuary, and they are critical for salmon populations as they acclimatize to the marine environment.<sup>4</sup>
- The remaining foreshore of the Fraser River estuary needs to be protected at all costs.<sup>5</sup>
- Habitat protection is lacking.<sup>6</sup>
- Habitat must be put ahead of development.<sup>7</sup>
- There is a problem with the Department of Fisheries and Oceans' (DFO's) principle of "No Net Loss" (see discussion later in this chapter) because one can destroy a natural stream bed and replace it with a man-made one somewhere else and call it No Net Loss.<sup>8</sup>
- The No Net Loss principle and professional reliance models are inadequate to protect habitat.<sup>9</sup>
- The professional reliance model should be abandoned and replaced by an independent, arm's-length review of all development proposals.<sup>10</sup>
- There are issues with the *Canadian Environmental Assessment Act* (CEAA)<sup>11</sup> and habitat compensation.<sup>12</sup>
- The province should create a wild salmon watershed reserve to protect habitat.<sup>13</sup>

- Salmon habitat is regularly compromised by industrial activity.<sup>14</sup>
- The paving of urban areas is affecting watersheds, and construction companies are dumping silt into the Fraser River watershed.<sup>15</sup>
- DFO is not upholding its *Fisheries Act*<sup>16</sup> obligations and is allowing various kinds of development.<sup>17</sup>
- Development in riparian areas should be halted.<sup>18</sup>
- Government must enshrine its commitment under the *Fisheries Act* to protect fish habitat.<sup>19</sup>
- Preserving salmon habitat is cheaper than repairing it.<sup>20</sup>
- The Neskonlith Indian Band is working with concerned citizens to protect the Salmon River delta from development.<sup>21</sup>
- the Habitat Management Program’s regulatory oversight;
- habitat monitoring;
- water use;
- gravel removal;
- forestry;
- marine spill response;
- DFO Science’s management of marine science issues;
- oceans management;
- non-point source contaminants;
- point source contaminants (municipal wastewater, pulp and paper, and metal mining effluents); and
- habitat enhancement and restoration.

Also, DFO witnesses told me that habitat is critical to fish production and that if current trends of habitat degradation and loss persist, there will be a significant ongoing decline in fish habitat, which will affect Fraser River sockeye productivity over time.<sup>22</sup> As Randy Nelson, regional director of the Pacific Region’s Conservation and Protection Branch, said, habitat in spawning and rearing areas and along all the migration routes, including the Fraser River estuary, is critically important for maintaining the productivity of these stocks.<sup>23</sup>

*Canada’s Policy for Conservation of Wild Pacific Salmon* (the Wild Salmon Policy or WSP, reproduced as Appendix B) explicitly acknowledges the importance of habitat to conserving Pacific salmon:

The health and long-term well-being of wild Pacific salmon is inextricably linked to the availability of diverse and productive freshwater, coastal, and marine habitats.

...

Identifying, protecting, restoring and rehabilitating aquatic habitats are critical to maintaining their integrity and sustaining ecosystems.<sup>24</sup>

The Commission held hearings on DFO’s habitat management mandate and on specific habitat management topics, including:

- implementation of DFO’s Policy for Management of Fish Habitat;<sup>25</sup>

Finally, I note that on June 29, 2012, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures* (Bill C-38), received royal assent. Bill C-38 amends the *Fisheries Act* and enacts a new *Canadian Environmental Assessment Act, 2012*, repealing the *Canadian Environmental Assessment Act* in force at the time of the hearings. I discuss Bill C-38 in Volume 3, Chapter 3, Legislative amendments.

## ■ Habitat management policies and practices

This section describes the evidence I heard on the policies and practices relevant to the management of Fraser River sockeye habitat. Although the hearings focused on the application of habitat management policies and practices in the Fraser River watershed – that is, the freshwater environment – most of the topics discussed are applicable to the marine environment as well.

DFO is the primary federal government department with responsibility for management of Fraser River sockeye habitat. Environment Canada is also involved. Other federal and provincial government agencies play a role, as do local governments. Those other agencies are described where necessary later in this chapter. For an overview of the legislative framework for Fraser River sockeye salmon see Chapter 3, Legal framework.

## DFO Oceans, Habitat and Enhancement Branch

DFO Pacific Region's Oceans, Habitat and Enhancement Branch (OHEB)\* has two complementary mandates:

- conserving, protecting, and restoring fish habitat to support sustainable recreational, Aboriginal, and commercial fisheries through the provision of scientific information and advice; and
- conserving and protecting oceans, ocean resources, and biodiversity on an ecosystem basis through integrated management, a precautionary approach, and sustainable development principles.<sup>26</sup>

Within the Pacific Region, the regional director of OHEB functionally reports to two assistant deputy ministers at DFO's national headquarters in Ottawa (Ecosystems and Fisheries Management sector and Programs sector) and line reports to the Pacific regional director general (RDG). The six DFO area directors functionally report to the regional director of OHEB and line report to the RDG. OHEB managers at regional headquarters (e.g., director, Salmonid Enhancement Program) line report to the regional director of OHEB.<sup>27</sup>

There are four major programs in OHEB: the Salmonid Enhancement Program (SEP), the Habitat Management Program, the Oceans Program, and the Species at Risk Program.<sup>28</sup> SEP and the Oceans Program are discussed later in this chapter. The other two programs are described below.

### *Habitat Management Program*

Within DFO, the regulation and management of fish habitat fall under the Habitat Management Program.<sup>29</sup> It is responsible for regulatory reviews, watershed planning, partnership and collaboration, information management, and monitoring.<sup>30</sup> The primary focus of the Habitat Management Program's regulatory work derives from section 35

of the *Fisheries Act*. When a developer or proponent<sup>†</sup> submits a proposal to DFO for regulatory review under the Act, the process is termed a "referral."<sup>31</sup>

National headquarters provides the policy framework and tools that are used in the regions, such as the 1986 Habitat Policy (reproduced as Appendix C) and operational policies. It also provides advice to the regions on major project development and the implementation of policies. In the DFO organizational scheme in place at the time of the hearings, habitat is not the sole focus of any one sector in Ottawa. Habitat management responsibilities are shared primarily across two sectors. The policy aspects fall within the Programs sector, while the operational aspects fall within the Ecosystems and Fisheries Management sector.<sup>32</sup> For an explanation of DFO's national sectors, see Chapter 4, DFO overview. Rebecca Reid, regional director of OHEB from 2007 to 2010, described the difference between national and regional responsibilities as one of policy development (national) versus policy implementation (regional).<sup>33</sup>

Regional OHEB staff, who are located at the regional headquarters in Vancouver and the five area offices, carry out the day-to-day delivery of the Habitat Management Program. The Habitat Management Program has a few key sub-programs: the Habitat Management group, which has primary responsibility for responding to project referrals; the Habitat Monitoring group, which conducts compliance monitoring; and the Major Projects and Environmental Assessment group, which focuses on certain aspects of CEAA environmental assessment work.<sup>34</sup>

Over the last five to 10 years, funding for the Habitat Management Program has essentially remained stable. However, the strategic review departmental cuts of 5 percent under way during this Inquiry will affect the Habitat Management Program budget.<sup>35</sup>

### *Species at Risk Program*

The Species at Risk Program applies the *Species at Risk Act* (SARA) to identify species that are at risk

\* During the Commission, the name of OHEB was changed to Ecosystem Management Branch; however, OHEB is used throughout this Report. For further explanation of OHEB, see also PPR 14, Freshwater Urbanization, pp. 13–17, and PPR 11, Habitat Enhancement and Restoration, pp. 7–8; and Exhibit 654.

† "Proponent" and "developer" are used interchangeably, but DFO in general refers to proponents and I have followed that usage. Proponents may include private land developers, government bodies, and others.

or trending toward risk so that appropriate steps for protection or recovery may be developed and implemented. The program also develops goals, objectives, and approaches for recovery, as well as identifying appropriate measures and actions to achieve recovery.<sup>36</sup>

OHEB delivers this program in conjunction with other sectors, such as Science, Fisheries and Aquaculture Management, and Conservation and Protection; area office involvement is indirect and occurs mostly through incorporating recovery strategy requirements into *Fisheries Act* referrals and various planning processes.<sup>37</sup> For more information on SARA and Fraser River sockeye, see Chapter 11, Cultus Lake.

## Provincial-federal co-operation on habitat management

Many of the activities regulated by the province (e.g., agriculture, forestry, mining, road construction, waste management, water use, land use, and development) may affect Fraser River sockeye habitat (see also chapters 3, Legal framework, and 4, DFO overview). Accordingly, these activities may have to comply with both federal and provincial laws. The participant Canada told me that land and water use are largely managed by the province, though Canada has a role where fish habitat or navigable waters are involved.<sup>38</sup>

Fish habitat management is about water and land use management. According to Jason Hwang, area manager, OHEB, BC Interior, DFO has a very specific authority and role under the *Fisheries Act* to manage, protect, and administer regulatory decisions around water and land use, and it does its “best with that to influence ... decisions in favour of fish.” He said that the department does not have a veto for everything that happens on land, as the authority for land and water use ultimately lies with the province.<sup>39</sup> DFO needs to work co-operatively with the other agencies to manage fish and water.<sup>40</sup> But, Mr. Hwang testified, there can be competing priorities, for example, where an agency has a mandate to manage forest harvesting and generate economic benefits for the province and DFO has a

mandate to protect fish habitat.<sup>41</sup> For a discussion of provincial-federal co-operation on habitat enforcement, see Chapter 7, Enforcement.

The province assumed responsibility for the management of all freshwater fish species except anadromous salmon through a 1938 agreement with DFO.<sup>42</sup> The federal government retained responsibility for fish habitat.<sup>43</sup>

There have been a number of Canada–British Columbia administrative agreements for habitat management.\* The 1997 Canada–British Columbia Agreement on the Management of Pacific Salmon Fishery Issues spawned two habitat-related sub-agreements: the 1999 Sub-Agreement Respecting Fisheries Information Coordination and Sharing, and the 2000 Canada–British Columbia Fish Habitat Management Agreement (2000 Canada–BC Agreement). The 2000 Canada–BC Agreement has two overarching commitments:

- to establish a federal-provincial habitat management committee at the director level (or equivalent); and
- to establish local habitat management committees, or use existing committees or frameworks, to develop a coordinated local approach to setting objectives for fish habitat protection, watershed and resource planning, and fish habitat referrals.<sup>44</sup>

Currently, there is no active federal-provincial habitat management committee at the director level; however, according to DFO, the Pacific Fisheries and Aquaculture Committee, which is a working group of the Pacific Council of Fisheries and Aquaculture Ministers, is intended to play this role. There is no annual reporting on the status of implementation as set out in the agreement.<sup>45</sup>

Other Canada–BC fisheries endeavours, most notably the Pacific Council of Fisheries and Aquaculture Ministers and its staff-level support committee, the Pacific Fisheries and Aquaculture Committee, have not formalized any co-operative processes or approaches to fish habitat management during the last 10 years.<sup>46</sup> A Canada–BC fish habitat management task group was formed in response to a commitment made by the Canadian

\* See Exhibit 1923 (List of Treaties, Acts, Regulations, Agreements, Policies, Programs and Procedures Related to the Management of Fish and Fish Habitat on the Pacific Coast of Canada, submitted by DFO to the Commission, October 2010).

Council of Fisheries and Aquaculture Ministers. The 2009 terms of reference for this group state that the group will dissolve once a “fish habitat subcommittee” is established under either the 1997 Canada–British Columbia Agreement on the Management of Pacific Salmon Fishery Issues or the Pacific Council of Fisheries and Aquaculture Ministers / Pacific Fisheries and Aquaculture Committee process. As of spring 2011, the fish habitat subcommittee had not been formed.<sup>47</sup>

In 2004, the Auditor General’s report noted concerns about the coordination between DFO and the province on the protection of fish habitat,<sup>48</sup> and in 2009, the Commissioner of the Environment and Sustainable Development (CESD) reported that accountability in agreements with the provinces is weak.<sup>49</sup> In response, DFO agreed to review and evaluate, by March 31, 2011, its memoranda of understanding with the provinces and territories.\*

When asked about these concerns at the hearings, Mr. Hwang said that the BC Interior office does not see a lot of guidance coming from headquarters about how the Habitat Management Program and the province are to coordinate their work, despite the existence of the 2000 Canada–British Columbia Fish Habitat Management Agreement and other federal-provincial agreements. His understanding at the area level was that the 2000 Canada–BC Agreement has not progressed beyond directing habitat staff to establish some local co-operative committees. There are many examples at the operational level where DFO and provincial staff get along effectively on habitat matters, but there are also examples of things that fall through the cracks and do not get resolved as effectively as they could.<sup>50</sup>

Ms. Reid said that, although existing broad, overarching agreements like the 2000 Canada–BC Agreement are good in concept, they are not put into operation as clearly as habitat staff would like.<sup>51</sup>

In monitoring habitat, Dave Carter, regional team leader, Habitat Monitoring Unit, OHEB, said he does not use the 2000 Canada–BC Agreement, although some of the principles in the agreement inform his work. He does not participate with the province on any habitat monitoring committees, although he does sometimes meet with provincial officials and there are a number of area-based ad

hoc committees looking at monitoring in which DFO habitat and provincial staff participate.<sup>52</sup>

## Key provincial legislation affecting fish habitat

In this section, I introduce the most important provincial acts and regulations affecting the management of fish habitat. For further discussion about the provincial laws relevant to Fraser River sockeye habitat management, see the sections of this chapter on freshwater habitat and contaminants as well as Chapter 3, Legal framework.

The *Fish Protection Act* provides that the Lieutenant Governor in Council may, by regulation, designate streams as sensitive when this designation will help protect a population of fish whose sustainability is at risk because of inadequate water flow within a stream or habitat degradation.<sup>53</sup> Designated sensitive streams in the Fraser River watershed include Kanaka Creek, Nathan Creek, Salmon River (near Prince George), Silverdale Creek, West Creek, and Whonnock Creek.<sup>54</sup> As of July 2011, no further streams had been designated. The *Fish Protection Act* also prevents the construction of new bank-to-bank dams on the Fraser River.<sup>55</sup> The *Riparian Areas Regulation* (RAR) developed under this Act, directs local governments to improve the protection of fish and fish habitat in British Columbia in riparian areas.<sup>56</sup>

The provincial *Water Act* is the primary statute for managing works in and about a body of water and the diversion of water. It vests in the province the right to use and regulate flow of all stream water except where private rights have been established.<sup>57</sup> The *Water Regulation* sets out works permitted under the *Water Act*’s notification process, including restoration and maintenance of fish habitat, repair and maintenance of existing dikes, and emergency flood protection work.<sup>58</sup>

The provincial government regulates the forest industry by granting licences to harvest timber, stipulating forestry practice requirements, and subsequently granting approval to licensees to carry out forestry activities. It exercises this authority mainly through the provincial *Forest and Range*

\* For a list of co-operative and planning initiatives engaged in by the Pacific Region Habitat Management Program with the province and other agencies, see Exhibit 655.

*Practices Act*<sup>59</sup> (FRPA) and the *Forest Act*.<sup>\*</sup> The *Forest Planning and Practices Regulation* (FPPR) is the main regulation affecting fish habitat.<sup>60</sup>

The *Environmental Management Act* (EMA) is the primary provincial legislation governing the disposal of waste into the environment. Section 6 prohibits a person from introducing waste or causing or allowing it to be introduced into the environment in the course of conducting a prescribed industry, trade, or business.<sup>61</sup> Further, a person must not introduce waste into the environment so as to cause pollution. However, the EMA allows the disposition of waste, in compliance with the Act and a valid permit, approval, or order, regulation, or waste management plan.<sup>62</sup> The *Waste Discharge Regulation* prescribes the industries, trades, businesses, operations, and activities that require some form of authorization before discharging waste into the environment under subsections 6(2) and (3) of the EMA, as well as those that are exempt from the regulation. The regulation also prescribes the industries, trades, business, operations, and activities that may be exempt from subsections 6(2) and (3) through compliance with an approved code of practice. Industries that introduce waste into the environment in accordance with a code of practice are exempt from subsections 6(2) and (3) of the EMA.<sup>63</sup> No site-specific permit or other waste discharge authorization is required. These exemptions include the discharge of domestic sewage to a sewerage system.<sup>64</sup> Wastewater treatment facilities are regulated under the *Municipal Sewage Regulation*, pursuant to the EMA.<sup>65</sup>

## 1986 Habitat Policy for the management of fish habitat

The 1986 Habitat Policy guides DFO's administration of the *Fisheries Act* habitat protection provisions.<sup>66</sup> The policy sets out several key principles that guide the Habitat Management Program. It recognizes that fish habitat is the production system necessary to sustain Canada's fisheries resources. The 1986 Habitat Policy is a national policy and is also department-wide, meaning it contains guidance intended not only for DFO Habitat

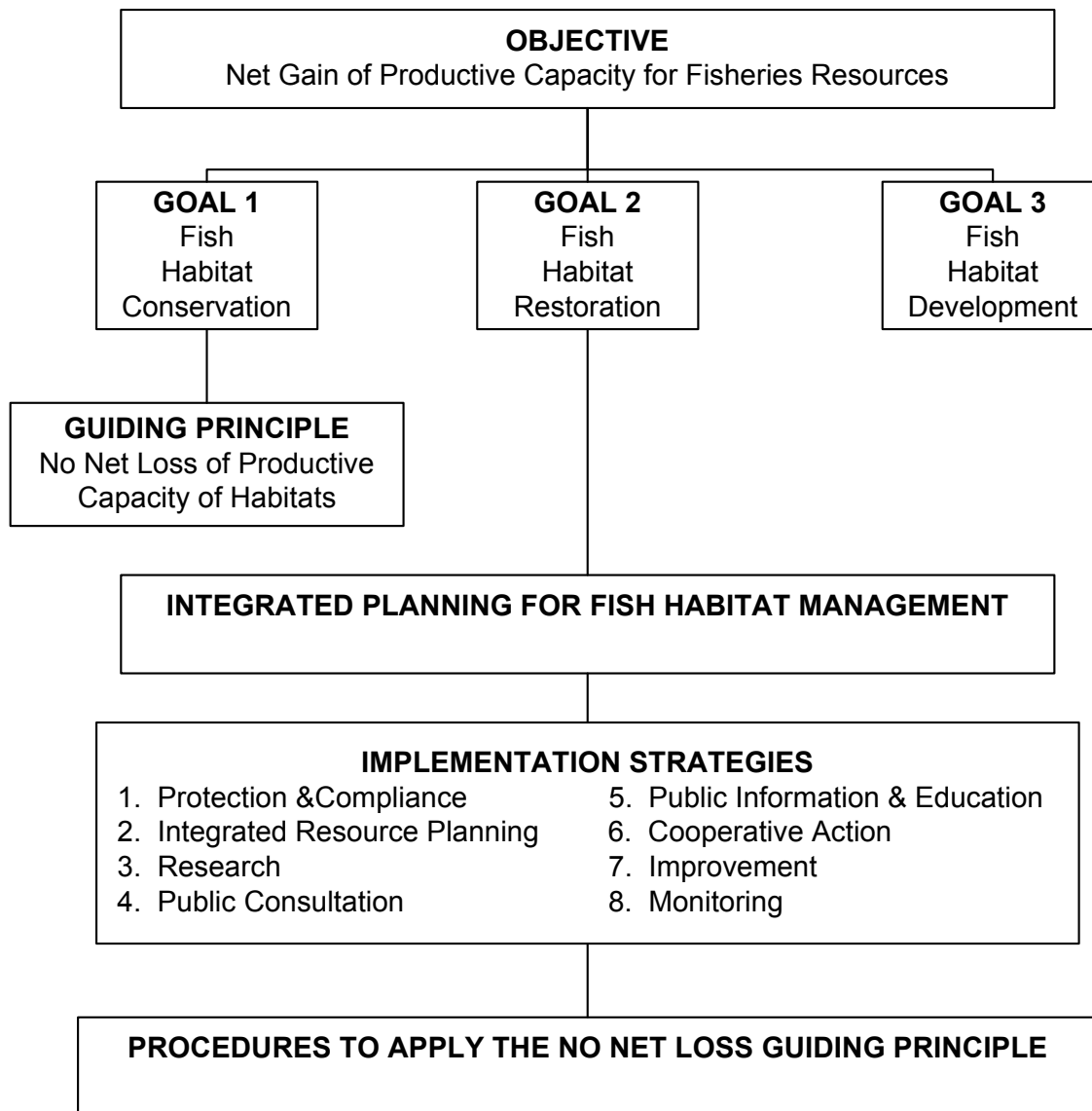
Management Program staff, but also for department staff involved in science, enforcement, policy, and programs. It states that it provides "objective statements against which the Department can measure its performance in fish habitat management."<sup>67</sup>

The ultimate objective of the 1986 Habitat Policy is to achieve a "net gain of the productive capacity of fish habitats." This objective is supported by three goals: (1) active conservation of the existing productive capacity of habitats; (2) restoration of damaged habitats; and (3) development of new habitats, as shown in Figure 1.6.1. The policy applies to all proposed development projects and activities of any size, in or near the water, that could "alter, disrupt or destroy" fish habitats, whether by chemical, physical, or biological means.<sup>68</sup>

I heard evidence with respect to the 1986 Habitat Policy – and Fraser River sockeye habitat in particular – that spawning and rearing habitat, and all the migration routes, including the Fraser River estuary, are critically important to maintaining the productivity of Fraser River sockeye stocks.<sup>69</sup> Mr. Hwang told me that the 1986 Habitat Policy is tremendously valuable because it gives DFO and other entities, like the provincial Ministry of Environment, something to point to when looking at trade-offs between economic development and the impact on fish and fish habitat. It provides DFO a "very strong and powerful opportunity to bring the fisheries' interest to the table when those kinds of decisions or trade-offs are being considered."<sup>70</sup> Despite the concerns about implementation of the 1986 Habitat Policy (discussed below), it appears that salmon habitat, including that of Fraser River sockeye, is better off today than it would have been without this policy.<sup>71</sup>

The fish habitat conservation goal (Goal 1 in Figure 1.6.1) is the most fully articulated of the 1986 Habitat Policy's three goals. It seeks to "[m]aintain the current productive capacity of fish habitats supporting Canada's fisheries resources." In part, this maintenance is done by administering and enforcing the habitat provisions of the *Fisheries Act* to "control the negative impacts of existing and proposed projects and activities that have a potential to alter, disrupt and destroy habitats." The goal is guided by a principle of "no net loss of the

\* The *Forest Act*, RSBC 1996, c. 157, grants the right to harvest timber in British Columbia and gives the Lieutenant Governor in Council the authority to make regulations to designate Crown land as mountain pine beetle salvage areas.



**Figure 1.6.1 Policy Framework for Fish Habitat Management**

Source: Reproduced from Exhibit 260, p. 12.

productive capacity of [fish] habitats” (No Net Loss principle). The No Net Loss principle is the policy’s best-known feature although technically only applicable to the first goal.\* Under this principle, the department strives to balance unavoidable habitat losses to development with habitat replacement on a project-by-project basis. This practice is known as habitat compensation. No Net Loss applies to both the deposit of deleterious substances (prohibited

under section 36 of the Act) and harm to habitat (prohibited under section 35 of the Act).<sup>72</sup>

Although No Net Loss is paramount to the 1986 Habitat Policy’s conservation goal, techniques used in relation to the two other goals – to restore habitat and to develop habitat – may also be employed by proponents to achieve No Net Loss and the conservation goal.<sup>73</sup> The second two goals are set out in the 1986 Habitat Policy as follows:

\* Although No Net Loss is the guiding principle of goal 1, the phrase “to achieve No Net Loss” is regularly used as shorthand for the achievement of the 1986 Habitat Policy’s conservation goal of maintaining the current productive capacity of fish habitat. I follow this usage in this Report.

- *fish habitat restoration* – rehabilitate the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved through the fisheries resource; and
- *fish habitat development* – improve and create fish habitats in selected areas where the production of fisheries resources can be increased for the social or economic benefit of Canadians.<sup>74</sup>

Whether DFO is meeting the policy’s objective of net gain of productive capacity is discussed below.

The 1986 Habitat Policy describes eight strategies focused primarily on implementing the conservation goal, but which may also apply to the restoration and development goals.

1. Protection and compliance
2. Integrated resource planning
3. Scientific research
4. Public consultation
5. Public information and education
6. Cooperative action
7. Habitat improvement
8. Habitat monitoring<sup>75</sup>

According to the 1986 Habitat Policy, applying No Net Loss does not mean that proposed development projects in or near water will end, or that unreasonable demands will be imposed on their designs. However, each project should be evaluated, early in the planning phase, using an existing process where possible, to determine if its impact on fish habitat would reduce the habitat’s productive capacity.<sup>76</sup> Where a fishery resource and supporting habitat are put at risk by a proposed project or activity, DFO is to be guided by the following hierarchy of preferences to achieve no net loss of productive capacity:

- 1 Maintain without disruption the natural productive capacity of the habitat(s) in question by avoiding any loss or harmful alteration at the site of the proposed project or activity.
- 2 If it proves impossible or impractical to achieve the first preference, then explore compensatory options in the following order: (1) assess possibilities of like-for-like

compensation at or near the site; and  
(2) consider replacement of habitat off site or increase the productivity of existing habitat for the affected stock.

- 3 Where the first two preferences are not technically feasible, consider proposals to compensate through fish production.<sup>77</sup>

The policy assumes a referral process whereby DFO receives information about or a request for review of proposed projects (see description of this process below). Referrals may come through established inter-agency referral systems, through inquiries from the proponent of a proposed project or from concerned citizens, through public announcement of a project, or through DFO’s own requests.<sup>78</sup> However, as discussed below, the habitat referral process uses a risk management framework, and therefore many projects are not actually reviewed.

Although No Net Loss applies to harm prohibited by sections 35 and 36 of the Act, habitat compensation only applies to harm to physical habitat prohibited by section 35 of the Act.<sup>79</sup> Compensation is defined as “[t]he replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada’s fisheries resources.”<sup>80</sup> To provide operational guidance on compensation, the department published the *Practitioners Guide to Habitat Compensation* in 2006. The guide directs habitat staff to aim for a compensation ratio greater than one-to-one, meaning that the productive capacity of compensatory habitat should exceed the productive capacity of impacted habitat. The amount of compensation required is to be determined based on the residual net loss of the productive capacity after relocation, redesign, and mitigation have been taken into consideration. In situations where very high ratios are required, the guide suggests habitat staff should reconsider whether the proposed “harmful alteration, disruption or destruction of fish habitat” (HADD) prohibited under section 35 should be authorized.<sup>81</sup>

If the HADD authorization is conditional upon satisfactory compensation, failure to provide



adequate compensation may invalidate the authorization and leave the proponent vulnerable to enforcement action.<sup>82</sup> Habitat Management Program staff may also demand financial security from the proponent.

A recently revised draft version of the *Practitioners Guide to Habitat Compensation* removes the compensation hierarchy on the basis that it is “too prescriptive and limits the ability to find innovative means to seek compensation.” The revised version also omits artificial propagation (the least preferred method of compensating for habitat losses in the original guide), which is “not sustainable in perpetuity.”<sup>83</sup>

The 1986 Habitat Policy and the 2005 Wild Salmon Policy (WSP) (described in Chapter 10, Wild Salmon Policy) are distinct but complementary policies. The WSP says this about the 1986 Habitat Policy:

Identifying, protecting, restoring and rehabilitating aquatic habitats are critical to maintaining their integrity and sustaining ecosystems. Since 1986, DFO’s Habitat Management Program has been guided by the “no net loss” principle for the protection of these habitats. The first and preferred approach is prevention of habitat loss. DFO policy also stipulates that where a harmful alteration of habitat is authorized by the Minister, losses shall be compensated by habitat replacement.

The strategies for achieving “no net loss” have focused primarily on project-by-project review, mainly in freshwater environments. A modern, more effective approach to achieve “no net loss” must assess the importance of habitat on an ecosystem basis, and balance the degree and type of impact with the most effective remedy. In evolving to a more integrated approach, the Department will make greater use of indicators to assess and monitor the health of freshwater and marine habitat.

A new focus on the salmon habitat that is most productive, limiting, or at risk in a CU [Conservation Unit] will clarify decision-making and better link habitat management strategies to harvest and salmon assessment (Strategy 4). Low risk activities, where measures to avoid or mitigate impacts are well understood, will be dealt with through other mechanisms such

as guidelines and standards. This approach will ensure that all habitats are addressed and resources are focused where most required.<sup>84</sup>

Operationally, there are obvious overlaps between the 1986 Habitat Policy and strategies 2 and 3 of the WSP. I discuss this overlap further in the findings section below, as well as in Chapter 10, Wild Salmon Policy.

### ***Implementing the 1986 Habitat Policy***

Various participants in this Inquiry expressed concerns in their final submissions about DFO’s efforts to implement the 1986 Habitat Policy. They told me there has been an ongoing loss of fish habitat rather than the net gain envisioned by the policy; DFO is not adequately monitoring habitat loss or enforcing proponent compliance; the policy is still not fully implemented; and the No Net Loss principle is either misapplied or not applied at all.<sup>85</sup>

Two previous reports canvassed DFO’s success in implementing the 1986 Habitat Policy:

- In 2004, the CESD found “indications” that implementation of the 1986 Habitat Policy “does not seem to be working.” The commissioner suggested the department “re-examine the objectives of the policy and make it work.”<sup>86</sup>
- In 2009, the CESD examined DFO’s protection of fish habitat generally. The commissioner reported that “[i]n the 23 years since the Habitat Policy was adopted, many parts of the Policy have been implemented only partially ... or not at all.” The report explained that, because the department “does not measure habitat loss or gain” and has limited information on the state of fish habitat, it cannot determine the extent to which it is progressing toward the Habitat Policy’s long-term objective of a net gain in fish habitat, and “[t]here has been little progress since 2001.”<sup>87</sup>

In response to the 2009 CESD report, DFO agreed to determine by March 2010 what actions are required to fully implement the 1986 Habitat Policy.<sup>88</sup> DFO completed its review of the 1986 Habitat Policy in 2010 and developed an action plan to renew

the policy (see discussion below).<sup>\*</sup> The review of the policy considered its eight implementation strategies but focused on Strategy 1 (protection and compliance).<sup>89</sup> In explaining his part in this review, David Bevan, associate deputy minister, said:

Now, we – “we” being myself and Kevin Stringer – met with habitat practitioners and managers across the country to discuss the policy and to discuss the implementation of the program. The difficulty we have is right now, the model for the delivery of the program is to receive proposals from proponents and then to review those to determine if there’s going to be a hazard or a change to the habitat, a HAD[D], and whether or not then there has to be an approval process initiated. That is very labour-intensive. It doesn’t look at the risks posed by these various projects and you end up trying to treat everything the same and it’s not an effective way. So what we’re looking at doing is bringing the ... practitioners of the program together over the course of the Fall to look at a new set of procedures and protocols for how to manage the risks that human activities pose in the habitat of fish and then how to be much more proactive and to spend more time on things like monitoring and then dealing with problems there and less time on low-risk activities where we’re looking at an armour stone or seawall or a wharf being put in where we think we can handle that through a different process.

So we’re looking at revising the program and to ensure that the policies reflect a better way ahead. The real problem we have with no net loss is the development of metrics. How much habitat exists? How do you track it over time? And that’s been a significant challenge. We still have that as a goal and we still have the policy in place but we do think that we need to look at the design of the program with a view to being more proactive, more focused on risk management and using better tools to get compliance with the policy and to make sure the policy reflects the actions.

That’s what we’re doing and we have that step done and we’re looking at now bringing the peo-

ple together over the course of the winter to try to be in position for the coming years to modify the approach and to get a better result for Canadians and for the preservation of fish habitat.<sup>90</sup>

According to Patrice LeBlanc, director, Habitat Management Policy Branch, Program Policy sector, and Ms. Reid, in many cases DFO does implement all the strategies, although Mr. LeBlanc also stated that DFO is primarily focused on implementing Strategy 1 of the policy and that limited effort and resources are directed at implementing the other seven strategies.<sup>91</sup> DFO has not estimated the level of effort it spends on each strategy and whether additional resources are needed to implement the policy.<sup>92</sup>

### Achieving No Net Loss

A number of previous reports have examined the issue of whether DFO is achieving No Net Loss as set out in the 1986 Habitat Policy:

- In 1997, the Auditor General examined the sustainability of the resource base for Pacific salmon. The report found that the department had not developed an acceptable, standardized measure of habitat productivity. Moreover, the Auditor General’s report suggested that an accumulation of small impacts from small-scale developments are probably the source of the “slow net loss” of habitat that is occurring.<sup>93</sup>
- In 1999, the Auditor General observed that fish habitat loss was still occurring, contributing to the continuing decline of many salmon stocks.<sup>94</sup>
- In 2004, the CESD reported on salmon habitat and found “indications that habitat loss is continuing.”<sup>95</sup>

DFO has acknowledged these criticisms and its responses to them are contained within the above-noted reports. In 2000, DFO embarked on a national evaluation program to assess whether compensation is “achieving No Net Loss of fish habitat productivity.”<sup>96</sup> The program included four components, each reported in a paper published in a peer-reviewed journal. These components are summarized in Table 1.6.1.

\* Exhibit 665 is a progress report regarding DFO’s response to the 2009 CESD report that was provided to the deputy minister in 2011 (Patrice LeBlanc, Transcript, April 5, 2011, p. 57).

**Table 1.6.1 Summary of the four papers representing the four components of DFO’s “national evaluation program”**

Literature review	Located and reviewed studies from the peer-reviewed and “grey” literature that assessed habitat compensation projects. Found 10 studies containing 109 No Net Loss assessments of 103 compensation projects across Canada between 1992 and 2003. Most of the projects were in British Columbia and were either urban development- or forestry-related. <b>Results:</b> Over half the projects were determined to have had smaller compensation areas than HADD areas, and over one-third clearly did not achieve No Net Loss.
File review	Analyzed files for 124 HADD authorizations (105 from BC) from 1994 to 1997. <b>Results:</b> 25% had smaller compensation areas than HADDs. Determination of No Net Loss could only be made for 14% of authorizations because of poor compliance with monitoring requirements and because the performance criteria used by DFO did not assess effectiveness / No Net Loss.
Compliance audit	Conducted site visits for 52 of the 124 authorizations from the file review (selected randomly), to assess compliance with HADD area; compensation area; biological, physical, and chemical requirements in authorizations. <b>Results:</b> 86% of authorizations had larger HADD or smaller compensation than authorized, or both. Two-thirds resulted in net loss of habitat area.
Effectiveness study	Evaluated 16 of the 52 authorizations (7 in BC) for achievement of No Net Loss by comparing habitat productivity at project site and reference sites. <b>Results:</b> 63% of authorizations resulted in net losses of habitat productivity.

Source: Reproduced from Policy and Practice Report 8, Habitat Management, pp. 22–23, Table 2. The table was compiled from four papers written by David Harper and Jason Quigley. The literature review is Exhibit 736; the file review is Exhibit 667; the compliance audit is Exhibit 737; the effectiveness study is not an exhibit but was cited in PPR 8.

A summary of the challenges revealed by the four-part evaluation program was published in a fifth paper.<sup>97</sup> This paper includes 39 recommendations in three areas: (1) achieving No Net Loss; (2) measuring No Net Loss; and (3) improving organizational memory, learning, and transparency.

According to Mr. LeBlanc, DFO has done little since the work described in Table 1.6.1 to assess whether there has been an improvement in meeting the No Net Loss principle to implement the 1986 Habitat Policy’s first goal of conserving fish habitat.<sup>98</sup> One change, however, is that DFO now has a habitat monitoring unit in each region (see the discussion below) and the Habitat Management Program is working with DFO Science to develop a standard, scientifically sound methodology to evaluate the accuracy of predicted HADDs and verify the effectiveness of the compensation measures (see below).<sup>99</sup> When asked whether Canada is currently achieving No Net Loss, Mr. LeBlanc testified that it is not achieving it and, furthermore, that there is an inability to measure the losses occurring nationally. He also said that, for some individual projects, No Net Loss may be

achieved.<sup>100</sup> If, however, action is not taken to arrest the effects of increasing economic development, the loss of fish habitat will continue, according to Mr. LeBlanc.<sup>101</sup>

Mr. Hwang said that, at the operational level, all indications are that Canada is not meeting the No Net Loss principle. He did say, however, that Fraser River sockeye habitat in the BC interior is probably better off than habitat for some other species because of the biology of the species and where it lives. He distinguished between proposed projects that come to DFO for review, which in his view are handled appropriately under the 1986 Habitat Policy, and the many other projects that are not reviewed by DFO for a variety of reasons and that have a cumulative incremental effect on habitat loss. One challenge in achieving No Net Loss for Fraser River sockeye is development in the Shuswap Lake area, where there are historical pressures from land uses such as agriculture and forestry; there are linear developments from railways, hydro rights-of-way, and highways; and, more recently, there has been a significant increase in recreational and residential property

development, all of which are “not positive for fish and fish habitat.”<sup>102</sup>

Ms. Reid agreed that Canada is probably not achieving No Net Loss, but said that there is not enough information to be sure.<sup>103</sup>

Mr. Nelson said that, based on his experience working on the Fraser River for 20 years and through staff who continue to work on the Fraser, there has probably been a loss of fish habitat in many areas.<sup>104</sup> Paul Steele, former national director general of Conservation and Protection, said that his direct knowledge of the situation on the Fraser River is quite limited but that, from what he has heard, he generally agreed with Mr. Nelson’s view of the loss of fish habitat on the Fraser.<sup>105</sup>

Claire Dansereau, deputy minister, DFO, testified that the department is continuing to monitor whether No Net Loss is “working” and that in some cases it is working and in some cases it is not.<sup>106</sup> In her view, the No Net Loss principle is a “guiding principle, as opposed to necessarily a metric that was ever intended to be measured on a centimetre-by-centimetre [basis] for habitat.”<sup>107</sup> She went on to say:

I would say that we have areas that we can certainly improve on, but I don’t think that the intention was ever that it would be that categorical. We are, as I think you know, looking at how to improve the system by taking the principle of no net loss potentially to an ecosystem base, rather than a project-by-project base, to allow us to achieve the intended outcomes, which is to make sure that the fish have the habitat that they need in order to survive and to thrive.<sup>108</sup>

Ms. Dansereau said that, whether the specifics of No Net Loss have been met on a case-by-case basis, “I don’t think we can say, and I don’t think we would say.”<sup>109</sup> However, Ms. Dansereau said DFO still takes the approach that, on a project-by-project basis, there must be habitat created or compensated for in some way for every area of habitat lost, although DFO is not as “proficient” at going back and monitoring to ensure that this has occurred for each project authorized by DFO. She said that this is particularly true for smaller projects.<sup>110</sup>

Mr. LeBlanc also said that No Net Loss was never intended to be a “performance measure” but that it was intended to be a “guiding principle”

that would allow DFO to make decisions about HADDs.<sup>111</sup> And I heard from Mr. Carter that the No Net Loss principle is more of a goal than a performance measure.<sup>112</sup> In contrast, the policy itself says that it provides “objective statements against which the Department can measure its performance in fish habitat management.”<sup>113</sup>

### Measuring No Net Loss

In 1997, the Auditor General found that DFO had not developed a measure of fish habitat productivity.<sup>114</sup> In 2009, the CESD found that DFO does not measure habitat loss or gain, and it recommended DFO develop habitat indicators.<sup>115</sup> When asked about this situation, Mr. LeBlanc said that DFO has no indication whether it is gaining or losing habitat.<sup>116</sup> He added that, although DFO has no real way to assess whether it is achieving no net loss of productive capacity, it is hoping to develop indicators to allow it to do this assessment.<sup>117</sup>

Mr. LeBlanc said there is a need for rigorous national scientific methodology to measure whether the No Net Loss principle has been met, including verifying that a HADD has occurred, and measuring the effectiveness of compensation. In his view, the results of the monitoring programs should be peer reviewed through the DFO Canadian Science Advisory Secretariat (see discussion in Chapter 4, DFO overview) or some other mechanism.<sup>118</sup>

Mr. Hwang and Mr. LeBlanc both said that DFO does not yet have the ability, on a site-specific, operational basis, to measure habitat productivity.<sup>119</sup> DFO Science has been asked to develop indicators for fish habitat in order to allow the department to measure whether there has been loss of productive capacity.<sup>120</sup> Mr. Hwang told me that establishing a benchmark, baseline, or status of habitat would allow a determination as to whether habitat is better or worse off. In his view, the habitat indicator work that has been started under the WSP is useful and, if completed, would be very helpful in managing habitat impacts now and in the future.<sup>121</sup> According to Ms. Reid and Mr. Carter, the Pacific Region has developed the methodology for habitat indicators under the WSP (Strategy 2).<sup>122</sup> Initial habitat status reports are at a preliminary stage (for further discussion, see Chapter 10, Wild Salmon Policy).<sup>123</sup>

## Cumulative impacts and No Net Loss

The 1986 Habitat Policy recognizes that cumulative impacts on habitat are a serious concern.<sup>124</sup> DFO habitat witnesses spoke about cumulative impacts and how these affect fish habitat.<sup>125</sup>

Mr. Hwang testified that, although not every small project will negatively affect fish habitat, a greater number of small projects increases the probability of harmful effects. In his view, the trend of “slow net loss” of habitat due to an accumulation of small impacts from small-scale developments is still occurring, and DFO is aware of this fact and is doing what it can about it with the resources it has.<sup>126</sup> Mr. LeBlanc said that DFO lacks methodologies for assessing cumulative impacts.<sup>127</sup>

I heard from Mr. Hwang about the challenge of managing cumulative impacts to fish and fish habitat:

Well, the challenge there, and I think it’s spoken to largely in the previous Auditor General reports that were mentioned earlier, is that the effects to fish and fish habitat that have happened already are already there on the land base and they have already taken whatever measure of, I guess, reduced productive capacity out of the resource base. And what happens when something new comes along is that if that does have another negative effect, it adds up cumulatively. And that’s what the previous audits have found and that’s what continues on today.

So it creates a challenge whereby any single development proponent in their mind, when they look at their project in isolation, it seems reasonable an effect that they are proposing may not be particularly significant or large and they will propose that it be reasonable that they be allowed to proceed with that development. And Fisheries and Oceans, we find ourselves often trying to represent the interests of fish, both in the specific circumstances of that site, as well as over time in terms of the cumulative results of other development activities in that area.<sup>128</sup>

Similarly, Michael Crowe, section head, Habitat Management Program, OHEB, BC Interior, said there is a need for management of cumulative incremental harm to sockeye habitat.<sup>129</sup> Mr. Bevan

said that no one at DFO is looking at the cumulative impact of habitat loss because the 1986 Habitat Policy calls for consideration on a project-by-project basis. He added that to develop this capacity DFO needs to shift some of its resources into monitoring.<sup>130</sup>

## *Renewal of the 1986 Habitat Policy*

In recent years, DFO internal discussion has turned to renewing or modernizing the 1986 Habitat Policy. According to Mr. LeBlanc, DFO has done some policy research and briefed the minister, but the department has not decided to do further consultation. If the proposal for renewal of the policy goes forward, a discussion paper would be presented internally and externally to get feedback on potential improvements to the policy and, once this discussion paper process is complete, then DFO would draft a new version of the policy, conduct internal and external consultation on this draft, and then finalize it. Mr. LeBlanc testified that it would take about a year to complete this entire process including obtaining ministerial approval and releasing the policy. In addition to internal discussions that have taken place, provincial and territorial officials at the director level and fisheries ministers were briefed on modernization of the 1986 Habitat Policy in 2008.<sup>131</sup>

DFO witnesses were asked what should be changed or retained in a revised habitat policy. All agreed that the policy should or could be updated, but they also said that the No Net Loss principle must be retained.<sup>132</sup> Mr. LeBlanc felt that a revised policy should reference legislation introduced since 1986, such as the *Canadian Environmental Assessment Act* and the *Species at Risk Act*, as well as the duty to consult Aboriginal peoples. The ideas of an ecosystem-based approach and results-based regulation should also be included in the policy where DFO would “move away from individual, although not eliminate” project review. Mr. LeBlanc also mentioned the possibility of identifying priority habitats. He described the 1986 Habitat Policy as a “framework policy” that needs a set of other principles setting out who (such as provinces, territories, conservation groups, or industry) is best placed to deliver some of the functions that have to be carried out. This set of principles would include a principle of accountability and mechanisms to

audit for accountability. Finally, he testified that, since 1986, a series of operational policies has been developed that “hang from” the 1986 Habitat Policy, and therefore the policy should be aligned with these.<sup>133</sup>

Mr. Hwang said that the hierarchy of preferences for achieving No Net Loss in the 1986 Habitat Policy are at times restrictive and can result in a compensation option that is not necessarily as useful as other measures. He suggested that a change to the 1986 Habitat Policy to allow Habitat Management Program staff the discretion to choose the most effective offset would be useful. However, he cautioned that a revised 1986 Habitat Policy should not “lower the bar for habitat protection” because “a strong policy is very, very helpful in terms of trying to carry that forward operationally.”<sup>134</sup>

Ms. Reid spoke to the need for more operational direction in the policy about how decisions should be made on mitigation or compensation measures and how to balance conservation and economics. She also suggested that strengthening the partnership aspects, whether with local or provincial governments or First Nations, would be helpful.<sup>135</sup>

I also heard from Susan Farlinger, regional director general, Pacific Region, that part of the renewal of the 1986 Habitat Policy is about figuring out how to measure and report back on implementation and demonstrate that DFO is protecting habitat.<sup>136</sup> She did not explain how this would be done in a renewed version of the policy.

In response to the 2009 CESD report, DFO committed to determine by March 2010 what actions were required to fully implement the 1986 Habitat Policy.<sup>137</sup> When asked in September 2011 why this determination has still not been made, Ms. Dansereau testified that it is a big task and it was overly optimistic for DFO to think that it could have been done by 2010. She said that by “this time next year” DFO hopes to have a “new Habitat Policy.”<sup>138</sup> I note that the Commissioner of Environment and Sustainable Development did not recommend DFO revise its Habitat Policy.

## The Habitat Management Program referral process

Once DFO receives a proposed project (or “habitat referral”) it assesses the project information and, if necessary, visits the site.<sup>139</sup> DFO decides whether the proposed project is likely to result in a net loss of productive habitat capacity and may decide to:

- 1 permit the proposal to proceed as proposed (no harm expected to fish habitat);
- 2 reject the proposal (potential harm to fish habitat judged unacceptable); or
- 3 permit the proposal to proceed with conditions aimed at achieving No Net Loss. Conditions may relate to either mitigation (actions taken during planning, construction and operation stages to alleviate potential adverse effects on the productive capacity of fish habitats) or to compensation.<sup>140</sup>

DFO has characterized its regulatory role as providing either advice or *Fisheries Act* section 35 authorizations, which may allow the HADD that a proposed project will cause.\* DFO’s Habitat Management Program is largely focused on ensuring compliance with the prohibition against HADDs in subsection 35(1) of the Act and other statutory provisions.<sup>141</sup> Under the *Fisheries Act*, development proponents are not required to seek advice, authorization, or approval from DFO for their proposed projects, but they are prohibited from conducting work that causes a HADD without authorization from DFO. Therefore, if they do not receive DFO approval they run the risk of prosecution under section 35.<sup>142</sup> I note that, at the time of the hearings, under the CEAA a proposed project may require an environmental assessment by DFO before it can proceed, and this is discussed further below. In practice, many projects cannot proceed without harming fish habitat. Consequently, since 1986, DFO has authorized many harmful impacts to fish habitat on the permit condition that proponents create or improve other habitat to compensate for loss in habitat productivity.<sup>143</sup>

\* On June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. Part 3, Division 5, amends the *Fisheries Act* in a way that will likely change the way DFO manages fish habitat. In Volume 3, Chapter 3, Legislative amendments, I address the potential implications of the legislative changes in light of the evidence, findings, and recommendations arising from the Commission’s hearings.

DFO uses a “risk management approach” to determine whether a HADD is likely to result from a project, and to determine the extent of DFO’s regulatory engagement (see below). This approach is guided by the *Practitioners Guide to the Risk Management Framework* (Risk Management Framework), as well as a set of standard operating policies.

Most of the policies that guide the Habitat Management Program’s regulatory work are encapsulated in the Habitat Management Program’s Standard Operating Policies Manual (Manual). The Manual is a reference guide to direct DFO Habitat Management Program staff on the day-to-day delivery of DFO’s responsibilities under the habitat protection provisions of the *Fisheries Act*, CEEA, and SARA.<sup>144</sup> It contains policies of uniform national application, but DFO regional offices may supplement the national standard operating policies with policies specific to the region.<sup>145</sup> The Manual is a “living document” that DFO Habitat Management Program staff are responsible for updating when new or revised policies become available.<sup>146</sup>

### ***Risk Management Framework***

The *Practitioners Guide to the Risk Management Framework* is used by staff reviewing habitat referrals. It has three components: aquatic effects assessment, risk assessment, and risk management.<sup>147</sup> These components each comprise a series of discrete steps in the overall process by which staff are directed to review development proposals. Before applying the Risk Management Framework, OHEB staff must do the following:

- check if an operational statement (discussed below) can be applied and, if there is an applicable one, then no further assessment is required;
- ensure that there is sufficient information to determine whether the habitat protection provisions of the *Fisheries Act* apply; and
- ensure that there is fish habitat within the area of the development proposal.

The first stage of the Risk Management Framework is an aquatic effects assessment. Aquatic effects assessment is a means of identifying the potential effects on fish and fish habitat from a proposed project. The second stage of the

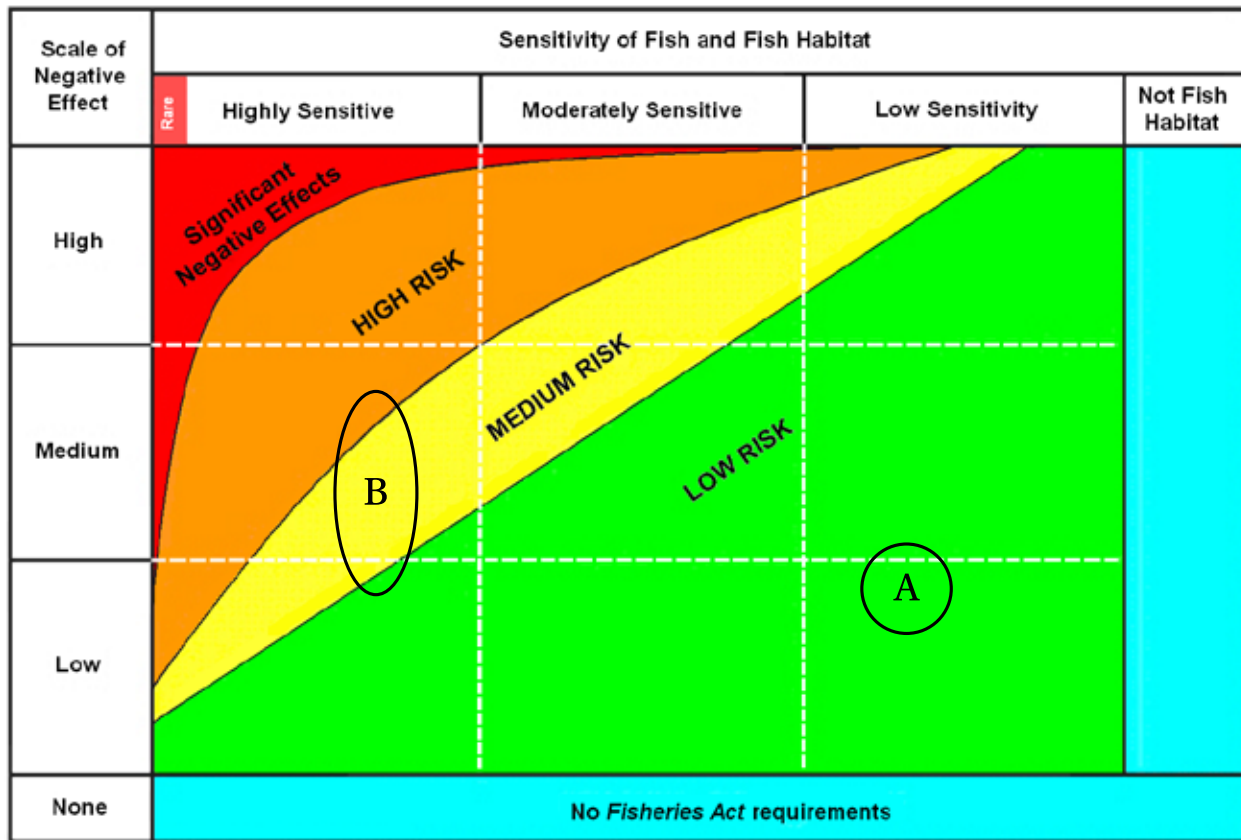
Risk Management Framework is risk assessment. Risk assessment involves determining the scale of negative effect and the sensitivity of fish and fish habitat, and using this information to characterize the level of risk the development proposal poses to the productive capacity of fish habitat.<sup>148</sup>

Habitat Management Program staff then use the analyses to plot a point on the Risk Assessment Matrix. The matrix is divided into four categories: low risk, medium risk, high risk, and significant negative effects. Figure 1.6.2 shows two points, representing hypothetical proposed projects, plotted on the Risk Assessment Matrix. Uncertainty is taken into account by changing the circle into an oval.<sup>149</sup>

The final stage of the Risk Management Framework involves determining how best to manage the risk identified by stages 1 and 2. The two most common risk management tools are: (1) letters advising proponents of their obligations to protect fish habitat and of the means to do so (generally for projects deemed “low risk”), and (2) *Fisheries Act* authorizations that include conditions for monitoring, compensation, and possibly even providing financial security.<sup>150</sup>

Authorizations are statutory approvals issued pursuant to subsection 35(2) that permit otherwise prohibited impacts to fish and fish habitat. They give the proponent protection from prosecution pursuant to section 32 and subsection 35(1), provided the proponent complies with the conditions of the authorization.<sup>151</sup> For project proposals deemed “high risk,” the Risk Management Framework states that a site-specific review and authorization under subsection 35(2) are required. However, instead of a formal section 35 authorization, for projects deemed “medium risk,” a standardized authorization process is recommended.<sup>152</sup> The Risk Management Framework suggests that these works are usually routine in nature, with small-scale or temporary effects. If a project falls in this medium-risk category and a streamlined authorization process has not been established, then a site-specific authorization would be required.<sup>153</sup>

Proposed developments with significant negative effects are those in which the residual effects are so large and/or the fish or fish habitat is of such importance that it cannot be compensated adequately. In this case, Habitat Management Program staff are directed to issue a letter advising that the project will result in an unacceptable HADD; the letter



**Figure 1.6.2 Risk Assessment Matrix with two plotted points representing two different proposed projects**

Source: Policy and Practice Report 8, Habitat Management, p. 36, reproduced from Exhibit 1624, p. 18.

outlines the rationale for this conclusion. A proposal in this category will likely be considered a “major project” by the Habitat Management Program; as such, it would be managed by the regional manager, Environmental Assessments and Major Projects, with guidance from national headquarters.<sup>154</sup>

***Pacific Region referral management and prioritization***

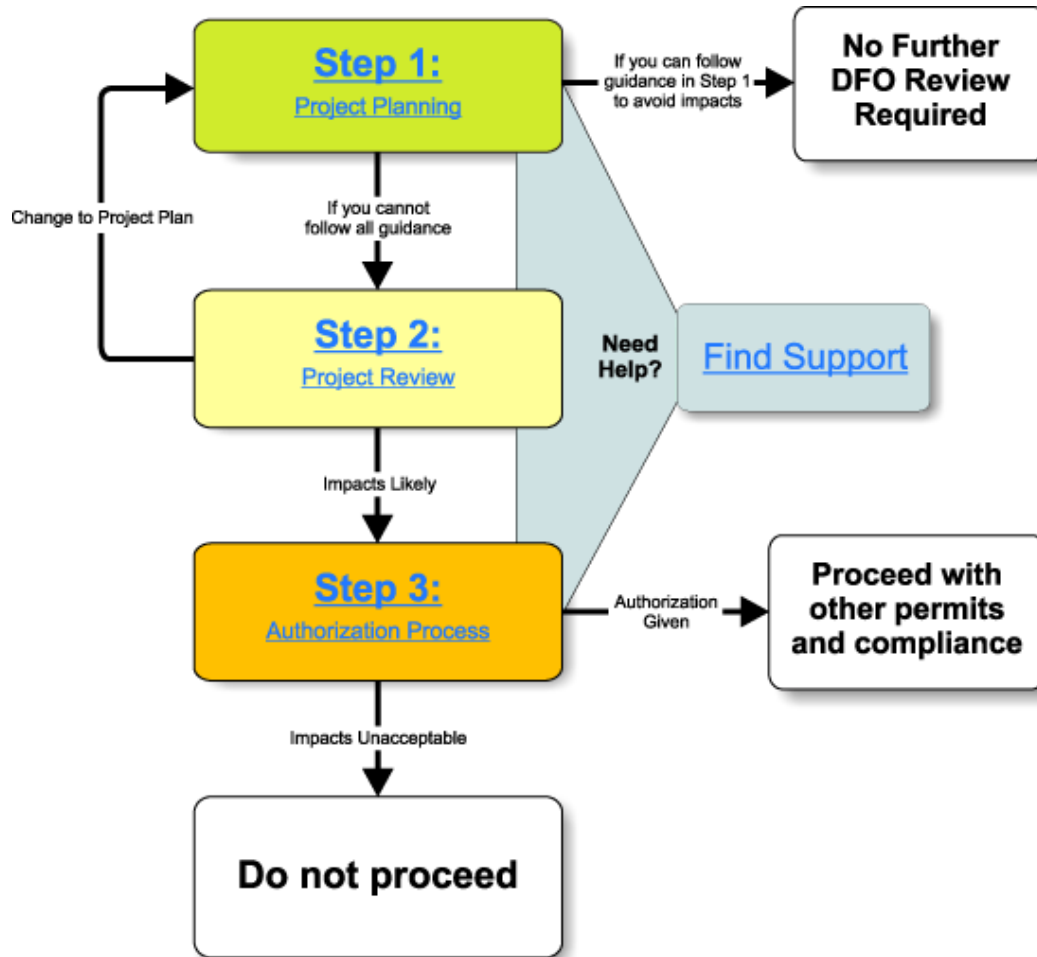
The Pacific Region has developed a Regional Habitat Regulatory Decision Framework (Regional Regulatory Framework). The region characterizes it as “complementary to, and consistent with” the national Risk Management Framework.<sup>155</sup> It is intended to further categorize and prioritize development proposals submitted for regulatory review.<sup>156</sup> It does not address major projects, which are managed by environmental assessments and major projects staff, as discussed below.

DFO’s national Habitat Management webpage “Working Near Water” and its Pacific Region counterpart “Working Near Water in BC and Yukon” guide proponents through the habitat referral process.<sup>157</sup> An overview diagram from the Pacific webpage is provided in Figure 1.6.3.

Non-reviewable projects, according to the Regional Regulatory Framework, are those that are considered low risk or for which mitigation measures, if complied with, would prevent a HADD. These include activities covered by operational statements (see below), as well as various works and projects the Regional Regulatory Framework considers low risk. There are also a number of “optionally reviewable” projects which cover activities for which there are best management practices (see below).<sup>158</sup>

The Regional Regulatory Framework lists three additional categories of proposed projects that do not require DFO review:





**Figure 1.6.3 An overview of the project review process in the Pacific Region**

Source: Policy and Practice Report 8, Habitat Management, p. 43, citing DFO Pacific website <http://www.pac.dfo-mpo.gc.ca/habitat/know-savoir-eng.htm>.

- 1 projects another level of government or agency has agreed to review and to which it will apply mitigation measures acceptable to DFO;
- 2 projects for which DFO has an agreement or arrangement with a specific industry sector, Crown corporation, or other partner to apply an “approved work practice” acceptable to DFO, monitor compliance, and report; and
- 3 projects for which measures acceptable to DFO for protection of fish habitat have been incorporated into a water, land, estuary, or foreshore management plan and will become conditions of a regulatory permit, licence, order, lease, approval, or operational protocol applied by a partner agency or Crown corporation.<sup>159</sup>

The Regional Regulatory Framework directs Habitat Management Program staff to process referrals in order of priority. Only first and second priority proposals *must* be reviewed. The first priorities for review are emergencies that represent immediate threats to fish and fish habitat, and established Government of Canada priorities. Government of Canada priorities are federally funded infrastructure projects.<sup>160</sup> Priorities two through four are based on scores determined by four project prioritization criteria:

- 1 relative risk, which is based on the risk assessment attributes of the national Risk Management Framework (effect severity and habitat / species sensitivity);
- 2 obligatory reviews and time sensitivity;

- 3 species or area conservation concerns, including those arising from the Departmental Salmon Stock Outlook, Marine Protected Areas, and SARA; and
- 4 regional and area priorities, which may include particular industries or activities.<sup>161</sup>

### ***Operational statements and best management practices***

Many low-risk projects are never considered under the Risk Assessment Matrix (see above, including Figure 1.6.2) because DFO has implemented a number of activity-specific operational statements intended for low-risk projects, which outline conditions and measures for avoiding impacts on fish habitat. Each operational statement is specific to a type of development project or work, such as clear-span bridges, small moorings, or aquatic vegetation removal in lakes. Operational statements tell proponents that, if they follow the specified procedures for a specific activity, DFO will deem proponents as not causing a HADD. A proponent who complies with an operational statement does not have to submit a proposal for review by DFO, and no notice of the activities is required. However, proponents are encouraged to notify DFO. In the Pacific Region, notification is not considered a referral unless the proponent advises it cannot comply with the mitigation measures found in the guidance tools.<sup>162</sup>

Although there is a national set of operational statements, not all apply in all regions. Each region is able to add, delete, or modify operational statements through an administrative process.<sup>163</sup> Proponents can also avoid DFO review by following other guidelines. Best management practice documents provide guidance on how best to conduct specific activities in a manner that meets DFO program objectives; many are produced by the province, some are co-authored by DFO and the province, and some are borrowed from other jurisdictions.\* DFO provides best management practices to proponents of specific development activities and tells them to contact DFO if they cannot follow the best management practices.<sup>164</sup> If the proponent can follow the guidelines and avoid harm to fish and fish habitat, DFO does not review the project.<sup>165</sup>

\* For an example of a best management practice, see Exhibit 1002.

### ***Environmental Process Modernization Plan***

In 2004, the department initiated the Environmental Process Modernization Plan (EPMP).<sup>166</sup> The EPMP was launched to align delivery of Habitat Management Program responsibilities with government-wide priorities such as expenditure review, smart regulation, sustainable development, and ministerial and departmental priorities such as the Departmental Assessment and Alignment Project. It also responded to demands: by industry for greater certainty, clarity, consistency, predictability, and timeliness in regulatory reviews and environmental assessments; by provinces and territories for improved coordination with their regulatory and environmental assessment process; by environmental and conservation groups demanding stricter application of the *Fisheries Act* and SARA and broader application of the CEAA; and by Aboriginals and stakeholders for greater involvement in regulatory decisions and environmental assessments.<sup>167</sup> Mr. LeBlanc described it as an improvement initiative:

EPMP was one of several continuous improvement initiatives that we undertook to make the [Habitat Management] program more effective, more transparent, predictable, timely and coherent in the decision-making process, and also to engage others in terms of delivery of the protection of fish habitat.<sup>168</sup>

The EPMP initially comprised five elements:

- 1 a Risk Management Framework (described above);
- 2 streamlined regulatory reviews of low-risk activities (i.e., referrals; described above);
- 3 improved coherence and predictability;
- 4 improved management of environmental assessments and major projects (described below); and
- 5 strengthened partnering arrangements.<sup>169</sup>

In late 2005, a sixth element was added – Habitat Compliance Modernization.<sup>170</sup> Although many of the intended elements of EPMP have now been

implemented, some – such as Habitat Compliance Modernization – are not yet fully in place.<sup>171</sup>

The focus of the second element, streamlining regulatory reviews, was the development of operational statements. A key component of the third element was the development of a Standard Operating Policies Manual, originally released in May 2006. Other strategies to improve coherence and predictability included the development of a mandatory training program for all Habitat Management Program staff and changes to the program’s governance structure.<sup>172</sup>

The fourth element sought to bring a new approach to environmental assessments and the review of major projects. Resources were allocated to dedicated national and regional units that would focus on environmental assessments of major projects, and policies were established related to DFO’s duties under the CEEA. Under this element, senior management became more involved in decision making with respect to both *Fisheries Act* and CEEA decisions for major projects (see below).<sup>173</sup>

The strengthening of partnerships element sought to engage aggregate industry groups, non-government organizations, First Nations, and provincial and local governments in habitat protection.<sup>174</sup>

The sixth and final element of EPMP, Habitat Compliance Modernization, aimed to build a nationally coherent, strategic, balanced, risk-based, and integrated approach to promote, assist, and compel compliance with habitat protection provisions of the Act. It also aimed to clarify the roles, responsibilities, and accountabilities of both the Habitat Management Program and the Conservation and Protection Program regarding habitat compliance activities and decisions through the implementation of a National Habitat Compliance Protocol and annexes (this protocol is also discussed in Chapter 7, Enforcement). Finally, Habitat Compliance Modernization was intended to enable the Habitat Management Program to monitor for compliance with, and effectiveness of, approved measures to mitigate impacts on fish and fish habitat and compensate for loss of fish habitat, as well as allow DFO to confirm compliance with the habitat protection provisions of the Act.<sup>175</sup>

About the same time as the EPMP was introduced, resources for the Habitat Management Program were reduced. In June 2005, DFO

announced it would cut 42 Habitat Management Program positions, including 10 positions in the Pacific Region.<sup>176</sup> According to Mr. Crowe, this reduction was due to the Expenditure Review Committee process, EPMP, and the loss of B-based funding from “sunset” programs like the Habitat Conservation and Stewardship Program (see section below on habitat enhancement and restoration for more about this program).<sup>177</sup> In the BC Interior office, for example, 20 full-time equivalent habitat staff were reduced to eight.<sup>178</sup> However, according to Mr. Hwang, an expansion period between 1999 and 2005 saw quite a few staff added to the Habitat Management Program, which was followed by the staff cuts beginning in 2005. Thus, the numbers of BC Interior OHEB Habitat Management Program staff are now roughly the same as when Mr. Hwang first started with DFO in the BC Interior office in 1999.<sup>179</sup>

### ***Effect of budget reductions and streamlining processes on the Habitat Management Program in the BC Interior and Lower Fraser areas***

In the 2000s, the province indicated to DFO’s Habitat Management Program that it would no longer be actively reviewing individual proposed projects and would instead be moving to a “results-based approach,” which provides standards and guidance documents and has no active involvement in project review or environmental review committees. (Environmental review committees were DFO partnerships with local governments, often with provincial involvement, which would coordinate reviews and comments on proposed development projects.) According to DFO habitat managers, the initial impact on the department in the BC Interior and Lower Fraser was an increase in referrals; in response, DFO put in place streamlining measures so that proponents could “avoid impacts and therefore avoid the need for us to review their work.”<sup>180</sup>

When the EPMP was introduced in 2004, Habitat Management Program staff in the Pacific Region expressed concern over specific aspects of the plan.<sup>181</sup> A Pacific Region internal review or “diagnostic” observed in 2007 that Pacific Region Habitat Management Program staff felt that DFO was allowing significant habitat loss under the EPMP and not serving Canadians as it should.<sup>182</sup> Barriers to staff’s acceptance of the EPMP included

a lack of success indicators, not seeing the benefits or values of the EPMP, conflicts with personal values, and a perception that the EPMP was lowering the bar for habitat protection.<sup>183</sup> Ms. Reid spoke about the results of this review and said that, although some valid concerns were raised by staff, the various elements of EPMP are now successfully implemented in the region and the level of staff concern has gone down significantly.<sup>184</sup>

A July 2007 internal DFO memorandum written by Mr. Hwang describes a number of key issues for the BC Interior Habitat Management Program staff at that time.<sup>185</sup> The memo indicates that the EPMP and staff reductions had reduced BC Interior staff's ability to engage with proponents of proposed projects; had resulted in a "regulatory minimum," which was not as favourable for fish habitat as under the previous regime; and meant that staff did not have a handle on what was going on with projects. Mr. Hwang confirmed that the latter issue still exists.<sup>186</sup> Two other DFO habitat managers, Mr. Crowe and Corino Salomi, area manager, OHEB, Lower Fraser, said that this memo for the most part reflected their views at this time.<sup>187</sup>

A January 2007 internal DFO memo written by Mr. Crowe summarizes the changes and challenges for Habitat Management Program staff in the BC Interior office as a result of staff reductions. Mr. Crowe testified that, with the exception of a couple of changes for the better, such as DFO involvement in a local government foreshore planning initiative (Shuswap Lake Integrated Planning Process, see section below on freshwater habitat) and the province re-engaging in HADD management in resident fish-bearing waters, the situation in the BC Interior office is still substantively the same as set out in this memo.<sup>188</sup>

Mr. Crowe and Mr. Salomi told me that changes in staffing and the implementation of the EPMP have resulted in a greater reliance by Habitat Management Program staff on streamlining processes such as provincial best management practices and federal operational statements. Also, the BC Interior office developed operational principles to determine the resources required to deliver on program priorities and triage the workload. In the Lower Fraser area, DFO encouraged local governments to adopt similar standards to the 1992 Land Development Guidelines within their bylaws, which a number of municipalities did. Further, DFO

participates in project review and assessment with the provincial and regional governments as part of the Fraser River Estuary Management Program.<sup>189</sup>

Under the EPMP and DFO's Risk Management Framework, the department reviews fewer projects than it did prior to the EPMP.<sup>190</sup> I heard DFO witnesses say that one result of the EPMP's streamlining and voluntary reporting regime has been the screening out of a number of small projects from DFO's review process.<sup>191</sup> But Mr. Hwang did not agree with the proposition put to him that the "vast majority" of small projects are not assessed by DFO.<sup>192</sup> He also said that some guidelines and best practices were in place before the introduction of the EPMP, and that the EPMP put these into a national context, took a few more activities off DFO's plate, and created a situation in which DFO does not have a regulatory awareness of these activities anymore.<sup>193</sup>

One concern with the EPMP is that projects framed as "low risk" may result in small but cumulatively significant habitat impacts. Removing these projects from DFO review means less opportunity for DFO to influence them in a way that would be positive for fish and fish habitat.<sup>194</sup> Mr. Hwang was asked whether there is an inconsistency between the EPMP's focus on medium- to high-risk projects and a concern about cumulative impacts. He answered that he would not necessarily frame it as an inconsistency because the rationale for a risk management approach is tied directly to the most effective use of the resources that you have at your disposal. If you have fixed resources and you only go after smaller projects, Mr. Hwang explained, then you are making a trade-off against reviewing the more significant or substantive things. The cost of having fixed resources is that the smaller, lower-risk projects are not getting the degree of oversight or scrutiny that a government could apply.<sup>195</sup>

Ms. Reid commented that DFO cannot "do it all" and so the EPMP, the 1986 Habitat Policy, and other strategies that are in place reflect DFO allocating time and energy given its resources. According to her, in the Pacific Region, DFO made an explicit decision to not spend all of its time and energy on the project review process, but to focus also on stewardship and partnership; she noted that watershed planning is an important element of protecting habitat and addressing cumulative impacts.<sup>196</sup>

Ms. Farlinger told me that new development activity arises constantly; it is therefore a “balancing” process to adjust the system so that the required monitoring is done and proponents meet the required standards, rather than each and every proposed project being monitored or audited by a habitat biologist.<sup>197</sup> Mr. Bevan similarly spoke about the increase in workload for the Habitat Management Program because of the increase in projects. In his view, DFO needs to do less specific project review and instead have standards in place that proponents can follow to comply with the *Fisheries Act*; DFO then could do more monitoring to ensure that the standards are being met.<sup>198</sup>

Because a proponent who complies with an operational statement does not have to submit a proposal for review by DFO, DFO does not have a good sense of what proportion of projects are operating outside the voluntary referral process.<sup>199</sup> DFO conducts some monitoring for compliance with operational statements through the Habitat Compliance Modernization program, but Mr. Crowe said that, because notifications are voluntary, monitoring would primarily be of people who are more likely to be compliant.<sup>200</sup> Mr. Nelson suggested that some kind of formal audit process for operational statements would improve habitat protection. Mr. Steele agreed with his suggestion.<sup>201</sup>

Although operational statements are intended to apply to low-risk activities, DFO witnesses testified that some activities are not actually low risk and using the operational statement contributes to incremental harm.<sup>202</sup> Mr. Salomi explained how some activities can be low impact in certain circumstances but, in other circumstances, for instance when they are undertaken in areas with significant existing development, he would not categorize these activities as low risk.<sup>203</sup> Another challenge I heard about the use of operational statements is that it allows for the avoidance of comprehensive planning in an area because each activity is only considered independently; whereas, in the past, when a proponent asked if an authorization was required, DFO could encourage the proponent

and/or local governments to do more comprehensive planning of multiple projects.<sup>204</sup>

Mr. Crowe also told me that DFO does not do compliance monitoring of best management practices because there are no resources for this monitoring and the activities to which best management practices apply are considered relatively low risk.<sup>205</sup>

## Environmental assessment

The *Canadian Environmental Assessment Act*\* is intended “to ensure that projects are considered in a careful and precautionary manner before federal authorities take action in connection with them, in order to ensure that such projects do not cause significant adverse environmental effects.”<sup>206</sup> The CEAA is implemented by many federal departments and agencies, including DFO, Natural Resources Canada, Environment Canada, Indian and Northern Affairs, Health Canada, and the National Energy Board, to name just a few. These departments may act as “responsible authorities” under the CEAA and be responsible for the environmental assessment of proposed development projects.

A similar provincial act, the *BC Environmental Assessment Act*, may concurrently review projects requiring CEAA review that may impact Fraser River sockeye habitat.<sup>207</sup> The *BC Environmental Assessment Act* applies to reviewable projects as defined by the Lieutenant Governor in Council, as well as other projects in limited circumstances.<sup>208</sup> Reviewable projects include mines, energy, water management (dams, dikes, water diversion projects, groundwater extraction projects, and shoreline modification projects), waste disposal, food processing, transportation (public highways, railways, ferry terminals, marine port facilities, and airports), and tourist destination resort projects (marine resorts, golf resorts, ski resorts, and other resort developments).<sup>209</sup>

Where DFO may issue a licence or permit that authorizes a project, in whole or in part, under a provision listed in the *Law List Regulations*<sup>210</sup> – such as subsection 35(2) of the *Fisheries Act* – DFO

\* On June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. Part 3, Division 1, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012), and repeals the CEAA. A summary of the CEAA, 2012, is set out in Volume 3, Chapter 3, Legislative amendments, where I also address the potential implications of the proposed legislative changes in light of the evidence, findings, and recommendations arising from the Commission’s hearings.

becomes responsible for the assessment of that project as a “responsible authority.”<sup>211</sup> A number of other *Fisheries Act* provisions related to the Habitat Management Program are also listed on the *Law List Regulations*.<sup>\*</sup> The CEAA is also triggered where DFO is the proponent of a project, or where it provides land or funding for a project.<sup>212</sup> There may be more than one responsible authority for any given environmental assessment under the CEAA. Where this is the case, the responsible authorities determine together the manner in which they will exercise their powers and duties.<sup>213</sup>

Projects are statutorily exempted from a CEAA assessment if they are listed on the *Exclusion List Regulations, 2007*, if they are undertaken in response to an emergency, or if they are a class of infrastructure project set out by schedule and funded by various federal governmental funding programs.<sup>214</sup>

There are four levels or types of assessment under the CEAA: screening, comprehensive study, review panel (or joint review panel), and mediation.<sup>215</sup> As a responsible authority, DFO does not “approve” a project under the CEAA. Rather, in a screening, DFO reaches a conclusion about the likelihood of significant adverse environmental effects and determines whether permits may be issued (this is called a “course of action decision”).<sup>216</sup> In a comprehensive study for which DFO is a responsible authority, after the Canadian Environmental Assessment Agency conducts the assessment and the minister of the environment issues a decision statement, DFO must decide on a course of action under subsection 37(1).<sup>†</sup> DFO is also responsible, at the conclusion of a comprehensive study, for ensuring the implementation of mitigation measures.<sup>217</sup>

After a CEAA assessment, DFO must decide whether to exercise its regulatory authority under the *Fisheries Act*. For example, it must decide whether to issue a HADD authorization under subsection 35(2) and, if it does, on what conditions, taking into account mitigation measures considered in the CEAA assessment. DFO is not permitted

to issue any authorization or permit until the assessment is concluded.<sup>218</sup> Finally, at the end of a CEAA assessment, DFO may also be required to design and implement a follow-up program. Such a program may include monitoring; it is intended to verify the accuracy of the assessment and determine the effectiveness of mitigation measures.<sup>219</sup>

In the Pacific Region, OHEB is generally responsible for conducting assessments for which DFO is a responsible authority. Regional headquarters is focused primarily on major projects through its Environmental Assessments and Major Projects division. Responsibility for conducting CEAA assessments of project proposals that are not major projects lies primarily with area offices.<sup>220</sup>

Public participation is not mandatory in a CEAA screening. Rather, as a responsible authority, DFO may choose to include and facilitate public participation in its screening-level assessments.<sup>221</sup> The CEAA Guide: Applying the *Canadian Environmental Assessment Act* for the Fish Habitat Management Program (Habitat Management Program’s 2001 CEAA Guide)<sup>‡</sup> states that “[the Habitat Management Program] is strongly committed to addressing public concerns in EA [environmental assessment].” At the Commission’s request, the department reviewed the Program Activity Tracking for Habitat (PATH) database to confirm the number and percentage of CEAA screenings in British Columbia in the last five years, for which it, as a responsible authority, allowed public participation pursuant to section 18 of the CEAA. Since January 1, 2005, as a responsible authority in 296 screenings under the CEAA, it had not allowed public participation for any project proposed for the Fraser River basin.<sup>222</sup>

## Habitat monitoring

Habitat monitoring is an essential tool to determine whether No Net Loss is being achieved.<sup>223</sup> Staff of the Pacific Region Habitat Management

\* Other provisions listed in the *Law List Regulations* that trigger the application of the CEAA, which are relevant to DFO’s Habitat Management Program, are ss. 22(1), 22(2), 22(3), 32, 37(2), and 36(5)(a)-(e). The regulation made pursuant to those paragraphs contains a provision that limits the application of the regulation to a named site.

† DFO also has responsibilities under ss. 37(1.1) and (1.3) for considering and, with the approval of cabinet, responding to a mediator or review panel’s report.

‡ In 2001, Habitat Management Program released the Habitat Management Program’s 2001 CEAA Guide. It is intended for internal use and is not currently available online.

Program are responsible for habitat monitoring activities. As described below, there is a Habitat Monitoring Unit (HMU), but other staff also participate in monitoring. The Pacific Region Habitat Management Program has set a goal of 20 percent of non-Habitat Monitoring Unit staff time for monitoring activities.<sup>224</sup> However, according to Mr. Carter, approximately 5 percent is the best estimate of time actually spent monitoring by staff who are not in the HMU.<sup>225</sup>

The Habitat Management Program distinguishes among three categories of habitat monitoring: compliance monitoring, effectiveness monitoring, and fish habitat health monitoring.<sup>226</sup> *Compliance monitoring* involves DFO staff ensuring that proponents comply with any conditions of authorizations or orders and that developments conform to any advice aimed at avoiding negative effects to fish and fish habitat. These factors can be determined by collecting data through site visits or by obtaining reports from the proponent or a third party, which may be a condition of the HADD authorization.<sup>227</sup> Identifying areas for improvement in management systems or areas of risk is another part of compliance monitoring.<sup>228</sup> *Effectiveness monitoring* involves verifying that mitigation and compensation measures effectively achieve their intended outcomes.<sup>229</sup> *Fish habitat health monitoring* is “ecosystem-level” monitoring to measure the effects of development activities on fish habitat when those effects are not clearly known in advance, to establish baseline conditions within a watershed, and to determine the cumulative effects of multiple works or undertakings on productive capacity of fish habitat and the health of the aquatic system.<sup>230</sup> Fish habitat health monitoring is sometimes referred to as “aquatic health monitoring,” “ecosystem monitoring,” or “effects monitoring.” This type of monitoring is akin to WSP Strategy 2 monitoring.<sup>231</sup>

The Habitat Management Program does compliance monitoring. The program is only at the early stages of work on effectiveness monitoring, and it does not yet do any fish habitat health monitoring. Mr. Carter testified that nationally, within DFO, there is recognition that there will be a stepwise rollout of monitoring, beginning with compliance monitoring; effectiveness monitoring and fish habitat health monitoring will then come with time.<sup>232</sup>

As discussed above, Habitat Compliance Modernization is the sixth element of the EPMP. It was intended to develop a nationally coherent, risk-based approach to compliance with the habitat protection provisions of the Act.<sup>233</sup> There are three components: (1) Habitat Compliance Decision Framework; (2) National Habitat Compliance Protocol between the Habitat Management Program and the Conservation and Protection Directorate; and (3) habitat monitoring.<sup>234</sup>

The first component to habitat modernization, the Habitat Compliance Decision Framework (Compliance Framework) is, according to DFO, the development of an integrated, risk-based, nationally coherent approach to habitat compliance management. The Compliance Framework is found in the Standard Operating Policies Manual. It provides guidance to Habitat Management Program staff in assessing compliance risks, making compliance decisions, and providing a rationale for those decisions.<sup>235</sup> It also provides guidance to Conservation and Protection staff.<sup>236</sup> The Compliance Framework focuses solely on compliance monitoring and responding to situations of potential non-compliance. It divides compliance monitoring into two broad categories: (1) monitoring of reviewed works or undertakings (those that have been through the referral process, including those where an operational statement applies); and (2) monitoring of works or undertakings that have not been reviewed.<sup>237</sup>

The second component of Habitat Compliance Modernization, the National Habitat Compliance Protocol, is to clarify the roles, responsibilities, and accountabilities of both the Habitat Management Program and Conservation and Protection. The National Habitat Compliance Protocol between the Habitat Management Program and the Conservation and Protection Directorate was signed in January 2007.<sup>238</sup> The 2007 protocol was replaced in 2010 by a similar agreement (Compliance Protocol).<sup>239</sup>

The Compliance Protocol establishes “lead” and “support” roles for the Habitat Management Program and Conservation and Protection. The Habitat Management Program leads in:

- identifying habitat compliance promotion, monitoring, and management priorities, and integrating these priorities into Habitat Management Program work plans;

- educating, training, partnering agreements, and stewardship to promote compliance;
- habitat compliance monitoring;
- determining risk to fish and fish habitat based on the compliance risk assessment in the Compliance Protocol;
- determining the level of compliance risk;
- conducting activities aimed at voluntary restoration in response to lower-risk compliance issues;
- making recommendations to prosecute and follow up monitoring on compliance issues; and
- gathering, tracking, and maintaining information related to compliance promotion, monitoring, occurrences,\* and responses through the national PATH database.<sup>240</sup>

Mr. LeBlanc succinctly summed up the division of responsibilities as follows:

First and foremost, they're shared. And in some cases, there's a lead with Habitat and then a lead with Conservation Protection. The lead in the monitoring and auditing function is with the Habitat program. The determination of risk associated with the non-compliance is joint work. And where there is an enforcement action to be taken based on a decision to proceed with the prosecution and conservation and protection, the Fishery officer take[s] the lead with the support of Habitat biologists or staff.<sup>241</sup>

Because of the division of responsibilities set out in the Compliance Protocol, Habitat Management Program staff are no longer designated as inspectors.<sup>242</sup> Instead they are designated as fishery guardians with limited powers, while Conservation and Protection fishery officers are designated as inspectors (for further discussion, see Chapter 7, Enforcement). This change means that Habitat Management Program staff can no longer write up an inspector's direction ordering work to be stopped if a violation is occurring; rather, they must call on a fishery officer to do so.<sup>243</sup>

The Compliance Protocol contemplates that revised regional operational protocols will be

developed between the Habitat Management Program and Conservation and Protection "to reflect the operating environment and operational needs unique to each region."<sup>244</sup> According to Mr. Nelson, initial discussions have occurred in the Pacific Region about developing this new protocol.<sup>245</sup>

The third and final component of Habitat Compliance Modernization involves strengthening the Habitat Management Program's capacity to conduct habitat monitoring. DFO addressed this goal by creating a Habitat Monitoring Unit with approximately 12 habitat monitoring positions in the Pacific Region. The positions consist of monitoring biologists and technicians, integrated with each of the area offices, and a regional team leader, habitat monitoring, at regional headquarters. The regional team leader (at the time of the hearings in April 2011, Mr. Carter) reports directly to the regional director, OHEB, and functionally to the national monitoring coordinator. The HMU was not fully staffed until the spring/summer of 2009 although Habitat Compliance Modernization was introduced in 2006. Mr. Carter explained the delay was owing to other OHEB staffing changes from 2007 onward, the need to develop staffing plans, and the need to create positions before staffing could occur.<sup>246</sup>

At the national level, a working group made up of regional team leaders for habitat monitoring from all of the regions (the National Monitoring Team Leaders Working Group) develops national standards and works on national implementation of monitoring. DFO has not finalized a national habitat monitoring strategy. Mr. Carter testified that a certain amount of national direction would be useful and helpful, but that you need to be able to tailor your program to specific regional circumstances, and therefore, an overly prescriptive national strategy could be difficult. There has also been a "tremendous amount of flexibility offered" to the regions, and the reality is that monitoring is a regional initiative being rolled out somewhat differently in different regions.<sup>247</sup>

The Pacific Region has developed a Habitat Monitoring Framework for itself that, as of April 2011, was near to final but still in draft. It lays out goals, objectives, priorities, and how and why

\* An occurrence is "an observed or reported incident which is a potential violation of a statute or regulation"; occurrence screening is defined as "the initial information gathering and risk assessment of occurrence management used to inform a response decision" (Exhibit 657, p. 3).



monitoring is to be done in the region. Mr. Carter told me that the primary goal is to increase the amount and quality of information available through compliance, effectiveness, and fish habitat health monitoring to support an improvement in current habitat management approaches, which is all in aid of meeting the 1986 Habitat Policy goal of avoiding or minimizing loss of fish habitat.<sup>248</sup>

### ***Compliance, effectiveness, and fish habitat health monitoring***

All three types of monitoring (compliance, effectiveness, and fish habitat health monitoring) are interdependent and, according to Mr. Carter, one is not more critical than the others for ensuring the sustainability of Fraser River sockeye salmon.<sup>249</sup>

The Habitat Management Program does some compliance monitoring on the regulatory tools that DFO uses – section 35 (HADD) authorizations, letters of advice, and operational statements where proponents provide notification. Typically, a HADD authorization includes conditions requiring a proponent to do some monitoring, but proponents do not normally have to do any monitoring when following a plan confirmed by a letter of advice or when following an operational statement or best management practice. Compliance monitoring is not a very strong surrogate for assessing whether there has been a loss or gain in the productive capacity of fish habitat. In its role in habitat enforcement, compliance monitoring identifies occurrences (circumstances where an unauthorized harm to fish habitat has occurred). HMU staff refer this information to the DFO area habitat biologist, and the biologist then works with Conservation and Protection staff to decide on the level of compliance risk and how to proceed.<sup>250</sup>

As noted above, the Habitat Management Program is not yet conducting effectiveness or fish habitat health monitoring.<sup>251</sup> To do effectiveness monitoring, according to Mr. Carter, it is “fairly key” to have baseline inventory information, including general inventory information about a watershed and baseline information in relation to a specific project. He described a few different methodologies that could be applied.<sup>252</sup> He explained that OHEB and DFO Science are working on building some of the tools needed to do this work. In his view, the stated DFO timeline for full

implementation of effectiveness monitoring by 2013 is ambitious.<sup>253</sup>

Regarding fish habitat health monitoring, there are a number of places where Habitat Management Program staff are collecting inventory information, which is part of this type of monitoring, and under the WSP there is some pilot work on evaluating the status or health of habitat. The latter work is not part of the current Habitat Compliance Modernization initiative, which is mainly looking at project-by-project monitoring. DFO Science is intended to be the lead in developing the methodology to do fish habitat health monitoring.<sup>254</sup> The Pacific Region Habitat Monitoring Framework says that DFO hopes to implement fish habitat health monitoring within five years from 2011.<sup>255</sup> Mr. Carter said that a lot more work would be needed to establish the methodologies to do this, but that a five-year timeline was not “necessarily unreasonable.”<sup>256</sup>

### ***Habitat monitoring since the 2009 CESD report***

In 2009, the Commissioner of the Environment and Sustainable Development (CESD) reported that DFO did not have a systematic approach to compliance monitoring. The CESD also found that proponents were carrying out the required monitoring in only six of 16 projects involving authorizations and one of 30 projects involving letters of advice.<sup>257</sup> After the CESD’s audit, DFO formed the Habitat Monitoring Unit. The first full field season of compliance monitoring by the HMU was 2010. Forty-two percent of sites monitored partially conformed to DFO’s advice on conditions required to protect fish habitat; 36 percent were in complete compliance. In the context of lessons learned from this field season, Mr. Carter stated that clear, specific, and measurable conditions are important to the success of compliance monitoring.<sup>258</sup>

The 2009 CESD report also recommended that DFO “accelerate the implementation of its Habitat Compliance Decision Framework to ensure that there is an adequate risk-based approach to monitoring projects and providing assurance that proponents are complying with the *Fisheries Act* and all terms and conditions of departmental decisions.” In response, DFO committed to implement the framework and report on the results of project monitoring activities by March 31, 2010,

and annually thereafter.<sup>259</sup> In April 2011, Mr. Carter testified that, regionally, DFO had not yet written this report and he had not seen a national report emerge, but the HMU did provide the data that are required to develop such a report. He also said that his role as regional team leader and the unit itself are essentially a response by DFO to this CESD recommendation.<sup>260</sup>

The HMU cannot monitor projects it does not know about, such as those where a proponent has not filed a proposed project with DFO or provided a voluntary notification.<sup>261</sup> I heard from DFO witnesses that the department does not have a good sense of what proportion of projects are not part of the voluntary referral process.<sup>262</sup> Notification of the use of best management practices is not required or requested. There is no monitoring for compliance by DFO on the use of best management practices, as there are no resources for it and the activities covered are considered relatively low risk compared to other monitoring priorities.<sup>263</sup>

According to Mr. Hwang, the fact that there is no monitoring or follow-up on many projects invites non-compliance, an example of which is the re-emergence of non-compliant practices around foreshore development on Shuswap Lake that were previously done in a much more sustainable way.<sup>264</sup>

As for future funding for the Habitat Monitoring Unit, Mr. Carter said that an increase in funding for compliance monitoring above the 2010 level (which was the first full year of compliance monitoring) is unlikely; this situation causes him concern considering that not only is compliance monitoring to be continued but his group is also supposed to implement effectiveness and fish habitat health monitoring in the near future.<sup>265</sup>

## Data and file management

The primary tool that the Habitat Management Program uses to track and access data and decisions made on its various activities, including habitat referrals, is the Program Activity Tracking for Habitat system, which is a national electronic database. The use of PATH is mandatory for environmental assessments and referrals, including operational statements and notifications. It is optional for other activities such as planning, stewardship, education, partnering, and administrative tasks.<sup>266</sup>

While PATH is useful for recording decisions, it is not useful for documenting the rationale behind those decisions, such as application of the Risk Management Framework (described above). Its utility is also limited by the willingness and available time of Habitat Management Program staff to enter the data. Obstacles include general inconsistency in data entry, slow access, and an inability to store documents electronically in some offices, a perceived resistance to change, time constraints and high workloads, lack of administrative support for habitat biologists, and a preference for “field work” over “desk work.”<sup>267</sup>

Despite recording information about numerous development activities affecting fish habitats, for a number of reasons, at the time of hearings in April 2011, PATH could not be used to determine cumulative effects or watershed-level impacts. An audit conducted by the BC Interior office concluded that “[m]andatory PATH fields do not collect data required to assess program performance [No Net Loss].”<sup>268</sup>

Adequate data and file management practices are important to providing support for habitat monitoring activities. However, information in DFO project files is often not available or is difficult to obtain. Information related to referrals is stored in combinations of paper and electronic files, centrally and with individual staff, in ways that are not standardized across the region. In 2009, the CESD examined the department’s management of project referral information. The commissioner reported that some documentation required by departmental policies could not be located, including identification of impacts to habitat, documentation of risk assessment, and monitoring plans. Since the 2009 CESD report, DFO has worked on improving PATH, and there has been some work on file management protocols, but according to Mr. Carter, not all the issues identified by the CESD have been addressed.<sup>269</sup>

Some of the information resulting from monitoring efforts is entered into PATH, although a separate, specific Habitat Monitoring Unit system to track monitoring appears to be in development.<sup>270</sup>

Environment Canada has an electronic database, the Regulatory Information Submission System (RISS), into which pulp and paper mills and metal mines can enter their effluent monitoring results (under the *Pulp and Paper Effluent Regulations* and *Metal Mining Effluent Regulations*).<sup>271</sup> These data do not include those from environmental

effects monitoring (EEM – see the contaminants section of this chapter for a description of EEM) of pulp mills. However, metal mines are required to submit quarterly and annual effluent monitoring results, as well as EEM results, through RISS.<sup>272</sup> RISS is primarily used to monitor compliance.<sup>273</sup>

The Canadian Coast Guard is responsible for responding to marine spills and for cleanup activities, including maintenance of the Marine Pollution Incident Reporting System (MPIRS). MPIRS has a data field for information about effects on wildlife, but, given the nature of the spill response, the information in this field relates to dead or living oiled wildlife. Potential longer-term impacts on wildlife, including fish, are not caught by this field.<sup>274</sup>

## Findings

Management of Fraser River sockeye habitat is an area of overlapping jurisdiction among the Department of Fisheries and Oceans (DFO), the province, and local governments. Effective protection of Fraser River sockeye habitat requires DFO to work co-operatively with the province, which has jurisdiction over water and land use. The Wild Salmon Policy (WSP) explicitly recognizes the need for this co-operation.<sup>275</sup> I accept the evidence of Jason Hwang, area manager, Oceans, Habitat and Enhancement Branch (OHEB), BC Interior; Rebecca Reid, regional director of OHEB from 2007 to 2010; Michael Crowe, section head, Habitat Management Program, OHEB, BC Interior; Corino Salomi, area manager, OHEB, Lower Fraser; and Dave Carter, area manager, OHEB, Lower Fraser, that, although there are broad, overarching federal-provincial agreements regarding management of fish habitat, DFO regional headquarters has not provided guidance on how Habitat Management Program staff and the province are to coordinate their habitat work.

I accept evidence that the cumulative impacts of development projects (because of the collective effect of habitat degradation and loss arising from multiple projects in an area) affect fish habitat and thus we need to manage the cumulative, incremental harm that could have a substantial negative effect on Fraser River sockeye habitat. The habitat management system that DFO has in place does not address these harms adequately.

The 1986 Habitat Policy is a key national policy intended to guide DFO's protection of fish habitat. It recognizes that fish habitat is required to sustain fisheries resources and aims in the long term to achieve net gain in the productive capacity of fish habitat. I accept the evidence of Mr. Hwang that the 1986 Habitat Policy is valuable in protecting the productive capacity of fish habitat, as well as the documentary evidence that salmon habitat, including that of Fraser River sockeye, is better off today than it would have been without this policy and its No Net Loss principle.

It is apparent to me from the evidence on the implementation of the 1986 Habitat Policy and the Wild Salmon Policy (WSP) that these policies are distinct but complementary. Implementation of one policy will advance implementation of the other – the ultimate goal of both being to maintain and restore fish populations, including Fraser River sockeye. The 1986 Habitat Policy aims to do this by focusing on the protection, restoration, and creation of fish habitat generally, in part through a framework of project review. The WSP works toward a related goal of conserving and protecting Pacific salmon by focusing on conservation of these stocks through specific habitat, fisheries management, and strategic planning processes.

I accept the documentary and testimonial evidence that DFO is not achieving No Net Loss of fish habitat, which is a guiding principle of the 1986 Habitat Policy. On the evidence, it is also apparent that DFO does not measure habitat loss or gain. To do so, it requires habitat indicators, such as those contemplated by Strategy 2 of the WSP, but, as discussed in Chapter 10, Wild Salmon Policy, almost nothing has been done to implement Strategy 2. I note that there are practical recommendations for how to achieve and measure No Net Loss in DFO's 2006 Quigley and Harper evaluation and these could be revisited with a focus on Fraser River sockeye habitat. Further, past reviews of DFO's efforts to protect fish habitat found that the department has met neither the net gain objective nor the No Net Loss principle (see the 1997 and 1999 reports of the Auditor General and the 2004 and 2009 reports of the Commissioner of the Environment and Sustainable Development [CESD]). Like these previous reviews, I conclude that the 1986 Habitat Policy has not been fully implemented. Moreover, DFO has not developed a plan to fully implement it.

Lack of funding within the Habitat Management Program for WSP implementation, as described in Chapter 10, Wild Salmon Policy, has exacerbated the problem of developing habitat indicators, which are required for implementation of both the WSP and the 1986 Habitat Policy. Implementing Strategy 2 of the WSP would advance implementation of the 1986 Habitat Policy by providing DFO with a method to assess Fraser River sockeye habitat loss or gain. The habitat inventory information needed to estimate gains and losses in Fraser River sockeye habitat is in effect the same information required under Strategy 2 of the Wild Salmon Policy.

The Auditor General and the Commissioner of the Environment and Sustainable Development both found that DFO has not met its 1986 Habitat Policy objectives, and the evidence before me was that the department has not yet completed the policy's implementation. In response to this evidence, Claire Dansereau, deputy minister, told me that the department hopes to have a new habitat policy.<sup>276</sup> Based on the evidence I heard, the 1986 Habitat Policy is a valuable tool for the protection of productive Fraser River sockeye habitat. In my view, DFO does not need a new habitat policy; it needs to complete implementation of the 1986 Habitat Policy. Although the policy may need updating to address changes in case law and legislation, including the changes to the *Fisheries Act* contained in Bill C-38 (see discussion in Volume 3, Chapter 3, Legislative amendments), its goals and its No Net Loss principle are sound and should be retained.

Downsizing within DFO and the disengagement of the province in many joint habitat management activities have resulted in the department placing greater reliance on streamlining processes to manage impacts on fish habitat. I heard convincing testimony from several DFO Habitat Management Program staff that this streamlining, as well as budget reductions, has had a negative impact on DFO's ability to protect Fraser River sockeye habitat. I acknowledge the sentiment, expressed by several witnesses, that, given the current fiscal regime and increasing development activity, DFO cannot review all proposed projects. However, as David Bevan, associate deputy minister, and others testified, more monitoring is required if there is to be less project review.

Although there have been some improvements in monitoring since the 2009 CESD report made

its recommendations, I am concerned about DFO's ability to monitor impacts of development on Fraser River sockeye habitat. At the time of the hearings, if a project proponent did not file a proposed project with DFO, the department was unable to monitor the project because it might not know that the project existed. DFO's reliance on streamlined processes such as operational statements and/or best management practices means that for many projects notification is voluntary or not required. The shift away from project-by-project review and toward a proponent or professional reliance model demands a strong emphasis on monitoring. Despite the fact that DFO acknowledges that monitoring for compliance, effectiveness, and fish habitat health are all important for ensuring the sustainability of Fraser River sockeye, at the time of the hearings, DFO was only doing some monitoring for compliance and no effectiveness or fish habitat health monitoring.

I accept the evidence of Mr. Carter that, although DFO has done some work to improve its file management protocols in response to problems identified in the 2009 CESD report (missing policies and other documents), it has not yet addressed all the issues identified.

I discuss these findings and any related recommendations in Volume 3 of this Report.

## ■ Freshwater habitat

In this section, I summarize the evidence I heard about specific habitat issues in the freshwater environment: management of riparian areas, water use, gravel removal, and forestry. Although forestry is a stressor that can also affect marine habitat, the focus of the Commission's hearings was on the management of this activity in the Fraser River watershed.

### **The provincial *Riparian Areas Regulation***

Riparian areas are vegetated shorelines of a stream or lake that are a critical component of the water body and can affect fish habitat.<sup>277</sup> Mr. Crowe told me about the importance of riparian areas to fish:

Sockeye, other salmon and trout are very dependent on healthy aquatic ecosystems. You cannot have healthy fish populations without healthy streams, and that's completely dependent on healthy riparian areas.<sup>278</sup>

Subsection 12(1) of the provincial *Fish Protection Act* enables the province to “establish policy directives regarding the protection and enhancement of riparian areas ... subject to residential, commercial or industrial development” by regulation. As a result, British Columbia enacted the *Riparian Areas Regulation*.<sup>279</sup> The RAR came into force on March 31, 2006, repealing the *Streamside Protection Regulation*.<sup>280</sup> The RAR provides many local governments with direction to improve the protection of fish and fish habitat in British Columbia.<sup>281</sup> Its purpose is to “establish directives to protect riparian areas from development so that the areas can provide natural features, functions and conditions that support fish and life processes” and to facilitate co-operation between DFO, the provincial Ministry of Environment, and the Union of BC Municipalities.<sup>282</sup>

On July 16, 2008, DFO, the Ministry of Environment, and the Union of BC Municipalities entered the Intergovernmental Cooperation Agreement Respecting the Implementation of British Columbia's Riparian Areas Regulation. The agreement defines the roles and responsibilities of the parties and creates a management structure to oversee the implementation and ongoing delivery of the RAR.<sup>283</sup>

The RAR applies only to new residential, commercial, and industrial development on land under local government jurisdiction in the Lower Mainland, on much of Vancouver Island, in the Islands Trust area, and in parts of the southern interior. Where it applies, the RAR covers all streams, rivers, creeks, ditches, ponds, lakes, springs, and wetlands that are connected (above ground) to a body of water that provides fish habitat. It does not apply to marine or estuarine areas.<sup>284</sup>

Under the RAR, development activities include the following:

- a. Removal, alteration, disruption, or destruction of vegetation;
- b. Disturbance of soils;
- c. Construction or erection of buildings and structures;
- d. Creation of non-structural impervious or semi-impervious surfaces;
- e. Flood protection works;
- f. Construction of roads, trails, docks, wharves, and bridges;
- g. Provision and maintenance of sewer and water services;
- h. Development of drainage systems;
- i. Development of utility corridors; and
- j. Subdivision as defined in s. 872 of the *Local Governments Act*.<sup>285</sup>

The RAR does not apply to development or development variance permits issued to enable reconstruction or repair of permanent structures if the structure remains on its existing foundation.<sup>286</sup> It also does not apply to agriculture and mining activities, hydroelectric facilities, forestry, federal and First Nations reserve lands, parks and parkland, and institutional developments. Nor does it apply to existing permanent structures, roads, and other development within the riparian protection area or developments that were approved before the RAR was enabled.<sup>287</sup>

Local governments covered by the Regulation are required either to include riparian area protection in accordance with the RAR in their bylaws or to ensure that their bylaws meet or exceed the protection set out in the RAR.<sup>288</sup> A number of Lower Fraser municipalities have maintained the riparian protections they had in their bylaws pre-RAR, which were adopted as part of the repealed *Streamside Protection Regulation*.<sup>289</sup>

Under the RAR, a proponent must have an assessment report completed by a qualified environmental professional\* (QEP) before

\* Under the RAR, s. 1(1), qualified environmental professionals are individuals or groups of applied scientists or technologists that meet the following requirements: (1) the individual is registered and in good standing in British Columbia with an appropriate professional organization constituted under an Act, acting under that association's code of ethics and subject to disciplinary action by that association; (2) the individual's area of expertise is recognized in the assessment methods as one that is acceptable for the purpose of providing all or part of an assessment report in respect of that development proposal; and (3) the individual is acting within that individual's area of expertise.

development may be approved or allowed by local governments.<sup>290</sup> The *Riparian Areas Regulation Implementation Guidebook* (RAR Guidebook) provides guidance to QEPs, local governments, Ministry of Environment staff, landowners, developers, community organizations, and others regarding the RAR process and requirements.<sup>291</sup> Completed QEP assessment reports must be submitted to the provincial Ministry of Environment, which then notifies local governments of the report. Local governments may approve a development if the QEP assessment report says one of the following two things:

- (a) if the development is implemented as proposed there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area, or
- (b) if the streamside protection and enhancement areas\* identified in the report are protected from the development, and the measures identified in the report as necessary to protect the integrity of those areas from the effects of the development are implemented by the developer, there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area.<sup>292</sup>

If a proponent is compliant with the RAR, DFO accepts that there will be no HADD.<sup>293</sup> If implementing a development proposal would result in a HADD in the riparian assessment area, a local government may nonetheless allow or approve the development if the minister of fisheries and oceans or a regulation under the *Fisheries Act* authorizes that HADD.<sup>294</sup>

There are two ways of assessing streamside protection and enhancement areas (i.e., required setbacks) under the RAR: the simple method and the detailed method. The simple method involves

adopting the repealed *Streamside Protection Regulation* setbacks, and the detailed method is new to the RAR. If a local government has already adopted the simple method in their bylaws, then that is used; otherwise, the QEP decides which method to use in his or her assessment.<sup>295</sup>

The provincial Ministry of Environment notifies DFO of requests for variances to the streamside protection and enhancement area recommended in the QEP assessment report, and until the time of the hearings in spring 2011, DFO has been responsible for approving these variances.<sup>296</sup> Whether this process will remain in place, however, is in question because of a recent court challenge to the delegation of this responsibility to DFO.<sup>297</sup> In *Yanke v. Salmon Arm (City)*,<sup>298</sup> Justice Meiklem held (in the alternative) that developments that require variances to the streamside protection and enhancement area but that do not result in a HADD do not require approval by DFO or the Ministry of Environment. Subsequently, the BC Court of Appeal upheld the lower court judgment, including this aspect of the ruling. Justice Groberman, for the court, stated that section 4 of the RAR does not prohibit development within a streamside protection and enhancement area where an assessment states that there will be no HADD resulting from the development. There is nothing in section 4 of the RAR that allows DFO to veto a development proposal that is before a local government where the QEP has given an opinion that the proposed development will not result in a HADD.<sup>299</sup>

Stacey Wilkerson, riparian areas regulation coordinator, Ecosystems Branch, Ministry of Environment, explained that the province can reject an assessment report if it is incorrect or incomplete, but, once a report has been accepted by the Ministry of Environment and the local government has carried on with the development approvals, the province cannot do anything to stop the development process. She also said that the RAR does not prescribe how riparian areas protection should be implemented or require local government to monitor whether a QEP assessment report has been

\* Under the RAR, s. 1(1), a streamside protection and enhancement area is an area:

- a) adjacent to a stream that links aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential adjacent upland vegetation that exerts an influence on the stream, and
- b) the size of which is determined according to this regulation on the basis of an assessment report provided by a qualified environmental professional in respect of a development proposal.

correctly implemented.<sup>300</sup> As noted above, once the RAR requirements have been met, DFO deems that there will be no HADD. Mr. Hwang testified that, under the RAR, municipalities have the delegated power to decide whether a development will proceed. As a result, some projects could be deemed compliant with the RAR, even though they would have been considered to constitute a HADD if reviewed under DFO's habitat referral process.<sup>301</sup>

### ***Monitoring and compliance***

The Ministry of Environment has started compliance monitoring for the RAR and is currently working on an effectiveness monitoring plan although the time frame for developing this plan is uncertain.<sup>302</sup> Compliance monitoring in relation to the RAR is broken into three components: QEP, local government, and developer compliance.<sup>303</sup> DFO and the ministry agreed on a RAR compliance target or benchmark of achieving 90 percent compliance with 90 percent confidence levels.<sup>304</sup> The ministry has produced one draft compliance report (2007 Compliance Report).<sup>305</sup> According to Ms. Wilkerson and documentary evidence tendered at the hearings, the result of the compliance monitoring to date indicates low compliance with the Regulation.<sup>306</sup>

For the first three years after the RAR came into force (2006–7 to 2009–10), the Ministry of Environment determined QEP compliance with the RAR reporting requirements by reviewing every report submitted by a QEP in each year (results are set out in the 2008–2009 Annual Report). This review determined whether QEPs were adhering to the RAR methodology. The results have not been published, though a near final draft was marked in evidence at the hearings. The ministry has now moved to more of an audit function where every fifth report is audited unless there are particular concerns with specific QEPs. When the assessment reports were examined, 48 percent of non-compliance was found to be attributable to errors by the QEP. The ministry notified QEPs of the results of its review and, if the errors were considered a serious concern, then the ministry had “more serious discussions with” the QEP and with his or her professional association. The QEP training course has also been improved based on some of the compliance information collected,

although Ms. Wilkerson said that this course is not mandatory for QEPs.<sup>307</sup>

Sixty percent of local governments were found to be compliant. Ms. Wilkerson stated that non-compliance in this context meant that 40 percent of local governments did not have the appropriate bylaws or process in place to trigger regulatory action under the RAR.<sup>308</sup>

For sites monitored on Vancouver Island, developer compliance was found to be 38 percent. On the BC mainland, developers were responsible for 52 percent of the sites that were non-compliant. However, the 2008–2009 Annual Report on implementation of the RAR notes that there were many reports of development occurring without the benefit of a RAR assessment and QEPs have reported that, in some areas, sites are regularly cleared of vegetation before the QEP is called in to perform an assessment.<sup>309</sup>

At the time of the hearings, no further analysis of compliance data had been completed since the 2008–2009 Annual Report and 2007 Compliance Report were completed in May 2009, and no changes to the RAR were made on the basis of compliance-reporting results.<sup>310</sup> DFO is not engaged formally in RAR monitoring, although Mr. Crowe testified that there is some participation by DFO staff on an opportunistic basis.<sup>311</sup>

### ***Regulation of riparian areas***

Ms. Wilkerson, Mr. Crowe, and Mr. Salomi presented their views on how well the current riparian protection regime under the RAR and the *Fisheries Act* work together to protect Fraser River sockeye habitat. These witnesses agreed that the main benefit of the RAR is that it requires local governments (where the RAR applies) to have riparian protection in their bylaws, which was not a requirement before the Regulation came into force.<sup>312</sup> Mr. Crowe noted that having riparian setbacks under regulation (and not just through guidelines) is a substantial improvement and complements the *Fisheries Act*.<sup>313</sup> Also, the RAR applies to brownfield sites (previously disturbed areas) that are not easily dealt with under the *Fisheries Act* and includes streamside enhancement. It therefore works not just to protect what is already there, as (at the time of the hearings) was required by sections 35 and 36 of the Act, but also to promote restoration and recovery of habitat.<sup>314</sup> In

Mr. Crowe's view, this is complementary to the 1986 Habitat Policy goal of net gain of productive habitat (see discussion above about implementing the 1986 Habitat Policy).

Witnesses also noted a number of deficiencies with the RAR process:

- The RAR does not apply to all of British Columbia, and where it is applied, it is not applied consistently.<sup>315</sup>
- There are a number of professional classifications that should not be QEPs because these professionals do not bring the right values to their judgments, and the professional reliance model of the RAR allows for too much QEP discretion.<sup>316</sup>
- The RAR does not require follow-up to ensure that the measures that are required in the assessment reports are completed as intended, and there is a need for an enforcement mechanism.<sup>317</sup>
- Delivery through local governments creates a complicated environment for DFO and the province to try to maintain a standard and level playing field; where a local government feels it is not its responsibility to deliver the RAR, then this works against the objectives of the RAR and the *Regulation* is ineffective.<sup>318</sup>
- The RAR is a poor planning tool and makes it difficult for local governments to plan in their regions in a sustainable way because it only requires assessment on a site-by-site basis.<sup>319</sup>
- There are no consistent contacts within DFO for the province to deal with regarding the RAR, and DFO senior management is not focused on the issue.<sup>320</sup>
- There is no definition in the *Regulation* of "institutions," which is a category of development that is not covered by the RAR.<sup>321</sup>
- The setback widths prescribed in the RAR for many smaller and steeper stream classes are inadequate to protect the stream and stream functioning in the riparian zone.<sup>322</sup>
- There should be some effort to look scientifically at the assessment of RAR's efficacy in support of compliance work.<sup>323</sup>

Another regulatory gap exists between the RAR and the provincial *Water Act*.<sup>324</sup> Lands adjacent to water courses may be privately owned, but the land between the low- and high-water marks in

lakes, rivers, and streams is owned by the province, and the provincial *Water Act* controls works in and around a stream (see discussion below about water use on the Fraser River watershed). According to Mr. Crowe, the province interprets "in and around streams" to mean that works above the high-water mark are not covered by the *Water Act*, and therefore no provincial approvals are required for work above this boundary. However, the RAR applies from the one-in-five-year flood elevation, which is higher than the high-water mark, so there is a physical gap between where the *Water Act* and the RAR apply. Mr. Crowe indicated that, in DFO's view, the province has jurisdiction and should be regulating in this area.<sup>325</sup>

## Lakeshore / riverfront development

Lakeshore and riverfront areas are riparian areas. As such, they are sensitive and productive fish habitat, and they play a crucial role in ensuring healthy fish populations.<sup>326</sup> Several public submissions suggested that development along lakes and rivers may be responsible for the decline in Fraser River sockeye productivity.<sup>327</sup>

Lakeshore and riverfront development often affects shoreline stability, putting it at risk for erosion. Stabilization practices include work to protect bank shores from erosion and, although individual stabilization projects may have minimal impact, the cumulative effect may be significant, as protecting or armouring stream banks in one area increases the potential for erosion problems elsewhere. Shoreline development works can also have other significant impacts, such as the removal of riparian, bank, and foreshore vegetation in addition to stabilizing structures limiting the use of the foreshore by fish.<sup>328</sup>

Stream channel alteration in the flood plain ecosystem is often undertaken in areas where flooding threatens human activities. Alterations associated with river instability, seasonal floods, and the migration of channels may be done by diking, dredging, ditching, and land filling.<sup>329</sup> Emergency flood projects requiring formal authorization from DFO do not require *Canadian Environmental Assessment Act* screening because of the emergency nature of the work.<sup>330</sup> Emergency projects proceed even if habitat compensation is required, and DFO



is flexible on how and when such compensation takes place to ensure timely completion of the primary work. DFO is not involved in granting approvals for flood projects under the Provincial Emergency Program; although it can ask questions, the department defers to the province's assessment.<sup>331</sup> However, an emergency exclusion from the CEAA does not change the requirements for habitat compensation under the *Fisheries Act*, section 35. These requirements may be written into a HADD authorization.

In the Shuswap Lake area, 14 government agencies share jurisdiction over the management of fish habitat (and damage caused thereto), water quality (and its degradation), and conflicts among recreational users.<sup>332</sup> These agencies have separate mandates, priorities, and financial pressures, creating a complicated regulatory environment. The RAR applies to some of these areas but not all.<sup>333</sup> Shuswap Lake is subject to a range of development pressures on habitat.<sup>334</sup> I heard that this foreshore development, as well as septic inflows into Shuswap Lake, are affecting fish habitat.<sup>335</sup>

The Shuswap Lake Integrated Planning Process (SLIPP), launched in 2007, was designed to foster a joint planning process by multiple government agencies, politicians, First Nations, and the public in order to gain control over the type and rate of development and increase government effectiveness in coordinating and filling regulatory gaps in the lake environment. SLIPP has a number of key objectives (or “workstreams”): water quality management, recreational use management, and foreshore development management. An inter-agency technical committee reviews development applications in order to improve decision making and ensure efficiency in the development process.<sup>336</sup>

According to Mr. Crowe, SLIPP has refocused agencies on the importance of habitat management of Shuswap Lake, but there is no secure funding for the initiative.<sup>337</sup>

The Lakeshore Development Compliance project, a provincial three-year program to collect baseline foreshore habitat data, created an inventory against which to assess compliance with the provincial *Water Act*. The Ministry of Environment,

other provincial agencies, stewardship groups, local governments, and DFO were involved. The project found that compliance with the *Water Act* was extremely low, with the majority of beach creation and docks not authorized. Regionally, the information collected by this project has been used to start collaborative planning processes among different levels of government and stewardship groups. Several regions have used the information to develop guidelines for shoreline management, and some have started to use it to look at implementing compliance actions.<sup>338</sup>

## Water use in the Fraser River watershed

I received several public submissions on the impact of water use in the Fraser River watershed on Fraser River sockeye. Concerns included the construction of large and small hydroelectric projects,<sup>339</sup> groundwater withdrawals, and the diversion of water from the Nechako River to Kemano, lack of knowledge regarding the impact industrial activities have on groundwater sources,<sup>340</sup> and weak protection for small streams and groundwater.<sup>341</sup> The potential impacts of water use on Fraser River sockeye is discussed in Volume 2 of this Report. In the sections that follow, I discuss surface and groundwater use generally, and more specifically in relation to hydroelectric power projects.

### *Regulation of surface water use and groundwater extraction*

Pursuant to the *Fisheries Act*, DFO is responsible for ensuring that water use, storage, and diversion are carried out in a manner that does not harm fish or fish habitat. Because “migration areas” are included in the definition of fish habitat, the obstruction of fish passage may be considered a HADD.<sup>342</sup>

Section 32 of the *Fisheries Act*, which prohibits the destruction of fish by means other than fishing unless authorized by the minister, is also relevant to the regulation of water use.\* For example,

\* I note that on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. As discussed in Volume 3, Chapter 3, Legislative amendments, Bill C-38 expands the exceptions to the prohibition on killing fish by other means than harvesting.

DFO has expressed concern that fish mortality may result from entrainment in the structures of hydroelectric facilities or impingement against water intake structures.<sup>343</sup>

Mr. Hwang testified that the *Fisheries Act* is generally not enforced against water users. According to him, federal regulatory tools are limited and not particularly well-suited to managing water use for the benefit of fish. He explained that there is “enormous complexity in taking [*Fisheries Act*] authorities and applying them to a water withdrawal situation.” Many streams have multiple users and multiple points and timings of withdrawal, which makes it “very difficult to ... put your finger on exactly which water user may be causing what effect.” There is added complexity in determining whether a particular impact is a natural occurrence or the result of water withdrawals.<sup>344</sup>

The difficulty of enforcing the *Fisheries Act* with respect to water use is compounded by a lack of capacity for monitoring the effects of water use. Mr. Hwang indicated that there are “very, very few people on the ground between [DFO] and the provincial ministries that are actually able to monitor and assess the habitat quality and the habitat impacts of water use.” However, Mr. Hwang noted that the *Fisheries Act* has value in terms of applying regulatory pressure on water users.<sup>345</sup>

The province holds property and usage rights to surface and groundwater in British Columbia,<sup>346</sup> except insofar as private rights are granted to other persons. British Columbia is thus responsible for the licensing of surface water use and groundwater extraction, including water stored and diverted for the purpose of power generation. The Ministry of Forests, Lands and Natural Resources Operations (MFLNRO) is the provincial agency (at the time of the hearings) in charge of licensing, issuing approvals, and monitoring of surface water and groundwater resources. The Ministry of Environment is responsible for science and knowledge management, as well as the development of policy and legislation for surface water use and groundwater extraction.<sup>347</sup>

The *Water Act* establishes a system for the allocation of water rights in British Columbia. The

use of surface water for any purpose other than emergency withdrawals and certain domestic uses requires a water licence or approval.<sup>348</sup> The comptroller of water rights (comptroller) or a regional water manager has authority to grant, amend, or refuse all or part of an application for a water licence.<sup>349</sup>

The comptroller or regional water manager is not required to consider instream flows or fisheries impacts when making licensing decisions. Glen Davidson, comptroller and director, Water Management Branch, MFLNRO, indicated that fisheries impacts, though not “always” considered, are commonly considered when issuing licences and are considered for any “significant withdrawal.” He added that the province routinely consults with DFO regarding licensing decisions related to fish or fish habitat.<sup>350</sup>

The comptroller and regional water managers are required to consider effects on fisheries for licences issued on “sensitive streams” designated under the *Fish Protection Act* (see discussion in the above section on habitat management, policies, and practices, and Chapter 3, Legal framework).<sup>351</sup> Dr. Craig Orr, executive director, Watershed Watch Salmon Society, noted that the list of sensitive streams “is quite old and needs some updating.”<sup>352</sup> When assessing a water licence application on a sensitive stream, the comptroller or a regional water manager is required to consider impacts on “protected fish populations”\* and may only issue or amend a licence where the effect on those populations is “likely to be insignificant.”<sup>353</sup> Where impacts are anticipated, a licence may only be issued or amended if the application includes mitigation or compensation measures.<sup>354</sup>

The comptroller and regional water managers have a limited ability to amend, suspend, or cancel an existing water licence. Although they may restrict water use to ensure that water is available for licensees with earlier priority dates (“first in time, first in right”), they cannot restrict water use for the purpose of protecting fish.<sup>355</sup> The minister’s authority is broader. Under section 9 of the *Fish Protection Act*, the minister may issue a temporary order to restrict water use by a licensee if a fish population is threatened during a drought, but must give “due

\* The term “protected fish population” refers to a population of fish in relation to which a sensitive stream designation has been made (*Fish Protection Act*, s. 6(1)).

consideration” to the needs of agricultural users before doing so. Section 9 is a relatively new tool, brought into force in response to a drought in 2009, and by the time of the hearings in September 2011, it had only been used once.<sup>356</sup>

Dr. Orr expressed a concern that a number of streams in British Columbia are “way over-subscribed”<sup>357</sup> such that “more water is allocated in licences than is actually available in the hydrograph.”<sup>358</sup> Mr. Davidson explained that the province uses the term “fully recorded” as opposed to “over-subscribed.” “Fully recorded” refers to streams where there is no available flow for licensing at certain times of the year. He testified that oversubscription may or may not be a problem for instream flows, because “in some cases ... instream flows have some protection.” He indicated that the province has a number of licensing tools for protecting instream flows, for example:

- licences with conditions that allow the comptroller or regional water manager to vary instream flow requirements;
- licences issued specifically for conservation purposes (e.g., Ducks Unlimited, DFO’s water licence in the Upper Nechako River); and
- water reserves set aside by order in council (e.g., to preserve flow in the Adams River).<sup>359</sup>

In Mr. Davidson’s view, the province’s tools for protecting instream flows in new water licences “are being used and are pretty good,” but “the problem primarily exists with some of the existing allocation[s].”<sup>360</sup>

The parts of the *Water Act* that regulate licensing, diversion, and use of water currently do not apply to groundwater.<sup>361</sup> Under subsection 1.1(2) of the *Water Act*, the provincial cabinet may, by regulation, fix a date on which the licensing provisions of the *Water Act* apply to “ground water,” but this has not been brought into effect.\* British Columbia is the only jurisdiction in Canada where a licence is not required for groundwater extraction.<sup>362</sup> Although there is no licensing requirement, proposed groundwater extraction may be subject to review under the BC *Environmental Assessment Act*<sup>363</sup> in limited circumstances.<sup>364</sup>

The *Ground Water Protection Regulation* enacted under the *Water Act*, establishes standards for drilling, altering, and closing wells and requires well drillers and pump installers to register with the province.<sup>365</sup> This regulation does not address the licensing of groundwater. If surface water is limited or fully allocated, water users are able to bypass the *Water Act*’s licensing requirements by drilling wells, often adjacent to streams, to obtain groundwater.<sup>366</sup>

In a report released in 2010, the BC Auditor General was critical of the province’s management of groundwater resources. The report concluded that

- the Ministry of Environment’s information about groundwater is insufficient to enable it to ensure the sustainability of this resource;
- groundwater is not being protected from depletion and contamination or for the purpose of ensuring the viability of the ecosystems it supports; and
- control over access to groundwater is insufficient to sustain the resource, and key organizations lack adequate authority to take appropriate local responsibility.<sup>367</sup>

I heard from Mr. Davidson that the province is responding to the report primarily through changes being contemplated in the *Water Act* modernization process.<sup>368</sup>

### **Water Act modernization**

The *Water Act* modernization process began in 2008 with the release of Living Water Smart: British Columbia’s Water Plan, which contained a number of commitments related to water law reform.<sup>369</sup> The province has indicated that new legislation will be introduced in 2012.<sup>370</sup>

In February 2010, the ministry released a discussion paper that outlined a number of specific proposals for changing the *Water Act*. Following the release of the paper, the ministry sought feedback from the public, stakeholders, a number of government agencies including DFO, and other interested parties. DFO supported the overall goals and objectives of the *Water Act* modernization, but offered a number of specific

\* The term “ground water” is defined in s. 1 of the *Water Act* as “water below the surface of the ground.”

recommendations related to protecting fish and fish habitat and harmonizing the proposed legislation with federal legislation.<sup>371</sup>

Following the feedback process, the Ministry of Environment released a policy proposal for a Water Sustainability Act to replace the current *Water Act*.<sup>372</sup> The policy proposal is guided by an “area-based” approach which provides for varying levels of regulatory action in different areas, based on risk, competing demand, and scarcity.<sup>373</sup> The policy proposal also outlines seven specific policy directions for the new legislation:

1. Protect stream health and aquatic environments: With respect to protecting stream health and aquatic environments, the Ministry of Environment proposes to require decision makers to consider instream flow guidelines for all new water allocation decisions, for both surface water and ground water. This requirement would not affect existing licences.
2. Consider water in land use decisions.
3. Regulate groundwater use: Groundwater extraction will be licensed for all large withdrawals throughout the Province. The threshold for a large withdrawal could be in the range of 250 to 500 m<sup>3</sup>/day for unconsolidated aquifers, and 100 m<sup>3</sup>/day for bedrock aquifers. In known and chronic problem areas, licensing requirements will likely apply to smaller users, and in some circumstances may apply to private domestic wells.
4. Regulate during scarcity.
5. Improve security, water use efficiency and conservation.
6. Measure and report: Licensees will be required to report actual water use, starting with large surface water and groundwater users province-wide. In known or chronic problem areas, smaller users such as domestic licensees may also be required to report on water use.
7. Enable a range of governance approaches although ultimate accountability will remain with the Province.<sup>374</sup>

Several of these policy directions were the subject of evidence at the hearings. Regarding the first,

Dr. Orr testified that there must be better protection of instream flows so that fish can be sustained in all river systems; regulations are required rather than guidelines.<sup>375</sup> Mr. Hwang agreed that legislated environmental flow standards on fish-bearing streams would be useful to protect fish. He also questioned how well the *Water Act* modernization proposals would apply to existing licences and the issue of oversubscribed streams.<sup>376</sup> In response, Lynn Kriwoken, director, Water Protection and Sustainability Branch, Environmental Sustainability Division, Ministry of Environment, said that additional tools for restricting water use may be available in water-stressed or problem areas. One proposed mechanism is to require the development of “water resource assessments” and “watershed sustainability plans,” which could apply to both new and existing licences.<sup>377</sup>

With respect to the third policy direction (regulate groundwater use), Ms. Kriwoken indicated the province’s intention is not to regulate private domestic wells (approximately 90–95 percent of wells drilled in British Columbia) unless those wells are in water-short areas.<sup>378</sup> Mr. Davidson advised that the future licensing regime for groundwater would mirror the current licensing regime for surface water, under which a licence for domestic use is only required in heavy-use areas.<sup>379</sup> Ms. Kriwoken advised that the province has yet to identify priority areas, but is currently looking at this issue: “Those operational details have not been fully worked through yet.”<sup>380</sup>

However, I heard from Dr. Orr that groundwater licensing should not be limited to priority areas and large extractions; rather, there should be complete coverage for all groundwater extractions in the province.<sup>381</sup> Ms. Kriwoken testified that the province is looking for a practical threshold that is easy to implement. She suggested that a blanket approach that would regulate an individual well on the west coast of British Columbia may not be practical or pragmatic. She said that the province could implement a system requiring a licence for all groundwater extraction, but indicated that, administratively, such a system may require licensing of many thousands of wells.<sup>382</sup>

As for measuring and reporting (item 6 above), there is currently no comprehensive program requiring reporting on water use by licensees, although some are required to report because of

the terms and conditions on their licences. The province currently requires some licensees to report on their water consumption, which “depends on the size of the licence and the requirements of each specific licence.” Mr. Davidson stated that perhaps a quarter of the 44,000 water licences in the province (and maybe even less) must report on water use. Licences for domestic use do not require reporting. The province engages in some compliance monitoring of licence conditions, which is generally focused on larger licensees such as hydro projects and industrial users. For smaller licensees, monitoring is done on a “complaint or problem basis.”<sup>383</sup> The proposal under item 6 is to increase the reporting starting with large water users rather than domestic users.<sup>384</sup>

A small proportion of DFO Habitat Management Program staff time in the BC Interior office is assigned to monitoring stream flow conditions in areas where there are high salmon values and known limitations on water supply.<sup>385</sup> According to Mr. Hwang, from DFO’s perspective, having mandatory metering and monitoring would be useful because

right now you can go out to a licensed water user, many of the older historic ones, and you don’t know how much they have taken today, how much they’ve taken this year, and how that effect may or may not be contributing to the current circumstances in a stream. So having some sense of that would then allow more regulatory control[.]<sup>386</sup>

DFO has, however, expressed concerns about the Ministry of Environment’s proposal regarding measuring and reporting:

Metering is proposed as a requirement for large water users, but the problems facing aquatic ecosystems are often the result of many small, cumulative and incremental withdrawals. How is it contemplated that the broader array of withdrawals will be monitored?<sup>387</sup>

Mr. Hwang explained that DFO is not “opposed to regulating large users, but the concern would be not having an effective degree of monitoring and regulation on the smaller users.”<sup>388</sup>

In Mr. Hwang’s view, implementing a new water allocation regime is the biggest challenge: “I don’t see from where I sit currently the Province or any other entity being resourced to actually follow through and deliver ... the results that are contemplated in the new ... legislation.” According to him, DFO has not urged the province to ensure that sufficient resources are allocated for implementation.<sup>389</sup> When asked about resources to implement the new regime, Mr. Davidson would not speculate, saying that this is “a question for government at the time they consider it.”<sup>390</sup>

### ***Regulation of hydroelectric power projects***

For hydroelectric power projects, the province issues water licences and enforces compliance with the terms and conditions of licences, and, under the *Fisheries Act*, DFO is responsible for ensuring the facilities do not cause harm to fish or fish habitat.

### **BC Hydro power projects**

BC Hydro is a Crown corporation mandated, among other things, to generate and supply power.<sup>391</sup> It owns, maintains, and operates a number of hydroelectric power projects in the Fraser River watershed.

Most BC Hydro power projects were first licensed before 1962. In the late 1990s, the comptroller ordered a review of all BC Hydro water licences and required the development of a water use plan for each BC Hydro facility, recognizing multiple water use objectives (e.g., power generation, fish and fish habitat, flood control, recreation, and so on). Water use plans are developed by BC Hydro through a consultative planning process involving multiple parties (government agencies, First Nations, business groups, environmental groups, local residents), including DFO. As of August 2011, the comptroller had approved water use plans for all BC Hydro facilities in the Fraser River watershed.<sup>392</sup>

Paul Higgins, former manager, Environmental Resources Department, BC Hydro, testified that water use planning has been beneficial in terms of achieving biological benefits, as well as developing relationships among stakeholders.<sup>393</sup> Mr. Hwang agreed that the water use planning process has been beneficial and he thinks DFO finds water use plans to be very effective.<sup>394</sup> Dr. Orr referred to a report by the Watershed Watch Salmon Society that

analyzed fish conservation gains from water use plans at several BC Hydro facilities.<sup>395</sup> The report found that the process resulted in generally positive outcomes for fish conservation, as well as net gains for both power and fish in many cases.<sup>396</sup>

In recent years, the Bridge Coastal Fish and Wildlife Restoration Program has funded studies to assess the feasibility of restoring fish passage at the Alouette and Coquitlam dams, which blocked the sockeye's upriver access.<sup>397</sup> A joint initiative of BC Hydro, British Columbia, and Canada, the program funds projects to address the historical impacts of BC Hydro facilities in the Bridge Coastal generation area, which includes the Alouette and Coquitlam facilities.<sup>398</sup> Mr. Higgins testified that the Alouette Dam program to re-anadromize sockeye (i.e., to remove obstacles preventing the fish from migrating to, and returning from, the ocean during their life cycle) has shown "good potential" for biological feasibility.<sup>399</sup> The program to re-anadromize sockeye at the Coquitlam Dam has been less successful (only six fish returned in 2011).<sup>400</sup>

DFO has issued *Fisheries Act* authorizations under section 32 and subsection 35(2) for the following BC Hydro projects in the Fraser River watershed: Alouette, Coquitlam-Buntzen, Stave River, and Wahleach. These authorizations permit "impacts from upstream and downstream habitat alteration as well as destruction of fish by stranding or entrainment, provided that such impacts occur in association with WUP [water use plans] operations or specified maintenance activities, and in accordance with specific mitigation, compensation and monitoring requirements."<sup>401</sup>

### **Kemano Hydroelectric Project**

The Kemano Hydroelectric Project is a hydroelectric facility operated by Rio Tinto Alcan (Alcan). It supplies power to Alcan's aluminum smelter at Kitimat, as well as to BC Hydro.<sup>402</sup> Alcan generates power by diverting water from the Nechako Reservoir. The diversion of flow from the reservoir reduced annual discharges in the Nechako River by 40–50 percent between the late 1950s and 1978.<sup>403</sup> Although the diversion did not block migration to any known sockeye spawning grounds, it appeared to affect

conditions for sockeye runs that use the Nechako River as a migration corridor to the Stuart, Stellako, and Nadina systems.<sup>404</sup> The concern with respect to Fraser River sockeye is that low water flows in the Nechako River may cause higher summer water temperatures, which in turn can increase stress on migrating adults and make them more susceptible to disease and pre-spawn mortality.<sup>405</sup> Dr. Steve MacDonald, research scientist and head, Environmental and Aquaculture Research Section, DFO, and Cooperative Resource Management Institute, School of Resource and Environmental Management, Simon Fraser University (SFU)\* observed that the temperatures in this stretch of the migratory route are the warmest that these fish will experience in their lives: "This is the hot spot in their entire four- or five- year life cycle."<sup>406</sup>

In 1987, Canada, Alcan, and the province entered into an agreement to address low flows that could be detrimental to sockeye (1987 Settlement Agreement). Under the 1987 Settlement Agreement, Alcan agreed to release additional flow into the Nechako River in the summer months to cool the waters. This program of flow releases is known as the Summer Temperature Management Program,<sup>407</sup> and its objective is to maintain mean daily water temperatures at or below 20°C as measured at Finmoore, near the Nechako's confluence with the Stuart River.<sup>408</sup> The temperature program is overseen by the Nechako Fisheries Conservation Program.<sup>409</sup>

In a 2005 report, the Nechako Fisheries Conservation Program found that for the period between 1983 and 2000, water temperatures at Finmoore have generally remained between 15°C and 21°C, while only infrequently exceeding 20°C.<sup>410</sup> Mr. Hwang was DFO's representative to the Nechako Fisheries Conservation Program from 1998 to 2004 and he described the Summer Temperature Management Program as "largely effective, not perfectly so, but within the bounds and limits of the operating infrastructure, it was meeting objectives."<sup>411</sup>

Dr. MacDonald was the lead author of two DFO reports that examined the effectiveness of the Summer Temperature Management Program in moderating temperatures in the Nechako River. Dr. MacDonald said, "[I]n a nutshell, [the Summer Temperature Management Program] works. And

\* Dr. MacDonald was qualified as an expert in aquatic habitat ecology (Commissioner, Transcript, September 15, 2011, p. 3). His curriculum vitae is Exhibit 1846.

it works because, very simply, if you have a large amount of water, it takes more energy to heat it than a small amount of water. It's just an issue of thermal mass." He explained that the program was primarily designed to benefit sockeye that migrate above Finmoore (i.e., Nadina and Stellako populations), but it also affects sockeye that only use the lower Nechako below Finmoore (i.e., Early Stuarts). In other words, "[A]ny fish that turns left at Prince George [at the confluence of the Fraser and Nechako rivers] stands to benefit from temperature control." According to Dr. MacDonald, the Summer Temperature Management Program is a success, benefits sockeye, and DFO is in favour of continuing it.<sup>412</sup> Dr. MacDonald was asked to comment on the following statement from an internal DFO document:

[S]ummer temperatures have been set by the agreement to a maximum of 20 degrees C. Research indicates this temperature to be lethal to salmon particularly when the fish have been exposed to these temperatures during a large portion of their freshwater migration. A maximum target of 18 degrees C at locations in the migration corridor where temperature control is a possibility is more precautionary and scientifically defensible.<sup>413</sup>

Dr. MacDonald said that "if all one was concerned about was sockeye salmon and it was doable, 18 degrees would be better than 20"; however, a lower target would not necessarily be achievable owing to limits on the amount of water that can be released into the system. In some years, the Summer Temperature Management Program "is doing its very best" to achieve the current target of 20°C despite operating at full capacity. He also emphasized there are a "plethora of other interests," in addition to sockeye, that need to be considered when additional water is released (e.g., potential for flooding at Vanderhoof, lost revenue from power generation, potential impacts on the Cheslatta Lake system, and potential impacts on other fish such as sturgeon).<sup>414</sup>

Regarding suggestions for improvements, Dr. MacDonald indicated that moving the program's

temperature target to a new location below Finmoore would allow for greater control over temperatures in the lower part of the Nechako. But he also said that such a proposal is "fraught with difficulties." An alternative would be to continue using Finmoore as the location for measuring temperature, but modify the program model based on the understanding that flow releases also affect temperatures below Finmoore. Dr. MacDonald has been working on this analysis for DFO, but said that "it's going to take ... work before we could actually get it into operation."<sup>415</sup>

### Independent hydroelectric power projects

The term independent power project (IPP) is used to describe a renewable energy project (e.g., hydro, wind, biomass, geothermal, etc.) that is developed independently of BC Hydro, usually by the private sector. IPPs typically enter into electricity purchase agreements with BC Hydro and are connected to the provincial power grid. The scope of evidence at the hearings was limited to IPPs that generate hydroelectric power, referred to in this Report as "independent hydro projects."<sup>416</sup>

There are different models for independent hydro projects, but most are "run-of-river" facilities. Run-of-river power is generated by removing water from a stream and diverting it through a tunnel at a steep gradient. Another model for an independent hydro project is where a tunnel is bored into a lake and lake water is used to generate power.<sup>417</sup>

Independent hydro projects are subject to both provincial and federal regulation. Regulation of independent hydro projects by DFO's Habitat Management Program generally follows the same referral process as for other types of development (see discussion above). Where an independent hydro project is expected to result in a HADD (section 35) or mortality of fish by means other than fishing (section 32), DFO requires the project proponent to obtain an authorization under the *Fisheries Act*. Before issuing a subsection 35(2) authorization, DFO has to do an environmental assessment under the *Canadian Environmental Assessment Act*.<sup>\*</sup> DFO provides specific guidance

\* *Canadian Environmental Assessment Act*, SC 1992, c. 37; Jason Hwang, Transcript, September 16, 2011, pp. 34-35. Part 3, Division 1 of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and repeals the CEAA. Under the CEAA, 2012, independent hydro projects may no longer require an environmental assessment as they did under the CEAA.

to proponents through its Instream Flow Risk Management Framework.<sup>418</sup> The framework was initially created for independent hydro projects but is not exclusive to them. It is intended to convey to proponents that DFO may not support projects that may impact sensitive or high-value fish habitat, and to encourage them to select projects that have lower risks.<sup>419</sup> Under the framework, projects with “anadromous fish populations and habitats within project impact boundaries and with potential for management concern” are categorized as “high to unacceptable risk.”<sup>420</sup> Dr. Michael Bradford, research scientist, DFO, and Cooperative Resource Management Institute, School of Resource and Environmental Management, SFU\* said that for DFO this is a “new industry” and it is anticipated that, in the next five to 10 years, DFO will start to see monitoring results that “hopefully will be able to give us a better idea of what the true impacts of these projects are.”<sup>421</sup>

Project proponents must obtain a water licence from the province under subsection 12.2(2) of the *Water Act*. For hydro licences the province often attaches conditions for minimum instream flows to protect fish and fish habitat. Projects with a capacity of 50 MW or greater are subject to review under the BC *Environmental Assessment Act*, but in most cases independent hydro projects do not exceed this threshold. The province has developed guidelines for assessing instream flow requirements for independent hydro projects.<sup>422</sup>

Dr. Orr expressed concern regarding the lack of public input with respect to the siting of independent hydro projects: “[A]s a citizen, I don’t know where the next one is going to go. I don’t know if it’s going to go in anadromous fish habitat that might affect sockeye or not.” He emphasized the need for increased “public participation and transparency in the whole process” and cited BC Hydro’s water use planning process as a possible model for small hydro development. Dr. Orr noted that a process does exist for public input but, in his experience, it is time consuming and not very responsive. He also said that the water flow guidelines for independent hydro projects are not rigorously determined or mandatory in contrast to the guidelines developed under water use plans.<sup>423</sup> However, Mr. Davidson indicated that

requiring non-Crown corporations to undertake water use planning would be “a little bit more problematic.”<sup>424</sup> Mr. Hwang noted that DFO lacks authority to order water users to undertake water use planning.<sup>425</sup>

## Gravel removal in the Lower Fraser River

Gravel has been removed from the Lower Fraser River on a regular basis since around the 1950s.<sup>426</sup> Some members of the public suggested that gravel mining is one of the causes for the decline of Fraser River sockeye.<sup>427</sup> Sockeye salmon are not known to spawn in the Lower Fraser River from which gravel is removed. I consider the evidence of the potential impact on migrating and some local rearing sockeye populations in Volume 2 of this Report. Here, I consider only the evidence relating to the management of gravel removal.

Gravel removal is governed by several federal acts and regulations, including the *Fisheries Act*, the *Navigable Waters Protection Act*,<sup>428</sup> and the CEAA. Applicable provincial legislation includes the *Water Act*<sup>429</sup> and *Water Regulation*,<sup>430</sup> the *Dike Maintenance Act*,<sup>431</sup> the *Land Act*<sup>432</sup> and *Crown Land Fees Regulation*,<sup>433</sup> and the *Mines Act*<sup>434</sup> and its *Health, Safety and Reclamation Code*. Before gravel removal begins, Emergency Management BC must typically receive a number of authorizations (including a section 35 HADD authorization).<sup>435</sup> If gravel removal exceeds gravel recruitment, habitat loss can occur; temporary habitat loss can also occur even if gravel recruitment matches removal until a mined area is filled in. To date, DFO has not required habitat compensation for any habitat loss from gravel removal, although it anticipates that this compensation will be necessary based on post-construction monitoring results from removals done in 2010.<sup>436</sup>

In 2004, Land and Water BC Inc. and DFO signed a letter of agreement with respect to gravel removal from the Lower Fraser River for 2004 through 2008.<sup>437</sup> In February 2009, the agreement was extended until March 31, 2010.<sup>438</sup> A new agreement was under negotiation at the time of hearings.<sup>439</sup>

\* Dr. Bradford was qualified as an expert in aquatic habitat ecology (Commissioner, Transcript, September 15, 2011, pp. 1, 3). His curriculum vitae is Exhibit 912.



The letter of agreement indicates that the province views gravel removal as necessary to address flood risks associated with accumulation of gravel in the lower reaches of the Fraser River.<sup>440</sup> DFO's position is that "[t]he provincial government, not the Department, has the authority and responsibility for flood protection, including the management of gravel removal projects." DFO officials defer to Emergency Management BC's "expertise and jurisdiction" in public safety and treat gravel removal as a "public safety priority." The role of DFO in gravel removal is to "manage the fish and fish habitat issues associated with these works," and "DFO seeks to balance the Province's interest in flood prevention with the need to protect fish and fish habitat."<sup>441</sup>

A technical committee and a management committee together oversee gravel removal in the Lower Fraser River.<sup>442</sup> DFO and the provincial Ministry of Environment co-chair the management committee. The BC Integrated Land Management Bureau, Emergency Management BC, the Provincial Emergency Program, and Transport Canada are also represented.<sup>443</sup> According to the latest available terms of reference, the purpose of the management committee is "to ensure that gravel removal meets the annual targets in keeping with the Letter of Agreement."<sup>444</sup> The committee also reviews and approves or rejects gravel removal proposals recommended by the technical committee.<sup>445</sup> Emergency Management BC chairs the technical committee, which reviews sites and provides recommendations to the management committee with respect to sediment removal.<sup>446</sup> This committee's terms of reference, which were never finalized, contemplate having a Ministry of Environment representative to provide expertise on hydrology and fish interests, and technical advice for flood protection.<sup>447</sup> However, there is no Ministry of Environment representative on the technical committee, and this fact has been an ongoing concern for the DFO members of the committee.<sup>448</sup>

A monitoring program is outlined in the letter of agreement.<sup>449</sup> There is general consensus within

DFO that a more strategic and comprehensive monitoring program is required.<sup>450</sup> DFO and Emergency Management BC are working on a new monitoring plan but by the time of the hearings in spring 2011 had not finalized it.<sup>451</sup>

In 2010, Emergency Management BC's technical committee commissioned a report to define criteria for a program that might be permitted for multi-year sediment removals in a long-term sediment management program.<sup>452</sup> The report says that a long-term program of sediment removal should only proceed if sufficient research is undertaken to acquire knowledge about the area's sediment budget\* and the annual pattern of fish activities.<sup>453</sup> The report's cover letter (from the expert commissioned to do the report) notes a concern about the state of knowledge:

The most expensive (and urgent) need is to improve knowledge of the aquatic ecosystem beyond site scale studies in the immediate environs of sediment removals and a limited number of control sites. It is evident that we need to know details about how fish use various parts of the river at various times of year before reasoned objections to sediment removal proposals may be overcome.<sup>454</sup>

Dr. Laura Rempel, habitat biologist, OHEB,<sup>†</sup> said DFO does not know as much as it should in order to manage a long-term gravel removal program; however, gathering the types of data referred to by the report would be very expensive. She said that a precautionary approach would perhaps require DFO to step back and reconsider the program, but because gravel removal is done for public safety reasons, DFO treats gravel removal projects somewhat differently from its regulatory review of strictly economically driven projects.<sup>455</sup>

In 2009, DFO, together with Emergency Management BC, commissioned a study intended to provide a picture of the impacts of gravel mining on the Lower Fraser gravel reach and support design of a comprehensive monitoring program for

\* A sediment budget was defined by Dr. Laura Rempel as "an estimate of the net accumulation of sediment, core sediment, that's building up in the reach and it's usually expressed in cubic metres per year. So it's an annual estimate of gravel influx to the reach" (Transcript, June 16, 2011, p. 20).

† Dr. Rempel was qualified as an expert in freshwater fish habitat in flowing waters and rivers, with an emphasis on the Lower Fraser River (Commissioner, Transcript, November 4, 2011, p. 2).

gravel removals.<sup>456</sup> One of the report's overarching conclusions was that the monitoring program in place was not being executed very diligently, and as a result, data were unavailable and the study could not adequately address questions about magnitude of effect.<sup>457</sup> Mr. Hwang said there are gaps in monitoring and there is a need for more in situ monitoring as works are undertaken. DFO would like to see this factored into a new management plan for gravel removal. However, monitoring relating to sockeye salmon would not be a DFO priority.<sup>458</sup> Dr. Martin Rosenau, instructor, Fish, Wildlife and Recreation Technology, British Columbia Institute of Technology,<sup>\*</sup> indicated that with limited funds the priority would be sturgeon, although this would not "diminish the requirement for sockeye to be assessed, as well."<sup>459</sup>

DFO is not able to do a cumulative effects assessment of the impact of gravel removals throughout the entire system because it is not able to forecast what sort of removals might be tabled in the future. This is one reason why DFO would like to see a longer-term comprehensive management program for the gravel reach.<sup>460</sup> Mr. Hwang pointed out that a longer-term management plan would likely widen the scope of project review under the CEAA<sup>†</sup> and this change would be positive in that it would allow for an understanding of the larger ecosystem impacts of gravel removal.<sup>461</sup> Dr. Rosenau added that impacts should be assessed on a time scale comparable to morphological and ecological changes (perhaps 10 years or more).<sup>462</sup> Dr. Rempel said the entire reach should be monitored, not just individual removal sites.<sup>463</sup>

## Forestry

Two levels of government are engaged in management of forestry impacts on fish habitat. Each province has the exclusive authority to make laws

for the development, conservation, and management of forestry resources.<sup>464</sup> The provincial government regulates the industry by granting licences to harvest timber, stipulating forestry practice requirements, and subsequently granting approval to licensees to carry out forestry activities. It exercises this authority mainly through the provincial *Forest and Range Practices Act*<sup>465</sup> (FRPA) and the *Forest Act*.<sup>‡</sup> The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO)<sup>§</sup> is the government agency responsible for the management of forest harvesting and the forest industry. DFO is responsible for protecting fish and fish habitat.

FRPA came into force in 2004. MFLNRO presented FRPA as a "results-based" approach to forestry management, relying on the professional reliance principle.<sup>466</sup> FRPA streamlined the planning process while maintaining tough penalties for non-compliance.<sup>467</sup> It calls for three operational plans: the forest stewardship plan, the site plan, and the woodlot licence plan. The forest stewardship plan and the woodlot licence plan require approval by the minister of MFLNRO. It also sets out broad objectives (including fish and fish habitat protection objectives), which a licensee must strive to meet when carrying out forestry practices. A licensee must describe its strategies to achieve the objectives set out in FRPA and its regulations.<sup>468</sup>

Developed under FRPA, the *Forest Planning and Practices Regulation* (FPPR) is the main regulation respecting fish habitat. It addresses (among other things): objectives set by government that must be included in the operational plans; practice requirements pertaining to soils, timber and forest health, riparian areas, watersheds, biodiversity, and roads; and reporting requirements. Specific objectives provided for in forest stewardship plans include those related to fish habitat.<sup>469</sup> The FPPR also sets out requirements for riparian areas.<sup>470</sup> It establishes stream, wetland, and lake riparian classes and sets restrictions on harvesting and road construction

\* Dr. Rosenau was qualified as an expert in freshwater fish habitat in flowing waters and rivers, with an emphasis on the Lower Fraser River (Commissioner, Transcript, November 4, 2011, p. 2).

† As noted above, Part 3, Division 1, of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and repeals the CEAA. Under the CEAA, 2012, gravel removal proposals may no longer require an environmental assessment as under the CEAA.

‡ The *Forest Act*, RSBC 1996, c. 157, grants the right to harvest timber in British Columbia and gives the Lieutenant Governor in Council the authority to make regulations to designate Crown land as mountain pine beetle salvage areas.

§ As the name of the provincial ministry responsible for management of forestry has changed a number of times over the years, this defined term refers to all of the previous ministries as well as the current one.

within the riparian management, riparian area zones, and riparian reserve zones.\* The FPPR also addresses other topics related to the protection of fish and fish habitat, such as temperature-sensitive streams, stream crossings, and fish passage.<sup>471</sup> Before 2004, and the passing of FRPA, the forest industry was regulated by the *Forest Practices Code* (Code), which comprised the *Forest Practices Code of British Columbia Act*, its regulations, guidebooks, and practice standards, and which included provisions pertaining to the protection of fish and fish habitat.

The transition to FRPA has significantly reduced requirements on industry.<sup>472</sup> FRPA is a results-based model, whereas the Code was a prescriptive model.<sup>473</sup> Despite the transition to FRPA, guidebooks developed under the Code remain important operational tools used by licensees, MFLNRO, and DFO, although they carry no legal weight.<sup>474</sup> The following are four guidebooks still relevant to the protection of fish and fish habitat created under the Code:

- Coastal / Interior Watershed Assessment Procedure Guidebook (1999);<sup>475</sup>
- Riparian Management Area Guidebook (1995) (RMA Guidebook);<sup>476</sup>
- Fish-stream Identification Guidebook (1998);<sup>477</sup> and
- Fish-stream Crossing Guidebook (2002).<sup>478</sup>

The province's introduction of FRPA in 2004 coincided with DFO's transition toward its national Environmental Process Modernization Plan (see discussion above in the section on habitat management, policies, and practices). Under FRPA, MFLNRO no longer refers the main operational plans it requires from licensees (the forest stewardship plans) to DFO for review. Since the advent of both FRPA and the EPMP, OHEB's BC Interior and North Coast offices have developed operating principles or position statements to clarify and confirm standards pertaining to forestry practices and activities in their respective areas.<sup>479</sup>

As part of the EPMP, DFO has developed operational statements, a number of which are applicable to forestry activities (see discussion above in the section on habitat management policies and practices).<sup>480</sup>

## Forest harvesting

Key fish-forestry issues have been the size of riparian management zones (especially around small fish-bearing streams and their tributaries) and stream crossings (mainly culverts) that can impede fish passage.<sup>481</sup>

In February 2000, the regional director general of DFO's Pacific Region wrote to the deputy minister expressing concerns that logging practices were being carried out adjacent to small fish-bearing streams and direct tributaries to fish-bearing streams without allowing adequate riparian leave strips. The letter attached a set of draft interim standards to meet DFO's fish habitat objectives. These interim standards were meant to be a temporary solution until the riparian provisions of the Code were reviewed.<sup>482</sup>

With the transition to FRPA and the EPMP, DFO's BC Interior office sent a letter to licensees and district managers to confirm DFO's requirements for compliance with the *Fisheries Act*. In this letter, the BC Interior OHEB staff adopted the 2000 interim standards with the caveat that the issue would continue to be reviewed.<sup>483</sup> In 2006, DFO, MFLNRO, and the forest industry agreed to make it a priority to revisit the RMA Guidebook in the context of FRPA, the EPMP, and the best available science, with a view to finding consensus on riparian standards. Accordingly, DFO proposed a draft work plan entitled "Review and Update of the Riparian Area Management Guidebook" for DFO, MFLNRO, and the provincial Ministry of Environment. This work plan included a timeline of deliverables that anticipated a redraft of the RMA Guidebook and implementation training to be completed by March 15, 2007.<sup>484</sup> This draft was not finalized, and the RMA Guidebook has not been updated.

The *Chief Forester's 2010 Annual Report on the Forest and Range Evaluation Program*, released in February 2011, recommended a no-harvest buffer around small fish-bearing streams and all perennially flowing, non-fish-bearing tributaries to them.<sup>485</sup> In January 2011, Extension Note 100<sup>†</sup> was developed by MFLNRO, DFO, and Pierre Beaudry and Associates. The extension note recommends

\* Riparian management areas and zones and riparian reserve zones are defined in Table 1 of Exhibit 1110 (BC Ministry of Forests, Riparian Management Area Guidebook [1995]).

† MFLNRO publishes its policies or practices in a series called "Extension Notes."

best management practices, similar to those recommendations contained in the RMA Guidebook.<sup>486</sup>

Before the release of the revised Fish-stream Crossing Guidebook (2002), DFO's policy was that all proposed bridges or culverts across anadromous fish-bearing streams were to be referred to DFO for review and comment.<sup>487</sup> DFO endorsed the Fish-stream Crossing Guidebook (2002), but has since raised concerns about culverts installed before both the Code (1995) and the Fish-stream Crossing Guidebook (2002).

In 2008, the FRPA Joint Management Committee Fish Passage Technical Working Group was formed by MFLNRO, the Ministry of Environment, and DFO to establish a working relationship with a view to identifying and rectifying problem culverts obstructing fish passage. The technical working group estimates that there are approximately 370,000 stream crossings in British Columbia. It also estimates that 76,000 fish-stream culverts need to be assessed and that the estimated number of culverts presenting fish passage problems in the province, which are likely in need of repair or replacement, is 30,000–70,000. The technical working group developed a strategic approach which outlines the process it will follow to address the fish passage issue. It estimates that \$4 million per year is required to allow the group to implement the key elements of the strategic plan.<sup>488</sup> Peter Delaney, former chief, Habitat Policy Unit and Fish Habitat Unit, and senior program advisor, OHEB, said that it would require hundreds of millions of dollars to fully rectify the fish passage issue in the province.<sup>489</sup>

In 2009, the Forest Practices Board\* released the *Special Investigative Report – Fish Passage at Stream Crossings* (2009 Special Investigative Report), which assessed fish passage at stream crossings in the central and northern interior and on Vancouver Island. A total of 1,110 crossings of fish-bearing streams in 19 watersheds were assessed; these crossings were installed before the Code, during the tenure of the Code, and after the passing of FRPA. The report found that only 42 percent of the 1,110 road crossings were sufficiently well designed to allow salmon, trout, and other fish to swim freely above them. The report has only one recommendation: “[T]hat government

take the necessary actions to ensure fish access to valuable habitat is maintained and restored.”<sup>490</sup> Ian Miller, manager, Sustainable Forestry Management, MFLNRO, supported this recommendation. In terms of what the province is doing to implement it, he said that British Columbia ensures access to habitat is maintained by forest tenure holders by insisting on compliance with provincially legislated requirements through enforcement actions, and that typically the province sees very high rates of success with this approach.<sup>491</sup>

In addition, the Forest Practices Board noted that, while section 56 of the FPPR requires licensees to ensure that forestry practices do not have a “material adverse effect on fish passage,” the legislation fails to define “material adverse effect.” As a result, “[I]t became apparent to the Board there are differences of opinion among enforcement agencies about what constitutes a material adverse effect on fish passage and how the assessment methodology for fish passage should be interpreted in the context of enforcement of the legislation.” Accordingly, the Forest Practices Board encouraged the MFLNRO, the Ministry of Environment, and DFO to come to an agreement on what constitutes a material adverse effect and how the legislation should be enforced.<sup>492</sup>

MFLNRO advised the Forest Practices Board as follows:

- Through the Forest Investment Fund (the primary funder for assessments of crossing structures) approximately \$9 million of provincial funding has been allocated in the past two fiscal years to conduct crossing assessments and to rectify priority (pre-Code) problematic structures. To date, approximately 5,000 stream crossing sites have been investigated, approximately 1,500 sites have been fully assessed, and about 50 restoration / remediation projects have been undertaken at an average cost of \$90,000 per crossing.
- The current focus is to develop a web-based course to develop a strategic approach to crossing assessments and remediation, assessment methodology, and basic fish biology.

\* The Forest Practices Board reports to the public on industry and government compliance with British Columbia's forest practices legislation (Ian Miller, Transcript, June 17, 2011, p. 68).

- In collaboration with DFO and provincial Ministry of Environment, MFLNRO created and posted on its website in December 2009 CEPS Bulletin 40 – “Guidance to C&E Program staff and delegated decision makers on interpreting the words ‘material adverse effect’ and ‘material adverse impact.’” MFLNRO says that fish passage assessment for compliance and enforcement will remain a provincial priority for 2010–11.<sup>493</sup>

*The State of British Columbia's Forests, Third Edition* (2010), relies on the 2009 Special Investigative Report. Ninety-four percent of the 1,202 sites assessed found forest-road stream crossings to have low to moderate potential to transport sediment into a stream.<sup>494</sup>

Dr. Peter Tschaplinksi, research scientist, Fish-Forestry Interactions and Watershed Research, Ministry of Environment, testified about fish habitat passage obstructions, in particular those that are a consequence of improperly installed road-crossing structures in streams.<sup>495</sup> Many of the impacts he identified are road related.<sup>496</sup> Mr. Miller agreed that maintenance of fish passage infrastructure has been a problem at stream crossings. However, he also described how the technical working group is tackling these issues and said that a recent provincial funding program called the Land Base Investment Program provides funding for improving fish passage.<sup>497</sup> Over the past four years, \$15.5 million has been allocated from this program, the bulk of the money going to the collection of assessment data. The province also remediates 10 to 20 crossings every year to fix the “most egregious problems and the ones that are going to give us back access to the best and most habitat that we can.”<sup>498</sup>

When asked if the size of riparian management zones and stream crossings were still key issues for DFO, Mr. Delaney stated that DFO has not reviewed whether its concerns have been addressed.<sup>499</sup> He was unaware of any structured review by DFO of “State of Stream Channels, Fish Habitats, and their Adjacent Riparian Areas: Resource Stewardship Monitoring to Evaluate the Effectiveness of Riparian Management, 2005–2008” (FREP Report)<sup>500</sup> but he noted that some of the recommendations coming out of it, such as the 10 m leave strip along streams and the reserve zone, are two items that DFO has been trying to get incorporated into the RMA Guidebook.<sup>501</sup>

### ***DFO withdrawal from fish-forestry work***

The FRPA Joint Management and Steering committees were formed in 1995 to foster cross-agency communication and decision making on policy initiatives and operational issues related to FRPA. The FRPA Joint Management Committee reports to the FRPA Joint Steering Committee and comprises director-level management members from DFO and provincial agencies. The FRPA Joint Steering Committee comprises assistant deputy ministers of policy and/or operations from DFO and provincial agencies.<sup>502</sup>

I heard that DFO’s role in forestry issues and fish-forestry interactions has decreased since the mid-2000s, although it is represented on the two FRPA joint committees.<sup>503</sup> A DFO document entitled, “BCI Mid-Fraser-Thompson-Okanagan Habitat Management Section Program Review, January 2007,” states that “virtually no forestry or agriculture issues are being addressed” in the DFO BC Interior office, and at that time, its staff were no longer attending district or regional forestry meetings.<sup>504</sup>

DFO does not have a fish-forestry person working out of its regional headquarters as it had until the early 2000s; Mr. Delaney also said that, by the mid-2000s, the priority placed on the fish-forestry file had decreased.<sup>505</sup> At one time, DFO had a fish-forestry technical working group, but this “fell apart in about 2006, 2007.”<sup>506</sup> There is no viable referral system or standard way for DFO to communicate with forest licensees or the province.<sup>507</sup> According to Mr. Delaney, DFO is not doing referral work on forestry because logging plans are not referred to it and/or these plans are not a priority for field staff given other demands on their time.<sup>508</sup> Mr. Delaney could not say whether the withdrawal of DFO on forestry issues had affected the health of Fraser River sockeye salmon.<sup>509</sup>

DFO has also become less involved with the research and monitoring of fish-forestry interactions, although some close connections remain between DFO and provincial scientists, and DFO Habitat Management Program staff have done some monitoring of stream crossings.<sup>510</sup> DFO has no active fish-forestry research under way, and DFO research funds in this area have dried up.<sup>511</sup> DFO does not undertake any of its own field assessments on streamside retention zones.<sup>512</sup>

Finally, Mr. Delaney told me that DFO has little, if anything, in the way of broad-scale level (as opposed to local level) work with First Nations or environmental organizations on forestry activities and protection of fish habitat. He added that monitoring is an area of potential partnership with First Nations or environmental organizations at the local level.<sup>513</sup> Mr. Delaney described a number of reasons for this disengagement by DFO on fish-forestry issues: DFO's move to a results-based professional reliance model, which has resulted in not as many referrals coming to DFO to review; the EPMP streamlining processes; reductions in staff; and an increase in development activities.<sup>514</sup>

### *Mountain pine beetle*

The mountain pine beetle epidemic increased significantly after 1997, peaked in 2007, and then began to decline in 2008. On average, mountain pine beetle attacked 99,600 hectares of forested pine per year from 1962 to 1997, and 4.5 million hectares per year from 1998 to 2008. From 2003 to 2007, approximately 88–95 percent of the annual mountain pine beetle infestation occurred in the Fraser River basin. Within the Fraser River basin, the regions of Cariboo-Chilcotin (at 49–51 percent infested) and the Upper Fraser (at 37–44 percent infested) experienced the greatest impact.<sup>515</sup>

In response to the mountain pine beetle epidemic, MFLNRO increased the allowable harvest levels in order to salvage the pine before the trees rotted in place. In August 2004, OHEB's BC Interior acting area chief wrote to the chief forester about the increase in allowable annual cut, stating DFO's support for a precautionary management approach due to the uncertainties surrounding the mountain pine beetle epidemic. Specifically, it recommended the following management actions:

- implementation and monitoring of watershed assessment procedures (provided in the Coastal / Interior Watershed Assessment Procedure Guidebook);
- protection of streamside and riparian areas as provided for by the Code and RMA Guidebook;
- protection of streams not provided for in the Code or RMA Guidebook;

- development of indicator basins for long-term monitoring to assist in management decisions; and
- inclusion of academics and the community in developing and carrying out monitoring programs.<sup>516</sup>

The March 2007 report of the Forest Practices Board noted that FRPA fails to require landscape-level watershed assessments or planning for most mountain pine beetle-affected watersheds and found that government needs to develop policy and strategies to protect fish habitat in such watersheds:

[M]ore consideration of the hydrological effects of [mountain pine beetle] is needed operationally. Priorities should include watershed planning, harvest scheduling, riparian retention, and assessment of the adequacy of drainage structures.<sup>517</sup>

Later in 2007, a presentation to DFO's Pacific Region Strategic Directions Committee (for a description of this committee, see Chapter 4, DFO overview) highlighted the need for DFO to consider seriously its role in mountain pine beetle management. The presentation noted the following key issues: the lack of DFO involvement; the lack of federal priorities to address the mountain pine beetle issue in a manner that provides for the protection of fish and water resources; and the importance of the latter, given the provincial approach does not focus on protecting water quality, preserving fish habitat, or preventing flooding.<sup>518</sup>

In December 2007, the DFO minister's office directed the Pacific Region to develop a "coordinated approach to salmon sustainability and to begin discussions related to a briefing of federal ministers around horizontal coordination on pine beetle and watershed management." In 2008, DFO's key science advice regarding mountain pine beetle was to leave riparian buffers and implement the "precautionary principle."<sup>519</sup> In 2009, MFLNRO scientists recommended a 10 m buffer for small streams in mountain pine beetle salvage areas.<sup>520</sup> This recommendation has not been implemented.<sup>521</sup>

Given what is unknown about the effects of the mountain pine beetle on fish-forestry interactions in the future, Dr. Tschaplinski recommended

researching large-scale, clear-cutting impacts on fishery values.<sup>522</sup>

### ***Log storage / handling on the Fraser River estuary***

Log handling refers to the “[e]stablishment and operation of aquatic and terrestrial areas used for storing and sorting logs and includes log sorts at pulp mills and sawmills and underwater log salvage.” Operations include the initial transfer of logs to water, sorting, booming, barging, transport, and storage. Because of the terrain, coastline, and economic realities of moving wood products in British Columbia, log-handling operations are often situated in (or near) marine or freshwater. In fact, most coastal forest tenures are log-handling facilities; however, only parts of these sites operate at any one time.<sup>523</sup>

Current log-handling site selection and operational procedures are regulated by a number of federal and provincial acts. Guidelines developed in 2003 for DFO direct operations into “steep and deep” areas and away from highly productive intertidal and shallow sub-tidal areas. These guidelines aim to assist proponents and regulatory agency personnel in meeting relevant log-handling environmental legislation. They describe best management practices for siting and design of log-handling facilities and log-transfer activities, as well as the design, orientation, construction materials, and chemical treatments of wharves, docks, piers, and floats, and the design of dry-land sort facilities.<sup>524</sup>

In 2009, DFO collaborated with the BC Coastal Forest Product Association to develop best management practices for log-handling activities, which aim to streamline DFO regulatory reviews of low-risk activities related to log handling. Relevant best management practices include helicopter log drop sites in marine waters of British Columbia and re-activated log dumps in marine waters of British Columbia. Also available is a land-use operational policy on log handling produced by the province.<sup>525</sup>

I heard some evidence that disturbance because of log storage on the Fraser River estuary has the potential to affect Fraser River sockeye.<sup>526</sup> Technical Report 3, Freshwater Ecology, looked at data describing the extent of log storage in the

Fraser River estuary as well as a time series of aerial photos in order to assess the potential impact of this activity on Fraser River sockeye. For discussion of the evidence on this with respect to impacts on Fraser River sockeye, see Volume 2 of this Report.

## **Findings**

### ***Riparian areas***

Riparian areas are important for Fraser River sockeye salmon. Loss or degradation of riparian habitat poses risks to Fraser River sockeye sustainability.

Under the *Riparian Areas Regulation* (RAR), a proponent must have an assessment report completed by a qualified environmental professional (QEP) before development may be approved or allowed by local governments. The provincial Ministry of Environment started compliance monitoring for the RAR and is developing an effectiveness monitoring plan, although at the time of the hearings in June 2011, the time frame for developing this plan was uncertain. The Department of Fisheries and Oceans (DFO) is not engaged formally in RAR monitoring although it participates on an opportunistic basis. Provincial compliance monitoring in relation to the RAR is broken into three components: QEP, local government, and developer compliance. DFO and the ministry agreed on a RAR compliance target of 90 percent compliance with 90 percent confidence.

Although the province has taken some positive steps toward auditing QEP assessments under the RAR, the evidence raises questions about whether this professional reliance model achieves the purposes for which it was developed. Specifically, I heard that almost half the incidents of non-compliance with the regulation were because of errors by QEPs and I heard concerns about the amount of discretion they have in the assessment process. The ministry notified QEPs of the results of its review, and if the errors were considered a serious concern, then the ministry had “more serious discussions with” the QEP and his or her professional association. The QEP training course was also improved based on some of the compliance information collected, although this course is not mandatory for QEPs. I also heard that local government and developer compliance with the

regulation is low. Only 60 percent of local governments were found to be compliant, meaning that 40 percent did not have the appropriate bylaws in place to trigger regulatory action under the RAR. Developer compliance was 38 percent on Vancouver Island and 48 percent on the mainland. By the time of the hearings, no compliance reports had been completed since 2009 and no changes to the RAR were made on the basis of compliance reporting results. I heard no evidence that anything other than the compliance assessments and the actions taken by the ministry in relation to QEP reports, has been done to ensure achievement of the RAR compliance target of 90 percent with 90 percent confidence.

Until recently, if a proponent sought to vary the streamside protection and enhancement area recommended in a QEP's assessment report, the provincial Ministry of Environment would notify DFO, and DFO would be responsible for approving the application for a variance. However, as a result of the decision of the BC Court of Appeal in *Yanke v. Salmon Arm (City)*, developments that require variances to the streamside protection and enhancement area, but that do not result in harmful alteration, disruption, or destruction of fish habitat (HADD), do not require approval by DFO or the Ministry of Environment. The court ruled that there is nothing in section 4 of the RAR that allows DFO to veto a development proposal that is before a local government where the QEP has given an opinion that the proposed development will not result in a HADD. I am concerned that DFO may have no proactive input into the development process, even though it is responsible for the protection of fish habitat and has extensive experience in this issue. It is left with only the reactive, and rather blunt, instrument of section 35 of the *Fisheries Act*.

I find the key benefits of the RAR are: the explicit requirement for local governments covered by the regulations to have riparian protection in their bylaws; the ability to protect previously disturbed habitat, as well as pristine habitat; and the identification of streamside enhancement as well as protection, so the regulation promotes restoration or recovery and not just protection of existing habitat as under section 35 of the *Fisheries Act*. Critical deficiencies of the RAR include: it does not apply to all areas of the Fraser

River watershed; QEPs have too much discretion; it does not require follow-up by the municipalities to ensure that the measures required in the assessment reports are implemented; and there is no enforcement mechanism to ensure compliance with the regulation.

I accept the evidence that there is a regulatory gap in protection for some riparian areas. Lands adjacent to water courses may be privately owned, but in the case of lakes, private ownership applies only above the high-water mark. The provincial *Water Act* controls works "in and around streams," but I understand that the province interprets this phrase to extend only up to the high-water mark. Thus, works above the high-water mark are not regulated under the *Water Act*. The RAR only applies above the one-in-five-year flood elevation, which is higher than the high-water mark. Thus, there is a physical gap between the high-water level (the *Water Act* limit) and the one-in-five-year level (the RAR level), and works undertaken in this area are subject to no provincial regulatory control.

Finally, I heard unanimous testimony from DFO and the province that the Shuswap Lake Integrated Planning Process is a good process that allows agencies from all levels of government, as well as First Nations and stakeholders, to focus on the habitat management of Shuswap Lake. At the time of the hearings, however, there was no secured funding for the initiative.

### ***Water use***

I accept the evidence of Jason Hwang, area manager, Oceans, Habitat and Enhancement Branch (OHEB), BC Interior, that the *Fisheries Act* is generally not enforced against water users and that federal regulatory tools are limited and not particularly well-suited to managing water use for the benefit of fish. Given that conclusion, the province's role in the regulation of water use in the Fraser River is important. I find the following potentially harmful to Fraser sockeye:

- the lack of regulation of groundwater;
- the lack of a requirement for the comptroller or regional water manager to consider instream flows and fisheries impacts when making licensing decisions; and



- the inability of the comptroller or regional water manager to restrict water use for the purpose of protecting fish.

Given these findings, I acknowledge and laud the efforts of the province with respect to *Water Act* modernization. In its final submissions, Canada also indicated that it supports the province's efforts to modernize the provincial *Water Act*.<sup>527</sup>

With respect to hydroelectric power projects, I conclude that the development of water use plans for BC Hydro power projects has been beneficial to the protection of sockeye habitat. I find that, as Dr. Steve MacDonald, research scientist and head, Environmental and Aquaculture Research Section, DFO, testified, the Summer Temperature Management Program is an effective strategy to protect Fraser River sockeye. The evidence regarding independent power projects does not indicate that there are negative impacts on Fraser River sockeye at this time; however, I note the concern expressed by Dr. Craig Orr, executive director, Watershed Watch Salmon Society, about the lack of public input into siting and water flow guidelines for these projects.

### ***Gravel removal***

I accept the evidence from both experts who testified on this subject, Dr. Laura Rempel, habitat biologist, OHEB, and Dr. Marvin Rosenau, instructor, Fish, Wildlife and Recreation Technology, British Columbia Institute of Technology, that there are gaps in the data with respect to sockeye and the gravel reach habitat, and I note that DFO is aware of the need for long-term planning, comprehensive monitoring on a reach-wide scale, and adequate habitat compensation from the proponent. I encourage DFO to consider supporting research on the annual pattern of fish activities within the gravel reach, including research directed at developing a better understanding of the spatial and temporal distribution of river-type sockeye in the gravel reach, habitat characteristics that river-type juvenile sockeye depend on, and the overall importance of these habitats to those fish. But, I am cognizant of that fact that DFO must prioritize its research, and I do not find myself compelled by the evidence to recommend prioritizing research on sockeye salmon over other species that may be

more threatened by gravel removal in the Lower Fraser River.

### ***Forestry***

I find that DFO has decreased its role in fish-forestry interactions and forestry-related reviews. Since the early 2000s, DFO has not had a fish-forestry person working out of its regional headquarters, and in about 2006, its Fish-Forestry Technical Working Group (a regional forum to communicate and discuss fish-forestry interaction issues, make recommendations to senior management, and facilitate communication between area Habitat Management Program staff and regional headquarters) was disbanded. There is no viable referral system or standard way for DFO to communicate with forest licensees or the province. According to Peter Delaney, senior program advisor, OHEB, DFO is not doing referral work on forestry because logging plans are not referred to it and/or they are not a priority for field staff given other demands on their time.

As well, DFO has also become less involved with the research and monitoring of fish-forestry interactions, although some close connections remain between DFO and provincial scientists, and DFO Habitat Management Program staff have done some monitoring of stream crossings. DFO has no active fish-forestry research under way, and DFO research funds are no longer directed to this area. DFO does not undertake any of its own field assessments on streamside retention zones. With respect to mountain pine beetle management, I agree with DFO's view of the need for a precautionary management approach, including leaving riparian buffers.

To the extent that I make recommendations in these areas, I discuss these findings in Volume 3 of this Report.

## **■ Marine habitat**

In this section I summarize the evidence on several topics specific to the marine environment: the marine spill response process; DFO's management of marine science issues relevant to Fraser River sockeye salmon (including Fraser River sockeye marine survival research, marine climate change research, and harmful algal blooms); oceans management; and the Disposal at Sea program.

## Marine spill response process

The federal government has primary responsibility for regulating pollution originating at sea (marine-based pollution).<sup>528</sup> The provinces are responsible for regulating many aspects of land-based pollution, but the federal government also plays a role in regulating the latter under the *Fisheries Act* in relation to fish habitat (section 36 and associated regulations deal with specific industries such as pulp and paper and metal mining).

The *Canadian Environmental Protection Act, 1999* (CEPA), addresses pollution.<sup>529</sup> The Act aims to protect the environment and human health by managing marine pollution, disposal at sea, toxic substances, and other sources of pollution. Land-based sources of marine pollution are addressed under CEPA Part 7 (Controlling Pollution and Managing Wastes), Division 2 (Protection of the Marine Environment from Land-based Sources of Pollution). The term “land-based sources” in CEPA Part 7, Division 2, means “point and diffuse sources on land from which substances or energy reach the sea by water, through the air or directly from the coast.”<sup>530</sup> “Marine pollution” in Part 7 is “the introduction by humans, directly or indirectly, of substances or energy into the sea that results, or is likely to result, in (a) hazards to human health; (b) harm to living resources or marine ecosystems; (c) damage to amenities; or (d) interference with other legitimate uses of the sea.”

The provincial *Environmental Management Act* governs environmental protection and management in British Columbia, including effluents introduced to the environment from point sources such as wastewater treatment plants, pulp mills, and mines.<sup>531</sup> The primary provision governing the disposal of waste into the environment is section 6 and the *Waste Discharge Regulation*.<sup>532</sup>

The *Fisheries Act*, CEPA, and the provincial *Environmental Management Act* are described in Chapter 3, Legal framework.

### Regulatory roles

Transport Canada is the lead regulatory agency for all ship-source spills. It also manages the National Aerial Surveillance Program, approves ship-source pollution prevention and response plans on large commercial vessels, approves oil handling facility

response plans, certifies response organizations, monitors their activities and exercises, maintains the Pollutants List, and is responsible for enforcement and compliance with the *Canada Shipping Act* (CSA).<sup>533</sup> Transport Canada is responsible for administering most regulations under the *Canada Shipping Act*.

The Department of National Defence (DND) is responsible for marine spill response, including cleanup and monitoring, from DND ships and facilities.<sup>534</sup> All spills are handled under DND Environmental Directive ED 4003-1/2003 (ED 4003-1), which is specific to DND’s Maritime Forces Pacific (MARPAF), and under local policies and procedures such as the Formation Safety Environment System Manual. DND determines whether the spill is a deleterious substance on a site-specific and incident-specific basis and, if so determined, DND reports the spill to the Provincial Emergency Program, which in turn reports spills to Environment Canada and DFO.

Environment Canada, and in particular its Environmental Emergencies Program, is the lead agency for land-based spills into the marine environment from federal facilities and lands. For other land-based spills, the province, through the Provincial Emergency Program, is the lead agency, and Environment Canada provides environmental advice and support.<sup>535</sup> A 1981 agreement between Canada and British Columbia determines whether Environment Canada or the province will be the lead agency for land-based spills.

The Canadian Coast Guard (Coast Guard) is the lead federal agency responsible for ship-source and mystery-source pollution incidents in Canadian waters, which include all waters out to the exclusive economic zone (that is, the 200 nautical mile limit) and internal waters including lakes and rivers. The legislative mandate for this responsibility arises primarily from section 180 of the CSA and section 41 of the *Oceans Act*. The Coast Guard is a special operating agency within DFO; the commissioner of the Coast Guard reports to the deputy minister of DFO.<sup>536</sup>

The Coast Guard has a Marine Spills Contingency Plan with national, regional, and area chapters.<sup>537</sup> The role of the Coast Guard is twofold: (1) overseeing a polluter’s response to a marine pollution incident;<sup>538</sup> or (2) if the polluter is unknown or unable to respond, managing the response to the incident.<sup>539</sup> Once the

Coast Guard assumes management of the response to a pollution incident, its on-scene commander initiates a response in one of five categories. The level of response depends on either the type of incident or the type of response that the incident requires and is not necessarily related to the severity of the incident.<sup>540</sup>

The Coast Guard does not consider the evaluation of habitat impacts as its mandate. Rather, it relies on Environment Canada and DFO to determine long-term habitat impacts.<sup>541</sup> Sergio Di Franco, senior enforcement and prevention officer, Environmental Response Branch, Coast Guard, testified that the Coast Guard brings a variety of expertise to marine pollution incidents and environmental response: operational, response management; technical, logistical, and public relations experience; as well as experience dealing with polluters. He noted advantages to the Coast Guard's role as the first responder, including the Coast Guard's organizational structure, staffing, response equipment depot sites, vessel support, logistical support, air support, and liaison experience with other government agencies.<sup>542</sup>

### ***The Regional Environmental Emergency Team***

According to Mr. Di Franco, the Regional Environmental Emergency Team (REET) is the group that develops monitoring plans for habitat issues and conducts long-term monitoring of a particular site. It is a body of experts that provides technical, scientific, and environmental advice to the Coast Guard and is chaired by Environment Canada and the province (Ministry of Environment). A REET is not convened for the majority of marine pollution incidents, where the Coast Guard has determined that these are small discharges of oil that disperse quickly, there are no major resources at risk, and/or no impacts are noted.<sup>543</sup>

Upon receiving a call about a marine pollution incident, the Coast Guard will do an assessment, and, if it determines further information is required, it will call Environment Canada to activate a REET. A REET can also self-activate if Environment Canada feels it is necessary to have a REET to deal with a certain incident. Mr. Di Franco explained that, in determining whether a REET is required for a marine spill, the Coast Guard does not generally talk with non-Coast Guard DFO, but it talks with the

Environment Canada chair and provincial co-chair of the REET. The Coast Guard assesses whether a REET is required based on visual observations of the spill site (including verification that an incident has occurred, identifying a source for the pollution, and identifying the resources at risk). The Coast Guard Marine Spills Contingency Plan outlines the steps to be taken during this assessment. Mr. Di Franco testified that the Coast Guard person who makes this assessment (the environmental response duty officer) may not understand the short- and long-term impacts on fish and fish habitat from oil spills.<sup>544</sup>

The Coast Guard relies on the REET for advice about impacts on anadromous fish and fish habitat in the marine environment. The Environment Canada chair of the REET determines the agencies that should participate in the REET to determine these impacts.<sup>545</sup> Bruce Reid, former (2007–9) regional manager of Habitat Protection and Sustainable Development, OHEB, and, at the time of the hearings, regional manager, Oceans Program, OHEB, said that, in his experience, the chair of the REET seeks advice from DFO on impacts related to anadromous fish and fish habitat and DFO provides this advice.<sup>546</sup>

The REET is only an advisory organization, and the Coast Guard can choose to ignore its advice.<sup>547</sup> Whether the Coast Guard follows the REET's advice depends on a variety of factors and circumstances. Mr. Di Franco testified that "[g]enerally, the Coast Guard does accept REET's advice, but the information that is provided by REET is just one component of the overall response plan."<sup>548</sup> However, Dr. Peter Ross, research scientist, Marine Environmental Quality Section, Institute of Ocean Sciences, Science Branch, testified that, in his experience, the Coast Guard ignored the REET's advice.<sup>549</sup>

In deciding whether to follow advice from the REET, Mr. Di Franco listed a number of things to be considered: worker safety issues, public safety issues, nature of the product spilled, weather conditions, forecast conditions, tide information, and cost and reasonableness of the monitoring. The Coast Guard can also take into account information sheets or standards from international science organizations. Even if the Coast Guard had advice from DFO Science particular to the spill at issue, this specific science advice may not take precedence over the international information sheets. Similarly, the Coast Guard may prefer the approach

of the polluter or cleanup company over the advice of the REET.<sup>550</sup>

Mr. Di Franco stated that any action taken by a polluter or the Coast Guard has to “pass the test of reasonableness.” Elaborating on this criterion, he said, “[T]he actions have to be reasonable in that we cannot implement any action or response action that is too costly and above and beyond what a reasonable person would implement.” He explained that this is because the Coast Guard always tries to recover its costs for marine spill response from the polluter, its insurance company, or the Ship Source Oil Pollution Fund. When a claim is submitted to one of these three, the Coast Guard has to demonstrate reasonableness or it will not recover its monitoring or response costs. This demonstration involves a cost-benefit analysis to help determine if an action is “reasonable.”<sup>551</sup>

The Coast Guard on-scene commander or federal monitoring officer (that is, the Coast Guard representative at the spill) normally makes the decision as to what is reasonable, but he or she can consult with Coast Guard staff, even up to the associate deputy minister or minister level, as needed.<sup>552</sup> Guidelines to assist in the selection of an appropriate on-scene commander or federal monitoring officer are the same and are set out in Coast Guard directives.<sup>553</sup> One of the items listed is “the ability to identify the public’s interests and priorities.” When asked how that quality is determined, Mr. Di Franco did not answer but stated that identifying the public’s interests and priorities is mainly conducted through a local liaison officer and this person would communicate his or her assessment of the public’s interests, priorities, and concerns to the on-scene commander.<sup>554</sup>

### ***Sampling and monitoring of marine pollution incidents***

The collection of samples or monitoring of a spill is specified in a monitoring plan for the spill. According to the Coast Guard, if a polluter is willing and able to respond to a spill, then the polluter is the one who develops the monitoring plan, and the plan is given to the Coast Guard and the REET (if one is convened) for review and comment. If any changes or amendments to the monitoring plan are required, then the Coast Guard will ensure that the polluter makes those amendments. If it is a mystery

spill or if the polluter is unable to respond and produce a monitoring plan, then it is the REET’s responsibility (again, if one is convened) to develop the monitoring plan.<sup>555</sup>

Ensuring that monitoring plans are implemented as described in the plan is the responsibility of the Coast Guard. Results of the monitoring go to the Coast Guard and to the REET, if a REET is convened.<sup>556</sup>

Dr. Ross said that understanding and mitigating impacts to natural resources requires scientific knowledge, active scientific investigation, and sample collections.<sup>557</sup> Mr. Reid agreed that monitoring programs are highly scientific and require experienced knowledge of what to sample, how to sample, where to sample, etc.<sup>558</sup> The list of competencies for on-scene commander or federal monitoring officer does not include these requirements.<sup>559</sup>

Dr. Ross expressed concern about whether the Coast Guard is the best decision maker for marine spill mitigation and monitoring. His concern stems primarily from his experience with a spill off Robson Bight in 2007. Initially, he was frustrated that the REET members did not have any fish or fish habitat expertise, although a DFO biologist from a local area office was eventually brought in. DFO Science provided advice through the REET regarding immediate steps to take to mitigate the effects, and the Coast Guard acted quickly on this advice.<sup>560</sup> However, the Coast Guard did not accept the REET’s advice regarding the longer-term monitoring plan. Instead, it followed a US National Oceanic and Atmospheric Administration (NOAA) fact sheet on small diesel spills.<sup>561</sup> In a 2007 email chain, Dr. Ross expressed his frustration with this decision, and he elaborated on this reaction at the hearings:

Yeah, I think what we’re seeing here is a little bit of frustration on my part and of course, this was an email which is now very much in the public light, but you know, the frustration was a personal and professional one. I was involved in this REET, and on the call, one of the things that is not captured here is that on the call, First Nations were very upset and very concerned about diesel getting into some of their local clam beds, which was happening. And I had suggested, on the calls, that we collect shellfish samples and, potentially, water samples, to conduct hydrocarbon measure-

ments. And we did have enforcement officials, Conservation Protection had a team of two on scene, they were able to collect samples, but they were instructed not to, despite having volunteered to do that. And I guess, you know, in terms of what had happened, as I recall, there were concerns expressed on a conference call by Coast Guard that LeRoy Trucking Company did not have the funds to carry out some of these monitoring efforts.

Now, being sensitive to that because, as a scientist, I know how difficult it is to raise money for research, and I know how expensive these analyses can be, I understood where that came from. At the same time, I was frustrated that as a scientist, with no budget and no capacity to follow my own recommendations, I was frustrated that nobody else was seemingly in a position to be able to fund some of these things which I considered to be an important part of making sure that the food supply, traditional food supply of local First Nations was safe, that killer whales were protected, and that we were really understanding where these different types of hydrocarbons were going in that local environment over time.<sup>562</sup>

Despite having advice from local experts, the Coast Guard decided to rely on a one-page fact sheet from NOAA relevant to only one of the substances of concern in the spill.<sup>563</sup>

Although Mr. Di Franco did not make the decision for the Coast Guard on the Robson Bight monitoring plan, he explained his understanding about the Coast Guard's considerations in deciding not to follow the REET's advice on monitoring: there were no reports of impact on birds or marine mammal fatalities attributed to the spill, and the area where the incident occurred is a heavy marine traffic area where discharges of diesel or other oils occur on occasion, and so it was not reasonable to monitor until no detectable hydrocarbons were found in the area. Also, the Coast Guard concluded, based on the amount of oil observed at the time and the depth of the ocean, that the majority of diesel had escaped during the sinking of the tanker truck, and according to an engineering study at the time, the Coast Guard was advised that whatever amount of diesel was left on the bottom would probably seep out of the truck over a long period of time and

would be undetectable. Mr. Di Franco testified that he thought the initial response to the incident was handled adequately based on the fact that there was very little diesel at the surface, the depth of the tanker truck was 350 m, the majority of diesel escaped at the onset of the incident, and, six or seven weeks after the incident, there were no reports of seepage coming from the truck. (Later it was found that the tank was intact with at least 3,000 L of diesel still in it.) Eventually, DFO and the province decided to bring the truck up from the bottom, against the Coast Guard's recommendation. Mr. Di Franco said this was not a reasonable response because the Ship Source Oil Pollution Fund did not think that it was a reasonable operation.<sup>564</sup>

In response to the more general question of whether the Coast Guard is the appropriate agency to determine monitoring and mitigation plans to protect anadromous fish and fish habitat, Mr. Di Franco responded that the Coast Guard does not have the expertise to develop the monitoring plans and that is why it relies on the REET's expertise to develop them or to review the polluter's plan.<sup>565</sup> He did not say how the Coast Guard could fulfill this responsibility when a REET is not convened.

### ***DFO Science's and OHEB's role in marine pollution incidents***

There is no requirement that DFO Science or OHEB be represented on the REET. The Environment Canada chair decides who will be brought in depending on the issues to be dealt with.<sup>566</sup> Both Dr. Ross and Mr. Reid said that, if DFO does not have a strong presence on the REET, then fish and fish habitat are unlikely to be properly identified, protected, assessed, and monitored.<sup>567</sup>

In 2007, there was a spill in Burrard Inlet from the Kinder Morgan fuel line. Because it was a land-based spill, the province was responsible for managing the spill response rather than the Coast Guard.<sup>568</sup> Coincidentally, Dr. Ross was in the area doing field work when the spill happened. Based on what he saw, he had concerns for anadromous fish and fish habitat. However, there was no avenue for him to provide direct science advice to the REET; he could only do so through OHEB, which was represented on the REET.<sup>569</sup> Based on the response to the Kinder Morgan spill, some DFO staff argued that DFO's role during major pollution events needed

to be clarified. If Environment Canada, as the chair of REET, decides to bring in DFO, it contacts the appropriate area director, who then contacts an OHEB area chief (or area manager), who in turn contacts an area biologist. However, according to Dr. Ross and Mr. Salomi, OHEB area biologists are not familiar enough with oil or chemical spill impacts, contaminants, or cleanup techniques to give practical or effective support to the REET.<sup>570</sup>

Dr. Ross said it is important to consult scientists who are experts in the field so that they can provide advice, recommend sampling and monitoring, and help guide mitigation efforts or cleanup. He also said that, if samples are not collected under the guidance of scientific researchers who are experts in the collection and selection of samples and the design of follow-up studies, then prosecutions or attempts to make the polluter pay are impaired.<sup>571</sup> Mr. Reid testified that DFO has considerable knowledge and expertise in the biology, ecology, and habitat requirements of anadromous fish and fish habitat, and so in the event of a spill he would expect that DFO's advice would be important.<sup>572</sup> There is no one person at DFO who coordinates the DFO response to a spill.<sup>573</sup> Mr. Reid said that there would be benefits to having such a person in a coordinating role.<sup>574</sup> Currently there are director-level discussions between DFO and Environment Canada to confirm the role of DFO on the REET.<sup>575</sup> Dr. Ross said that there should be a formalized role for the provision of DFO Science and/or OHEB advice on spill impacts to the Coast Guard,<sup>576</sup> and the Coast Guard should not ignore this advice.<sup>577</sup>

## DFO management of marine science issues

DFO requires adequate scientific advice to enable it to appropriately manage Fraser River sockeye in the marine environment. One factor that affects the ability of DFO Science to provide advice to managers is access to research vessels. Robin Brown, head, Ocean Sciences Division, Institute of Ocean Sciences, Science Branch, provided a summary of how many days each of the major DFO research vessels were used each year by DFO Science and other users.<sup>578</sup> The amount of funding has gone up between 2004/5 and 2011/12, but the number of days of research usage on oceanographic vessels

has gone down by about 100 days because the costs have increased faster than the rate of inflation.<sup>579</sup>

DFO's management of three research topic areas relevant to Fraser River sockeye is discussed below.

### *Fraser River sockeye marine survival research*

All the expert witnesses who testified about marine science issues agreed that there are large gaps in our understanding of the marine environment and what may be affecting survival of Fraser River sockeye salmon; they all recommended that DFO work on identifying stressors affecting marine survival of Fraser River sockeye.<sup>580</sup>

Dr. Laura Richards, regional director, Science Branch, Pacific Region, was not able to point to any specific research to address marine survival of Fraser River sockeye. She said that no work has been done to understand the timing of Fraser River sockeye salmon stocks into the Strait of Georgia during their outmigration, although she said that there is research more broadly directed at juvenile salmonids in the Strait of Georgia. She further noted that there is no work being done to understand which Fraser River sockeye stocks migrate along the west coast of Vancouver Island as opposed to up through Johnstone Strait and that there is no directed DFO research being done on the life history of Harrison River sockeye. With respect to Harrison sockeye, DFO does not intend to do this work directly, but it would do it in "conjunction with a broader project that would be looking at all salmonids in the Strait of Georgia."<sup>581</sup> Similarly, DFO is not looking at where Fraser River sockeye may go after they leave the north end of Vancouver Island, although some research is being done in this area and further north on salmonids generally. With respect to where Fraser River sockeye stocks reside in their first year of marine life and their marine distribution, Dr. Richards said:

I think the studies that I just mentioned again will give us some of that information ... indirectly. But we will be trying to get information on that. We'll also be getting information on their growth. And from the repeated samples we may be able to infer some information on survival, though that's a little less clear. But we will be

looking at all of the information that we get from those, including the stock composition.<sup>582</sup>

She went on to say that, from a scientific perspective, DFO's lack of knowledge on the precise migratory routes of sockeye has been an "obstacle." DFO is "very interested in trying to understand more explicitly the impacts of certain oceanographic conditions"; to do that it needs to know exactly where sockeye are in the ocean. Dr. Richards explained that, in terms of setting priorities for marine research, she considers advice from DFO scientists, but she has to take this advice in conjunction with management questions that are being asked. In relation to DFO Science's current marine research priorities, she said that a lot of the work is focused on long-term monitoring such as trawl surveys, oceanographic data, and stock assessment.<sup>583</sup>

I note, however, DFO's Ecosystem Research Initiative focused on the Strait of Georgia.<sup>584</sup> It has three principal goals:

- 1 understanding how this ecosystem works;
- 2 identifying drivers of change most likely to determine future conditions; and
- 3 analyzing future responses of the system under these influences.<sup>585</sup>

The Strait of Georgia Ecosystem Research Initiative could provide information about Fraser River sockeye marine survival, and it is discussed briefly in Chapter 4, DFO overview.

### ***Marine climate change research***

One of the major challenges faced by Canada is its ability to adjust management policies and practices in an appropriate and timely manner to deal with shifts in fish species distribution and relative abundance as a result of climate change.

DFO's 2011 corporate risk profile states that there is a risk that DFO will be unable to adapt quickly to the effects of climate change.<sup>586</sup> One of DFO's intended responses to this risk is to develop a "Policy Framework on Climate Change." Mr. Brown testified that this framework has not yet been developed; he did not know if there is a plan to develop it or if there has been any funding allocated to its development. Mr. Brown said no one in the DFO

policy group is taking advice from DFO Science on climate change, as the policy group has only an intermittent interest in these long-term issues. In his view, the policy side of DFO needs to be receptive to advice coming from DFO scientists.<sup>587</sup>

According to Mr. Brown, DFO Science has received funding for climate change work, but this funding has not been consistent. In the early 2000s, DFO Science had some funding under an inter-departmental program run by Natural Resources Canada called the Panel on Energy Research and Development; around this time there were also the Natural Resources Climate Impacts and Adaptation Research Network (which ran until about 2005), Canadian Climate Action Fund, and Action Plan 2000. Mr. Brown said the latter two seemed to be designed as interim programs while a larger Government of Canada framework for working on climate change issues was developed, though he was not sure if this larger framework was ever actually established. The next phase of federal climate change funding was subsequently renamed the "Clean Air Agenda."<sup>588</sup>

DFO has never been considered a lead agency with respect to climate change research in Canada and, in Mr. Brown's view, this negatively affects the funding available to DFO Science for climate change work in the marine environment. He explained that one of the ways DFO understands its priorities is whether funding is allocated to it for an issue. If it is not funded, then DFO takes this as a signal that it is not important. Climate change work within DFO Science does not have much funding, although some specific funding is embedded in the DFO Science Ecosystem Research Initiatives (see below).<sup>589</sup>

The DFO document entitled "Climate Change Risk Assessment Report" (2005) identifies relative risks of climate change in identified categories and sets out suggested responses to ecosystem and fisheries management risks.<sup>590</sup> The first category is "support and enhance the Science Program," and there are a number of recommendations on how to do so. Mr. Brown explained that any bullet that begins with "enhance" did not get much enhancing, and where it says "support" DFO probably continued to support it. The Science Branch allocated some money to the Climate Change Science Initiative, and this has been combined with some climate change-related research under the Ecosystem

Research Initiative, which in the Pacific Region is focused on the Strait of Georgia. The Climate Change Science Initiative and Ecosystem Research Initiative were introduced as new, funded programs, but, as the net spending within DFO Science did not actually increase much, these programs are essentially a repackaging of funding more than an infusion of new funds.<sup>591</sup>

Recommendation 3.25 of the *Fall 2010 Commissioner of the Environment and Sustainable Development Report* states:

Environment Canada, Natural Resources Canada, Health Canada, Fisheries and Oceans Canada, and Indian and Northern Affairs Canada should identify the adaptation measures necessary to respond to the risks that climate change presents for their areas of responsibility.<sup>592</sup>

But, according to Mr. Brown, there was no new funding to increase work in the areas identified by DFO in its response to this recommendation. Its response to Recommendation 3.25 is simply a description of the work that DFO is currently doing. The 2011 federal budget contained some funding for climate change adaptation and impact research; it is possible that DFO will get some of this money, but the money had not been allocated to departments at the time of the hearings in August 2011, and the program had not yet been designed.<sup>593</sup>

According to Mr. Brown, there has been “a fair bit” of research on climate change and impacts on fisheries.<sup>594</sup> Dr. Richards added that DFO has been working with the North Pacific Marine Science Organization (PICES) on a number of studies looking at the effect of climate change in the North Pacific on salmon.<sup>595</sup>

The DFO Climate Change Risk Assessment Report (2005) states that there are three fisheries management-related risks of climate change, which jeopardize DFO’s ability (1) to meet its strategic policy objectives related to oceans management, as well as the sustainable development and integrated management of resources in Canada’s aquatic environment; (2) to manage and protect the abundance, distribution, and quality of harvested fisheries and aquaculture stocks; and (3) to protect species diversity and species at risk. The second risk was ranked first among all risks identified by the report. The report sets out a suggested risk response. When

asked what DFO has done to address the identified risks, Mr. Brown said that not a lot of work has been done other than under the Climate Change Science Initiative and the Ecosystem Research Initiative. In his view, the Climate Change Science Initiative work is relevant generally for Fraser River sockeye, particularly if one is interested in what the future may hold for these stocks.<sup>596</sup>

DFO’s five-year research agenda lists “climate change variability” as a priority research area for DFO and sets out a number of priority research items.<sup>597</sup> Mr. Brown testified about the work under way on these items:

- 1 *Analyzing climate change projections from the Canadian Centre for Climate Modelling and Analysis coupled carbon-climate model and other international models and developing the next generation models* – This work is under way.
- 2 *Downscaling global climate model projections and interpreting their impact on Canadian waters, including freshwater systems* – This work is also under way, and some of it has been funded under the Climate Change Science Initiative.
- 3 *Analyzing climate change impacts on contaminant pathways* – There has been some continued analysis and interpretation of some existing data, but most of the work has been in the Arctic.
- 4 *Assessing the resilience of aquatic populations, from algae to marine mammals* – The science about how to measure resilience has been slow to emerge, though DFO has set out the following priority items:
  - a study of spatial and temporal variations in life history characteristics of wild populations of key species in different physical and biological environments;
  - b study of key species’ life history characteristic variations and ontogenetic changes in metabolism and potential biological-chemical-physical links related to growth, maturation, and behaviour through experimental work that simulates a variety of environmental conditions;
  - c integration of field and laboratory information into simulations; and
  - d inclusion of impacts of climate change on populations in fishing plans.<sup>598</sup>



Regarding the fourth item, Mr. Brown said some of this work is being done through the Strait of Georgia Ecosystem Research Initiative, but it is long-term work. The Strait of Georgia Ecosystem Research Initiative was to have been completed on March 31, 2012.<sup>599</sup>

Mr. Brown told me that, over the years, “a fair bit” has been done to correlate environmental factors to changes in return migration timing and routes of salmon. However, the year-to-year operations of managing salmon fisheries (that is, work on forecasting, managing catch and escapement, and openings / closings) consumes a lot of DFO’s effort, and much less emphasis has been placed on determining the conditions of the stocks in 20 or 50 years.<sup>600</sup>

### ***Harmful algal blooms***

As discussed in Volume 2 of this Report, blooms of toxic algae called “harmful algal blooms” or HABs occur on an annual basis in BC waters, particularly within the Strait of Georgia.<sup>601</sup> They have been found to coincide with the timing of smolts migrating through the Strait of Georgia and may be a contributing cause to the longer-term decline.

DFO Science in the Pacific Region had a harmful algae monitoring program (HAMP) from 1999 to 2004. This program was run out of DFO’s Pacific Biological Station in Nanaimo and was a collaborative effort between DFO and salmon aquaculture companies. Funding was provided by the aquaculture industry, and DFO Science provided in-kind funding through expertise and laboratory and office space. Most of the monitoring sites were either at or near fish farms.<sup>602</sup>

Since 2004, HAMP has been fully supported by the aquaculture industry and is now housed at Vancouver Island University. The focus continues to be on fish farm-related harmful algae monitoring, management, and mitigation, although some samples are taken in Departure Bay and also in other locations as opportunity arises. Overall, the monitoring program continues to be limited in spatial coverage and only considers surface waters. HAMP’s data are considered proprietary by the aquaculture industry and by HAMP, as the industry now provides all funding for the program.<sup>603</sup> HAMP does not release information to the public.

DFO is currently not doing any research or monitoring of HABs.<sup>604</sup> Mr. Brown testified that, in about 2004–5, the DFO funding for HAB research ran out and DFO interpreted this to mean that the priority for this activity had decreased.<sup>605</sup> He elaborated on what he thought was the thinking behind the decision not to fund or prioritize HAB research after 2004–5:

And I believe the thinking behind it was the big issues known to be affected by harmful algal blooms were human health through shellfish, and we have quite a mature system in Canada with the Canadian Food Inspection Agency, then losses of fish in net pens, a known issue. DFO, I think, considered it to be primarily industry’s issue to deal with. And impacts on wild fish, not generally considered to be an important issue, perhaps up till this point.<sup>606</sup>

DFO Science’s National Science Directors Committee decided that HABs were not a priority for DFO Science.<sup>607</sup> Dr. Richards, a member of this committee, explained that the decision was made following funding reductions.<sup>608</sup>

Dr. Jack Rensel, of Rensel Associates Aquatic Science Consultants, testified that there are possible measures that could be explored to reduce the impacts of HABs on wild fish. He also told me that HABs may be a contributing cause to the longer-term decline (see discussion in Volume 2 of this Report).<sup>609</sup>

DFO has not changed the priority assigned to HABs as a result of Dr. Rensel’s work or as a result of a 2010 proposal by Dr. Jim Irvine, research scientist, Salmon and Freshwater Ecosystems, Pacific Biological Station, Science Branch, to establish a monitoring program for HABs, even though DFO has identified Dr. Rensel’s hypothesis as something that the department ought to consider. Dr. Irvine’s proposal for a HAB monitoring program is minimal to moderate in terms of cost.<sup>610</sup> Some costing for a HAB monitoring program is set out in the document “Fraser River Sockeye – Proposed Research Framework Request for Projects.”<sup>611</sup>

DFO has also not changed the priority assigned to HAB research after a June 2011 briefing note was provided to the deputy minister identifying HABs as a leading hypothesis for the poor 2009 returns (discussed in Volume 2 of this Report).<sup>612</sup> No one at

DFO is responsible for coordinating HAB research or information.<sup>613</sup> DFO had not decided, as of August 2011, where research would be directed or what funds might be expended on HABs or other hypotheses for the decline.<sup>614</sup> Despite no directed research program, Dr. Richards said that DFO did collect some samples in 2011 in collaboration with HAMP. She added that DFO will try to stay informed about HABs, but that it does not feel that it is necessary for the department to do “absolutely everything” and that there were other priorities for DFO Science.<sup>615</sup>

Dr. Rensel testified that on the West Coast there is no sharing of expertise on HABs between US researchers and DFO, since no one at DFO is identified as a HAB specialist and DFO is not represented at US or international HAB meetings.<sup>616</sup> Mr. Brown explained that DFO scientists are not sent to international conferences to attend sessions on things that are deemed low priority.<sup>617</sup> DFO Science staff in the Pacific Region attend the North Pacific Marine Science Organization HAB working group meetings, but staff are there to learn rather than contribute.<sup>618</sup>

Dr. Rensel and Mr. Brown made two recommendations regarding management of HABs:

- DFO or some other institution should be researching and monitoring HABs, in particular *Heterosigma*, in the Strait of Georgia.<sup>619</sup>
- It would be useful to DFO Science to have HAB fish farm data, and fish farms should share this information with scientists, DFO or otherwise.<sup>620</sup>

## Oceans management

The *Oceans Act* calls for integrated, ecosystem-based management of Canada’s marine regions, grants the minister of fisheries and oceans the power to develop integrated management plans and designate marine protected areas, and requires the minister to lead the development of a national strategy.<sup>621</sup>

The Pacific Region’s Oceans Program has two key focuses: integrated oceans management, and

marine conservation tools, which include marine protected areas and marine parks.<sup>622</sup> According to a PowerPoint presentation provided to the Commission by Ms. Reid, on an operational level, the Oceans Program is focused on implementing Canada’s Oceans Strategy<sup>623</sup> through the “Oceans Strategy MOU”<sup>\*</sup> and its related sub-agreements.<sup>624</sup> Regionally, the Oceans Program is part of OHEB. The manager of the Oceans Program (as of August 2011, Bruce Reid) reports directly to the regional director of OHEB.<sup>625</sup> At the national level, the Science sector is responsible for the Oceans Program.<sup>†</sup>

Integrated coastal and oceans management (“integrated management” or “coastal zone management”) is a management framework that aims to include activities ranging from area-based planning to coastal and marine habitat and biodiversity protection.<sup>626</sup> Integrated oceans management involves adopting a spatially based planning and management approach so that ecosystem-scale management objectives may provide guidance to all ocean-related regulators. According to DFO, one of the key requirements for successful integrated oceans management is the “development of plans that include ecological, social and economic objectives.” Marine conservation tools such as marine protected areas support sustainable management of the oceans resource by providing options to secure critical aspects of the ecosystem from harm.<sup>627</sup> These elements relate, at least in part, to DFO’s oceans management mandate, as developed in Canada’s Oceans Strategy and Oceans Action Plan.

In accordance with the *Oceans Act*, the minister of fisheries and oceans released Canada’s Oceans Strategy in 2002.<sup>628</sup> It is the Government of Canada’s policy statement for the management of estuarine coastal and marine ecosystems; it sets out the policy direction for oceans management in Canada.<sup>629</sup>

Canada’s Oceans Strategy has three objectives, each with several identified activities:

- 1 *Understanding and protecting the marine environment.* Identified activities:
  - a improved scientific knowledge base for estuarine, coastal, and marine ecosystems;

\* The Oceans Strategy MOU was not described at the hearings, but it appears to be the Canada–British Columbia Memorandum of Understanding Respecting the Implementation of Canada’s Oceans Strategy on the Pacific Coast (see PPR 19, p. 56, and Exhibit 654).

† As of June 20, 2011, DFO renamed the Oceans and Science sector the Ecosystems and Oceans Science sector; however, for the purposes of this Report, the sector is referred to as the Science sector.

- b policies and programs aimed at marine pollution prevention; and
  - c conservation and protection of the marine environment.
- 2 *Supporting sustainable economic opportunities.* Identified activities:
- a sectoral measures to improve and support governance and management of marine industries;
  - b new and emerging opportunities for oceans industries and oceans-related coastal development; and
  - c co-operation and coordination to support and promote business development in the oceans sector.
- 3 *Promoting international leadership.* Identified activities:
- a sovereignty and security;
  - b international oceans governance; and
  - c sharing experience, promoting compliance, and building capacity, in particular for developing nations.<sup>630</sup>

Canada's Oceans Strategy states that understanding the marine environment is predicated on solid science and that science support for oceans management is important for delineating ecosystem boundaries, identifying key ecosystem functions and components, developing predictive models and risk assessment techniques, developing ecosystem-based management objectives, developing performance indicators, and assessing the state of ecosystem health. With respect to protecting the marine environment, Canada's Oceans Strategy states that protection must consider the degradation of the marine environment, including physical alteration and destruction of marine habitat.<sup>631</sup> The first objective is intended to support the creation of a national network of marine protected areas and the establishment of marine environmental quality guidelines.<sup>632</sup> The latter are not yet established.<sup>633</sup>

According to Canada's Oceans Strategy, the activities associated with each objective were to be implemented from 2002 to 2006.<sup>634</sup> When asked what DFO Science has done under the identified activity of "improved scientific knowledge base for estuarine, coastal and marine ecosystems," Mr. Brown described work in progress on the following:

- 1 *Improve co-operation in the collection, monitoring, and disseminating of information, including the integration of traditional ecological knowledge* – DFO Science has done quite a bit of work on the first part about collection, monitoring, dissemination, and state-of-the-oceans reporting (see item 3 below) through enhancing a state-of-the-oceans reporting system. The work on integrating traditional ecological knowledge has been very limited.
- 2 *Better understand ecosystem dynamics including climate variability and the impact of change on living marine resources, as well as a new orientation toward operational oceanography* – Work has been done on a scientific publication on climate variability, answering some but not all of the questions on ecosystem dynamics, and there has been modest progress on operational oceanography.
- 3 *Promote the development of a state-of-the-oceans reporting system* – See response to item 1 above.
- 4 *Promote academic liaison on oceans research for and among natural and social sciences, especially through the Oceans Management Research Network* – There is a lot of work done in DFO Science with (external) academics. The Oceans Management Research Network is not currently having much influence and has faded from the scene.
- 5 *Strengthen the coordination of ocean science in support of ocean management* – "Quite a bit" has been done by DFO Science for OHEB's Oceans Program.<sup>635</sup>

The 2005 Oceans Action Plan "serves as the overarching umbrella for coordinating and implementing oceans activities, and as the framework to sustainably develop and manage our oceans."<sup>636</sup> It sets out four "Oceans Management Tools" to be used in integrated management planning:

- 1 Ecosystem overview and assessment reports with basic scientific information to guide user-led oceans planning in each integrated management priority area, to inform stakeholder consultations, and to accelerate the production of ecosystem objectives.

The reports are also supposed to address ecosystem components and properties, causality and pressures, land-water interface, and water quality.

- 2 Identification of ecologically significant areas.
- 3 Seabed mapping.
- 4 Development of ecosystem objectives to maintain the biodiversity, productivity, and physical-chemical properties of marine ecosystems and to apply ecosystem-based management approaches in the oceans.<sup>637</sup>

Regional implementation committees, made up of representatives of federal and provincial governments and Aboriginal organizations, are intended to implement the Oceans Action Plan, with the first focus of implementation being integrated management planning. These committees include the following:

- *The Pacific Region Committee on Ocean Management.* This senior executive forum for the federal and provincial governments oversees implementation of the Canada–British Columbia Memorandum of Understanding Respecting the Implementation of Canada’s Oceans Strategy on the Pacific Coast (Oceans Strategy MOU) and elements of the Oceans Action Plan.
- *The Canada–BC Ocean Coordinating Committee (Coordinating Committee).* The Coordinating Committee administers delivery of the Oceans Strategy MOU and the Oceans Action Plan activities. It provides policy and operational advice and direction to respective agencies, departments, and ministries, and coordinates multi-jurisdictional aspects and interests.<sup>638</sup>

The federal government has created similar coordinating bodies within its own ranks:

- *The Pacific Interdepartmental Oceans Committee.* These regional director general–level representatives are tasked with ensuring collaboration between federal departments on oceans activities in the Pacific Region and developing strategic direction for implementation of the federal oceans agenda on the West Coast.
- *The DFO Pacific Region Managers’ Oceans Committee.* This internal DFO committee seeks to ensure communication among DFO

regional directors and branch managers on Pacific Region oceans issues, particularly in relation to the discussions of the Coordinating Committee.<sup>639</sup>

The Pacific North Coast Integrated Management Area (PNCIMA) is one of five marine regions, known as large ocean management areas, identified in the Oceans Action Plan as priorities for integrated management planning. PNCIMA extends from the Alaska border to northwest Vancouver Island and from the continental shelf in the west to the BC coastline in the east.<sup>640</sup>

In 2008, Canada, the Coastal First Nations, and the North Coast Skeena First Nations Stewardship Society signed a memorandum of understanding (PNCIMA MOU) under which they adopted a governance framework to support the PNCIMA initiative. The province was initially an observer in this process but signed the PNCIMA MOU in 2010, as did the Nanwakolas Council. The parties to the PNCIMA MOU appoint members to the steering committee, which provides strategic direction and executive oversight for the PNCIMA initiative, and to the planning office, which plays a technical and administrative role in the planning process. First Nations coordinate their involvement in PNCIMA through a body called the First Nations Governance Committee, consisting of representatives from the north coast, central coast, Haida Gwaii (Queen Charlotte Islands), and north Vancouver Island. The role of the governance committee is to seek advice from member communities and to represent the values and interests of member communities on the steering committee.<sup>641</sup>

Non-parties to the PNCIMA MOU have a role in PNCIMA through a multi-sector advisory body called the Integrated Oceans Advisory Committee. Membership includes representatives from industry (including commercial and recreational fishing, aquaculture, energy, tourism, and transportation), local government, environmental non-governmental organizations, and other interested parties. The Integrated Oceans Advisory Committee provides advice and recommendations to government agencies regarding the planning process and the integrated management plan for PNCIMA.<sup>642</sup>

Barry Rosenberger, area director, BC Interior, DFO, and Canadian chair of the Fraser River Panel, testified that, although he does not have

in-depth knowledge of PNCIMA, it “is one [governance] model that should be looked at and there are others.”<sup>643</sup> Several First Nations witnesses also expressed support for the PNCIMA governance model.<sup>644</sup> Ross Wilson of the Heiltsuk Nation and a member of the PNCIMA steering committee noted that membership on the committee is limited to federal, provincial, and First Nations governments: “So you’re looking at owners at the tables, not users.”<sup>645</sup>

The Heiltsuk First Nation submits that PNCIMA should be looked at “as a very useful model for how joint management of the Fraser River Sockeye Salmon should be arranged between DFO and First Nations.” This participant states that, because the PNCIMA process allows for involvement of First Nations in the fisheries management process in a manner that recognizes their jurisdiction, it has had a remarkable amount of buy-in from First Nations along the coast.<sup>646</sup> Another participant, the First Nations Coalition, says that there is value in marine use planning such as that done by the Haida and First Nations of the central coast.<sup>647</sup> The Commission also received a public submission urging me to recommend that future policy directions should include marine spatial planning elements.<sup>648</sup>

## Disposal at Sea Program

Canada is a party to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972* (London Convention), and the related *1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972* (1996 Protocol). As such, Canada is obligated to implement a permit system to regulate the disposal of wastes or other matter at sea.<sup>649</sup> Canada aims to fulfill its international obligations in this regard through Part 7 (Controlling Pollution and Managing Wastes), Division 3 (Disposal at Sea), of the *Canadian Environmental Protection Act*, the purpose of which is to prevent marine pollution, and through Environment Canada’s Disposal at Sea Program.<sup>650</sup>

CEPA prohibits the disposal at sea of material that may be harmful to human health and the marine environment, such as hazardous wastes. Disposal of some substances into the ocean from a ship, aircraft, platform, or other structure is allowed, but only if done in accordance with a Disposal at Sea permit issued by Environment Canada.<sup>651</sup>

In British Columbia, material permitted to be disposed of at sea is primarily dredged sediment from river or marine sources or excavated native material from the Metro Vancouver area. Most of what is disposed of at sea by Canada is material dredged to keep shipping channels and harbours clear for navigation and commerce.<sup>652</sup>

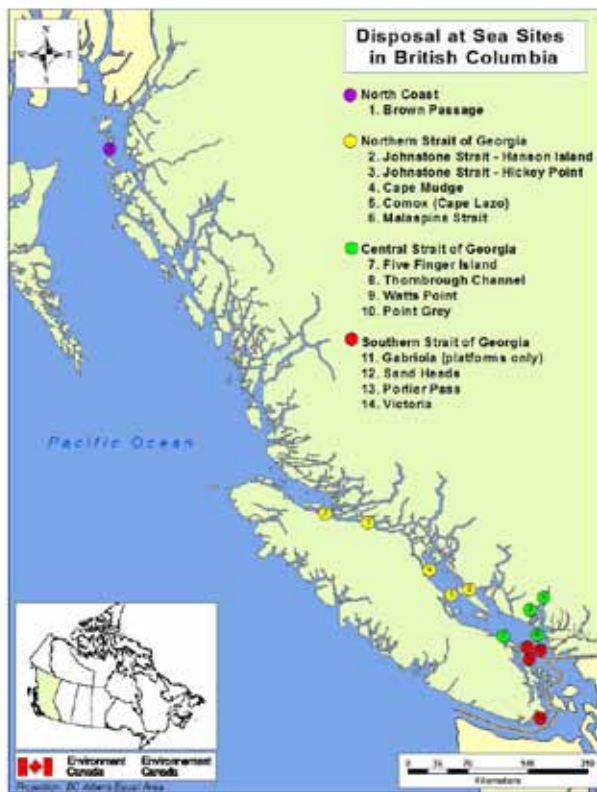
Environment Canada regulates disposal at sea by means of a permit process in accordance with CEPA’s requirements and regulations. Only a small list of wastes or other matter can be considered for Disposal at Sea permits.<sup>653</sup> At the time of the hearings, all proposed disposal at sea projects were subject to an environmental assessment by Environment Canada and permit applications may have triggered a *Canadian Environmental Assessment Act* assessment.<sup>654\*</sup>

There are 14 designated disposal sites in British Columbia (see Figure 1.6.4). Disposal site selection criteria under CEPA include proximity to fishery resources and habitat, interference with marine use in the area, evaluation of mixing and transport characteristics at the site, feasibility of monitoring the disposal site, and First Nations concerns.<sup>655</sup>

Environment Canada monitors compliance to ensure Disposal at Sea permit conditions are met. Disposal sites must be reviewed by Environment Canada at regular intervals, taking into account the results of monitoring and the objectives of monitoring programs.<sup>656</sup> Monitoring results indicate that seabed sediment at BC disposal sites has not been significantly affected by dumping activities.<sup>657</sup> Environment Canada enforcement officers may also conduct surveillance monitoring and inspections at both loading and disposal sites to ensure compliance with Disposal at Sea permit conditions.<sup>658</sup>

Before issuing permits for disposal in an area where DFO has determined that there is critical habitat under the *Species at Risk Act*,<sup>659</sup>

\* Part 3, Division 1, of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and repeals the CEAA. Under the CEAA, 2012, Disposal at Sea permits may no longer require an environmental assessment as they did under CEAA, para. 5(1)(d).



**Figure 1.6.4 Disposal at Sea Sites in British Columbia**

Source: Policy and Practice Report 19, Marine Environment, p. 39. Reproduced.

Environment Canada consults DFO regarding specific critical habitat requirements to include in the Disposal at Sea permit conditions.<sup>660</sup>

## Findings

The evidence before me shows that most marine spills are very small amounts that do not require a spill response. There was no evidence that the failure to assess the impacts of these small spills results in serious harm to salmon or salmon habitat.

The Canadian Coast Guard (Coast Guard) is the lead federal agency responsible for ship-source and mystery-source pollution incidents in Canadian waters. The role of the Coast Guard is twofold: overseeing a polluter's response to a marine pollution incident, or, if the polluter is unknown or unable to respond, managing the response to the incident. The Coast Guard does not see the evaluation of

habitat impacts as within its mandate – it relies on Environment Canada and on the Oceans, Habitat and Enhancement Branch (OHEB) and/or the Science Branch of the Department of Fisheries and Oceans (DFO) to deal with long-term habitat impacts. The Coast Guard receives advice from the Regional Environmental Emergency Team (REET) on impacts on anadromous fish and fish habitat in the marine environment. If a spill is marine in origin, the Environment Canada co-chair of the REET determines what agencies should be brought into the REET to assess any impacts. However, the REET is only an advisory organization, and the Coast Guard can choose to ignore the REET's advice.

The Coast Guard can also prefer the approach to cleanup and monitoring proposed by the polluter or cleanup company over the REET's recommendations. With respect to cost and reasonableness, the Coast Guard tries to recover its costs for marine spill response from the polluter, its insurance company, or the Ship Source Oil Pollution Fund. When a claim is submitted to one of these three sources of funds, the Coast Guard must demonstrate reasonableness or it will not recover its monitoring or response costs.

On the evidence, I am satisfied that the Coast Guard has the organizational structure; staffing; response equipment; vessel, logistical, and air support; and liaison experience to make it an appropriate first responder for marine spills. I also conclude that the REET is the appropriate body to provide advice on monitoring plans and habitat issues.

However, I have several concerns respecting post-emergency mitigation and long-term monitoring of the impacts of marine spills. I accept the evidence of Dr. Peter Ross, research scientist, Marine Environmental Quality Section, Institute of Ocean Sciences, Science Branch, that it is important to have scientists who are experts in the field of contaminants and anadromous fish involved in the marine spill response process to provide advice, recommend sampling and monitoring, and help guide mitigation efforts or cleanup. The current decision maker (the on-scene commander or federal monitoring officer) does not have expertise in long-term habitat monitoring. The Coast Guard is not required to implement the advice of the REET, and there is no mandatory role for DFO Science or OHEB. In my view, responsibility for these matters should be transferred from



the Coast Guard to Environment Canada (where the specialized expertise resides), and assigned to the Environment Canada co-chair of the REET. Membership of the REET should always include OHEB and Science staff, who bring specialized expertise respecting contaminant, fish, and fish habitat issues. Finally, I accept the evidence of Bruce Reid, former regional manager, Habitat Protection and Sustainable Development, OHEB, that it would be beneficial to have one person at DFO responsible for coordinating the department's response to a spill.

In the future, when the Environment Canada co-chair of the REET decides whether to follow the REET's advice respecting post-emergency mitigation and long-term monitoring, he or she should consider impacts on fish and fish habitat, logistics, ecosystem values, cost recovery, and socio-economic impacts.

In its final submissions, the participant Canada told me that it is conducting research on juvenile salmon in the Strait of Georgia and that DFO scientists are doing "considerable" research in other parts of the marine environment.<sup>661</sup> However, the evidence does not support this assertion with respect to Fraser River sockeye salmon. All of the expert witnesses who testified about the marine survival of Fraser River sockeye agreed that there are large gaps in our understanding of the marine environment and what may be affecting survival of these stocks during these life history stages. As discussed further in Volume 2 of this Report, I accept their expert evidence.

I conclude that DFO funding for climate change work, including impacts on fisheries, has been inconsistent and that even research priorities identified in DFO internal risk assessments, its five-year research agenda and five-year research plan, and in the *Fall 2010 Commissioner of the Environment and Sustainable Development Report* are often not fully funded. Canada submits that climate and ocean information are integrated into management through interactions between the Fisheries and Oceanography Working Group and the scientists who create the annual Salmon Stock Outlook document.<sup>662</sup> However, although the year-to-year operations of managing salmon fisheries such as forecasting and managing catch, escapement, and openings, consumes a lot of DFO's effort, I find that relatively little work has

been done to examine what the conditions of the stocks will be over the long term.

Regarding the management of harmful algal blooms, despite the possible contribution of this stressor to the Fraser River sockeye salmon productivity decline, DFO is no longer involved in the harmful algae monitoring program (HAMP) and, at the time of the hearings, was not doing any research or structure monitoring of harmful algal blooms. Because of this, information and advice about harmful algal blooms may not be available to DFO fisheries managers or scientists. To the extent that DFO requires this information for the management and control of the fishery, it could work with industry and HAMP as well as non-DFO scientists to obtain it.

To the extent that I make recommendations in these areas, I discuss these findings in Volume 3 of the Report.

## ■ Contaminants

A "contaminant" is a substance that can be detected, and a "pollutant" is a contaminant that has been shown to have an adverse biological effect on the environment.<sup>663</sup> Non-point source contaminants are those discharged from diffuse sources, such as runoff from forest management areas, agricultural operations or municipal stormwater, as opposed to contaminants originating from a point source, such as a pulp mill or a metal mine. Contaminants may negatively affect Fraser River sockeye and are a source of concern for members of the public.<sup>664</sup> In this section, I describe the evidence I heard regarding the management of non-point and point source contaminants.

### Non-point source contaminants

Canada regulates contaminants primarily through the *Fisheries Act*, section 36; the *Canadian Environmental Protection Act* (CEPA), section 44 and Part 5; and the *Canada Water Act*.<sup>665</sup>

The minister of fisheries and oceans is ultimately responsible for the implementation of the *Fisheries Act*, including sections 35 and 36. However, while DFO has the administrative lead for section 35, Environment Canada has the administrative lead for section 36.<sup>666</sup> (For further discussion of the delegation

of section 36 responsibility to Environment Canada, see Chapter 7, Enforcement.)

CEPA, subsection 44(1), directs the minister of the environment to monitor environmental quality, research pollution and contaminants, conduct an inventory of environmental quality data, make pollution prevention plans, and publish information about pollution prevention and environmental quality. Under CEPA, a substance may be designated as a Schedule 1 Toxic Substance.<sup>667</sup>

Under the *Canada Water Act*,\* the minister of the environment may co-operate with provinces in managing water quality of federal waters or inter-jurisdictional waters where water quality has become a matter of “urgent national concern.”<sup>668</sup> Such co-operative agreements shall designate the waters to which they relate as “water quality management areas.”<sup>669</sup>

In addition to legislation, the Canadian Council of Ministers of the Environment has published the *Canadian Environmental Water Quality Guidelines*, a set of ambient environmental guidelines that set levels beyond which adverse effects may be observed. These guidelines include the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, which establish acceptable levels for toxic chemicals, temperature, and acidity, and the *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life*. The Canadian Council of Ministers of the Environment also developed a Water Quality Index in 1999 as the national indicator of freshwater quality.<sup>670</sup>

The Province of British Columbia publishes Water Quality Objectives, which are physical, chemical, or biological characteristics of water, biota, or sediment that are intended to protect the most sensitive designated water uses. Neither industry nor government is legally required to meet these objectives.<sup>671</sup>

### ***Water quality monitoring and Fraser River sockeye salmon***

CEPA directs the minister of the environment to establish, operate, and maintain a system for

monitoring environmental quality.<sup>672</sup> As noted above, the *Canada Water Act* provides for co-operative management of water resources and water quality. Part II of the Act deals with water quality management.

Environment Canada’s Water Science and Technology Directorate (which is part of Environment Canada’s Science and Technology Branch) is the largest freshwater science group in Canada. The directorate conducts aquatic research and monitoring, providing scientific knowledge that supports the development of government policies and programs and public decisions concerning freshwater ecosystems.<sup>673</sup> The Aquatic Ecosystem Protection Research Division within the Water Science and Technology Directorate does ecosystem protection research, including research on contaminants.<sup>674</sup>

Environment Canada conducts water quality monitoring in the Fraser River watershed under a memorandum of understanding between Canada and the province (Canada-BC MOU). The Canada-BC MOU lists core parameters (for example, temperature, conductivity, nutrients) that are measured provincially and secondary parameters that might be measured on a site-specific basis (such as some metals and organic pollutants like organochlorines).<sup>675</sup> Although Environment Canada maintains six water quality monitoring stations, as well as a buoy in the Fraser River estuary, none of these provide information about most contaminants of concern to Fraser River sockeye salmon.<sup>676</sup> In addition to monitoring done under the Canada-BC MOU, Environment Canada also does “surveillance” studies on issues in specific ecosystems; these are infrequent studies of the bottom sediment and aquatic biota, but there is no comprehensive assessment of aquatic environmental quality on the Fraser River.<sup>677</sup> Environment Canada does not do any monitoring of marine water quality except for what is done under the Canadian Shellfish Sanitation Program. It assumes that marine water quality monitoring is DFO’s responsibility.<sup>678</sup>

DFO does not conduct environmental water quality monitoring, and there are no agreements

\* *Canada Water Act*, RSC 1985, c. 11; “federal waters” are, “other than in Yukon, waters under the exclusive legislative jurisdiction of Parliament and, in Yukon, waters in a federal conservation area within the meaning of section 2 of the *Yukon Act*” (s. 2(1)); “Inter-jurisdictional waters” means “any waters, whether international, boundary or otherwise, that, whether wholly situated in a province or not, significantly affect the quantity or quality of waters outside the province” (s. 2(1)).



or consultation between Environment Canada and DFO on water quality monitoring in the Fraser River system.<sup>679</sup> A 2008 DFO Science report on the status of monitoring states: “The marine environmental quality monitoring program is very weak. Existing efforts are *ad hoc*. DFO mandate in some of this area is vague.”<sup>680</sup> However, Canada’s Oceans Strategy states that Canada will establish and implement a marine environmental quality policy and operational framework under the *Oceans Act*.<sup>681</sup> This policy and operational framework have not been developed.<sup>682</sup> Dr. John Carey, former director general, Water Science and Technology, Environment Canada, stated that it would be useful for the long-term sustainability of Fraser River sockeye to have some water quality monitoring stations in the marine environment.<sup>683</sup>

However, until it was disbanded around 2004–5, DFO’s Pacific Region Water Quality Unit provided support and advice to Environment Canada about fish presence, fish habitat, and receiving water quality for fish.<sup>684</sup> The Water Quality Unit worked with Environment Canada and was a window into DFO for Environment Canada’s environmental protection programs. There were annual work-planning meetings between this group and Environment Canada to share work plans, to identify priorities and issues each department was working on, and to align and coordinate activities.<sup>685</sup> The unit provided advice on habitat impacts that supported Environment Canada’s work on controlling pollution at the source.<sup>686</sup>

Environment Canada was not consulted when DFO decided to disband its Water Quality Unit, but, when Environment Canada learned of this change, its view was that DFO had a responsibility under the 1987 Regional Working Agreement (RWA) and the 1985 “Memorandum of Understanding between the Department of Fisheries and Oceans and the Department of the Environment on the Subject of the Administration of Section 33 of the *Fisheries Act*” to continue the role that the Water Quality Unit had fulfilled.<sup>687</sup> Environment Canada did not have the capacity in the region to take on the science advice provided formerly by DFO on water quality, and Environment Canada was not funded to do this work.<sup>688</sup>

After DFO’s Water Quality Unit was disbanded, the Environment Canada–DFO working relationship shifted from being coordinated through the unit to a program-specific context, but I was told that regulatory gaps remain, particularly

with respect to water quality advice for sectors that are not regulated under the *Fisheries Act*.<sup>689</sup> According to Lisa Walls, former acting manager, Pollution Prevention and Assessment Section, Environmental Protection Operations, and former acting director, Environmental Protection Operations, Environment Canada, the real loss to Environment Canada was the access to DFO expertise on the effects of pollutant discharges on water quality to sustain fish.<sup>690</sup> Dr. Ross said that, in the past, Water Quality Unit staff had key expertise in point source spills and their impacts on fish and fish habitat.<sup>691</sup>

Dr. Ross testified that existing water quality guidelines are designed to either clean up a contaminated site or address a nearby contaminant source, but they are not designed to protect the environment more generally.<sup>692</sup> He said that water, sediment, or tissue quality guidelines developed in Canada fail to protect salmon.<sup>693</sup> This failure is in part because guidelines exist for single chemicals and not complex mixtures of contaminants, although these mixtures are what fish are actually exposed to.<sup>694</sup> The guidelines that are used by BC Ministry of Environment staff “were not designed to protect anadromous fish, were not designed to protect salmonids, and were not designed to protect the real world complexity of fish habitat.”<sup>695</sup> His view was that Canada needs to do more research and develop supportive guidelines for the protection of anadromous fish.<sup>696</sup>

### ***Contaminant research and monitoring***

Dr. Ross testified that it is very important for Canada to decide how it will support research, monitoring, and enforcement related to environmental contaminants in the marine environment.<sup>697</sup> He said Canada needs to better understand non-point sources as they relate to Fraser River sockeye salmon.<sup>698</sup> Dr. Robie Macdonald, head, Marine Environmental Quality, Institute of Ocean Sciences, Science Branch, said that long-term research and monitoring of contaminants is important for understanding and tracking ecosystem health.<sup>699</sup>

Witnesses from DFO and Environment Canada testified that there are gaps between the two departments’ responsibilities and mandates concerning contaminant research and monitoring. These arise from differences in what each department thinks is

its responsibility.<sup>700</sup> These gaps are most significant in the marine environment where neither DFO nor Environment Canada does any research or monitoring of toxic pathways and water quality.<sup>701</sup>

According to Environment Canada, its mandate under section 36 of the *Fisheries Act* is to regulate pollutant discharge or prevent deposit of the pollutant at the point of discharge, and DFO's responsibility is to look at the effect of the pollutant on the fish.<sup>702</sup> Dr. Carey said that Environment Canada's research mandate concerning toxic chemicals is set out in a "Strategic Review of Toxic Chemicals Research in the Environmental Science Program and the Arctic Science Program, Science Sector, Fisheries and Oceans Canada":

Environment Canada conducts research to protect aquatic ecosystems from the impacts of toxic chemicals by developing knowledge and understanding of priority pollutants ... Environment Canada's projects focus on the following areas: determining the persistence, fate and exposure of toxic chemicals in aquatic environments; evaluating the effects of priority substances on aquatic organisms; developing indicators and bioassays to detect, identify and measure contaminant effects in aquatic ecosystems; and assessing the distribution and biological effects of atmospherically transported persistent organic pollutants and metals in aquatic ecosystems and food chains. The primary focus of such research is in freshwater ecosystems.<sup>703</sup>

Dr. André Talbot, director, Aquatic Ecosystem Protection Research Division, Water Science and Technology Branch, Environment Canada, told me that Environment Canada considers contaminant research on salmon to be a DFO issue.<sup>704</sup>

In contrast, documentary evidence and DFO witnesses told me that, based on Environment Canada's administrative responsibility for section 36 of the *Fisheries Act* and section 44 of CEPA, Environment Canada has the mandate for all point and non-point source contaminant-related monitoring, research, regulation, and enforcement; DFO is responsible for the management and protection of the fisheries resource and its habitat.<sup>705</sup> At least in the marine environment, Dr. Sylvain Paradis, former director, Environment

and Biodiversity Science, and former director general, Ecosystem Science Directorate, DFO, testified that the department assumes that contaminant research and monitoring is Environment Canada's responsibility.<sup>706</sup> However, Dr. Paradis said that DFO's mandate includes research into toxic chemicals to determine their effects on fish, fish habitat, aquatic ecosystems, and human use of fish and aquatic ecosystems.<sup>707</sup>

Ms. Dansereau also indicated that monitoring of contaminants is the purview of Environment Canada, but research regarding contaminant effects on anadromous fish may be DFO's responsibility.<sup>708</sup> As well, DFO's contaminant research responsibility might be fulfilled by obtaining information from Environment Canada or another body of government.<sup>709</sup>

A 2006 report of the DFO Science Monitoring Implementation Team on aquatic monitoring in Canada says there is considerable confusion about the monitoring of contaminants: whereas Environment Canada monitors point sources in the Pacific Region, DFO monitors organisms (such as fish) for population health.<sup>710</sup> Mr. Brown, similarly said confusion exists over the mandates of Environment Canada and DFO, and that Environment Canada does not have much capacity to do monitoring work in the marine environment.<sup>711</sup> He testified that funding within DFO to work on marine contaminants has been very hard to find.<sup>712</sup> Yet, in 2006, contaminant monitoring was identified by the DFO Science Monitoring Implementation Team as a type of monitoring that would support DFO's healthy and productive aquatic ecosystem strategic outcome.<sup>713</sup>

The 2006 DFO Science Monitoring Implementation Team report states that there is little systematic monitoring of Canada's coastal and littoral zones (the area from the high-water mark to the submerged areas) and that DFO has little ability to assess cumulative impacts.<sup>714</sup> The 2006 report identifies the need to rationalize the work done by DFO, Environment Canada, Natural Resources Canada, and Health Canada on contaminant monitoring in water, sediment, and biota.<sup>715</sup> The information in the report is only current to 2004–5, but, according to Mr. Brown, the situation had not improved by the time he testified in August 2011.<sup>716</sup>

The gaps in contaminant research and monitoring between DFO and Environment Canada appear to result at least in part from major

changes DFO Science made to its Toxic Chemicals Research Program in approximately 2004–5.<sup>717</sup> As part of the 2003–4 Departmental Assessment and Alignment Project and the Treasury Board’s 2005 Expenditure Review Committee direction to cut DFO’s budget, DFO Science reduced the scope of its work on toxic chemicals nationally by the equivalent of 25 full-time staff.<sup>718</sup> This was a decision of DFO Science’s National Science Directors’ Committee, high-level DFO Science executives in Ottawa who meet to work out DFO priorities and match budgets to responsibilities.<sup>719</sup> These cuts were achieved by DFO Science refocusing its toxic chemicals research on biological impacts on fish and fish habitat and ceasing research on contaminant fate and transport pathways,\* creating national Laboratories of Expertise in Aquatic Chemical Analysis, ceasing any toxic chemical environmental monitoring (but I note DFO never did toxic chemical environmental monitoring in the Pacific Region), and rolling DFO Science’s Environmental Science Strategic Research Fund (ESSRF) – which consisted of \$5 million of dedicated funding for toxic research – into a general DFO Science funding envelope.<sup>720</sup> In all, \$2 million was cut from DFO Science.<sup>721</sup>

DFO did not consult with Environment Canada on the changes the department made to its Toxic Chemicals Research Program, although there was some consultation during the initial review of the program.<sup>722</sup> Dr. Carey said that there was no coordination or communication between Environment Canada and DFO when DFO implemented these changes.<sup>723</sup> At this time, DFO’s Water Quality Unit was disbanded, and thus coordination between DFO and Environment Canada in the Pacific Region on receiving water quality for fish like Fraser River sockeye also disappeared.

Since dissolution of the ESSRF, DFO toxic researchers have been expected to fund their work from other DFO sectors, other government departments, and non-government sources under a “client-based” funding system.<sup>724</sup> The intention is that contaminant research will not be done as stand-alone research but will instead be linked to other issues in an ecosystem-based approach to science.<sup>725</sup>

DFO Science witnesses, both managers and scientists, described “tension” between Environment Canada and DFO with respect to contaminants’ research due to DFO largely withdrawing from the contaminants research field in 2004–5 and assuming that Environment Canada would pick up this work. However, Environment Canada was not given resources to do what was formerly done by DFO.<sup>726</sup> For example, in 2004–5, Environment Canada had a very significant research program on contaminant effects on individual fish, but not on the effects on fish populations. Environment Canada told DFO that it was DFO’s job to look at the overall effect of toxic substances at the population level.<sup>727</sup> When changes were made to the Toxic Chemicals Research Program, Environment Canada picked up only one of DFO’s previous programs, the Great Lakes Fish Contaminants Monitoring Program. In light of DFO’s withdrawal from contaminants research, Environment Canada examined its programs. If there were gaps, Environment Canada modified its own programs to cover off the things it thought important. No contaminants work or monitoring associated with research that was being done by DFO on Pacific salmon was incorporated into Environment Canada’s work.<sup>728</sup>

Dr. Ross described struggling at times to understand which department is responsible for what contaminant work and what, as a scientist, he is expected to do to support DFO’s mandate to protect fish.<sup>729</sup> In Dr. Ross’s view, the ESSRF and the Toxic Chemicals Research Program allowed DFO scientists to identify problems, emerging issues, and data gaps.<sup>730</sup> Dr. Macdonald testified that, since the loss of the ESSRF, there has been no coordinated approach within DFO nationally on contaminants research and that DFO’s objective of maintaining adequate in-house expertise for toxic chemicals research has not been met.<sup>731</sup> Dr. Macdonald also said that changes to the DFO Toxic Chemicals Research Program meant research on contaminant transport pathways has ceased, and funding of toxic research generally has been uncertain and intermittent.<sup>732</sup> As of August 2011, Dr. Ross said that DFO was doing no research on marine contaminants that could affect Fraser River sockeye salmon because there was no funding

\* Chemical (or contaminant) fate and transport (pathways) is the science of understanding how and why fish have been exposed to the chemical. Toxicological or biological effects work relates to the effects on fish when they are exposed to a chemical. See Exhibit 995.

available to work on salmon and contaminants.<sup>733</sup> Dr. Richards said that she was not aware of any specific projects that DFO toxic chemical researchers were doing on Fraser River sockeye.<sup>734</sup>

According to Dr. Ross, DFO Pacific Region does not have a toxicologist with expertise on fish, despite its importance to assessing population-level impacts, and little contaminants research is done on sublethal stresses on salmon.<sup>735</sup> Dr. Richards said that DFO has to consider all of its many priorities and that contaminants research is only one of these. She indicated that researching the effect of contaminants on Fraser River sockeye may not be a priority for DFO.<sup>736</sup>

Environment Canada has the expertise to work on the fate, transport, presence, and effects of point and non-point source contaminants in the marine environment, but it is currently not doing any of this work in the Pacific Region.<sup>737</sup> It does not have the expertise to do the marine side of toxic chemicals work.<sup>738</sup> Both Dr. Talbot and Dr. Carey testified that there is no contaminant or ecosystem research conducted by Environment Canada on Pacific salmon or any anadromous fish.<sup>739</sup> Also, Dr. Talbot said that there is no ecosystem program right now that allows Environment Canada to *prioritize* work on Pacific salmon rivers and streams.<sup>740</sup>

Dr. Ross, Dr. Paradis, Ms. Dansereau, and Graham van Aggelen, head, Environmental Toxicology Section, Pacific Environmental Science Centre, Environment Canada, said that the respective responsibilities of DFO and Environment Canada for research and monitoring of contaminants and section 36 should be clarified.<sup>741</sup> Dr. Macdonald and Dr. Paradis said that it is not clear which department should take the lead, but both agencies should probably be involved and one agency should have the lead.<sup>742</sup> Ms. Dansereau said that she and the deputy minister of Environment Canada are working on recommendations to resolve the confusion in mandate for their ministers.<sup>743</sup>

### ***Science advice on contaminants***

Both Dr. Macdonald and Dr. Ross testified about the difficulties in providing scientific advice on contaminants that could impact Fraser River sockeye. Dr. Macdonald explained that toxicology work alone is not sufficient to provide advice to regulators on contaminants.<sup>744</sup> It is also necessary

to research contaminant fates and transport.<sup>745</sup> Further, the limited toxicology work being done by DFO does not address effects on fish of exposure to multiple contaminants or of exposure to contaminants at various stages of the fish life cycle.<sup>746</sup> Dr. Ross added that it is very difficult for regulators to assess complex mixtures of contaminants.<sup>747</sup> And, as noted above, the loss of the ESSRF and reduction in the Toxic Chemicals Research Program hampers DFO scientists identifying and investigating problems, emerging issues, and data gaps.<sup>748</sup>

There is no formal mechanism through which DFO Science can provide advice to Environment Canada regulators.<sup>749</sup> Dr. Paradis said DFO's Canadian Science Advisory Secretariat process (for a description of this process, see Chapter 4, DFO overview) is inadequate for providing timely advice to Environment Canada.<sup>750</sup> Contaminant scientists or managers from the two departments do not sit down with their counterparts to discuss work Environment Canada and DFO should be doing on contaminants.<sup>751</sup> There is also no body in Ottawa to oversee collaborative research and monitoring on contaminants.<sup>752</sup>

Witnesses, both managers and scientists, agreed that it would be beneficial to have improved communication whereby DFO Science and Environment Canada could coordinate research and DFO could provide advice to Environment Canada.<sup>753</sup> Dr. Carey described a national network for coordination of water-related research that was initiated by the federal government in the 1990s, in which a number of workshops were organized with representatives from the five federal natural resource departments (Health Canada, Environment Canada, DFO, Agriculture, and Natural Resources) and the National Research Council. The workshops identified four broad goals for water science along with priority areas for collaboration, one of which was producing the science and information required by the federal government to manage aquatic resources like harvested fish and shellfish; this network was about to be implemented when the government of the day fell and the initiative was abandoned.<sup>754</sup>

Several witnesses suggested that an integrated research program focused on Fraser River sockeye salmon and involving long-term research and monitoring would help ensure the long-term sustainability of the fishery. They indicated that, given the limited-term nature of federal science funding,

this kind of work is not currently possible.<sup>755</sup> If such a program were to be implemented, it would need collaboration between Environment Canada and DFO. Although one department should have the clear lead, witnesses said funding should be shared.<sup>756</sup>

## **Pesticides**

The broad application of pesticides to crops, lawns, and forests results in non-point source pollution in the form of runoff, which can have lethal and sub-lethal effects on Fraser River sockeye (as discussed in Volume 2). Pesticides\* from spraying, erosion of contaminated soils, and contaminated groundwater can also pollute surface waters.<sup>757</sup>

Several public submissions expressed the view that pesticides have affected salmon habitat.<sup>758</sup> Don MacDonald, lead author of Technical Report 2, Contaminants,<sup>†</sup> testified that the use of pesticides by the forestry sector may be one of the greatest concerns for Fraser River sockeye salmon productivity.<sup>759</sup> Dr. Ross testified that agriculture and forestry pesticides are of concern for Fraser River sockeye health.<sup>760</sup> Technical Report 2 describes a number of water quality concerns associated with agriculture. For example, in the Lower Fraser Valley, aquatic organisms face the potential for adverse effects due to their proximity to crops with heavy pesticide applications.<sup>761</sup> A 2003 Environment Canada study on pesticide use in Canada states that most pesticides sold and used in British Columbia were used in the forestry sector. This report also says that a number of pesticide active ingredients used exclusively in the agriculture sector accounted for 63 percent of total sales.<sup>762</sup>

All pesticides imported into, sold, or used in Canada are regulated federally under the *Pest Control Products Act*, SC 2002, c. 28 (PCPA) and regulations, which are administered by Health

Canada's Pest Management Regulatory Agency (PMRA). PMRA is responsible for administering the PCPA, registering pest control products, re-evaluating registered products, and setting maximum residue limits under the *Food and Drugs Act*.<sup>763</sup>

The province regulates the transportation, sale, use, storage, and disposal of pesticides, as well as the certification and licensing of applicators and vendors.<sup>764</sup> British Columbia is also responsible for ensuring compliance with PMRA labelling. The provincial Ministry of Environment's Environmental Protection program implements the Integrated Pest Management program and administers the *Integrated Pest Management Act* (IPMA) and regulations. The main function of the Integrated Pest Management program is to protect the quality of British Columbia water, land, air, living and working space, and human health in a way that contributes to the sustainability of the province's resources and economy.<sup>765</sup>

Pesticide use on private property by the owner or someone who is not acting on a fee-for-service basis (for example, an employee or volunteer) does not require a licence,<sup>766</sup> though the applicator may need a certificate if using a restricted product. The effect of the IPMA is that pesticide application to residential properties and in the agricultural sector is generally not regulated (unless the use falls into a permit- or confirmation-requiring category).

The province does not keep comprehensive information on the quantities and types of pesticides used in different areas of British Columbia.<sup>767</sup> Information regarding pesticide application to residential properties and the agricultural sector is not collected, nor is it required to be kept by the applicator. The province collects annual summaries of the amount of pesticide used by licence, confirmation, and permit holders, but not necessarily site-specific pesticide information.<sup>768</sup> Proponents keep more detailed records that must

\* According to the *Pest Control Product Act*, SC 2002, c. 28, s. 2, a pest control product (i.e., pesticide) means:  
 (a) a product, an organism or a substance, including a product, an organism or a substance derived through biotechnology, that consists of its active ingredient, formulants and contaminants, and that is manufactured, represented, distributed or used as a means for directly or indirectly controlling, destroying, attracting or repelling a pest or for mitigating or preventing its injurious, noxious or troublesome effects;  
 (b) an active ingredient that is used to manufacture anything described in paragraph (a); or  
 (c) any other thing that is prescribed to be a pest control product.

† Mr. MacDonald was qualified as an expert in environmental toxicology and chemistry with particular expertise in ecological risk assessment and ecosystem-based management, water quality and water use interactions, design and evaluation of contaminated sediments on ecology receptors, including fish, and the design and implementation of environmental quality monitoring programs (Transcript, May 9, 2011, pp. 9–10). His curriculum vitae is Exhibit 828.

be produced to an integrated pest management inspector upon request.<sup>769</sup> While pesticide vendors in British Columbia have to keep a record of their sales, according to Dr. Carey sales data for pesticides are extremely unreliable as to pesticide use in a region for any given year.<sup>770</sup> Both Dr. Carey and Mr. MacDonald agreed that better data for pesticide use are important for understanding impacts of pesticides on the Fraser River watershed.<sup>771</sup>

DFO Science and Environment Canada's Aquatic Ecosystem Protection Research Division both have agreements with PMRA whereby science advice is provided to PMRA to support its regulation of pesticides.<sup>772</sup> There is no mechanism for DFO Science to provide advice to the province regarding pesticide use.<sup>773</sup>

According to Dr. Talbot, pesticide research in relation to environmental contaminants is part of Environment Canada's mandate. However, Dr. Talbot also said that, other than the agreement with PMRA, the Aquatic Ecosystem Protection Research Division only spends about 5 percent of its budget on pesticide research.<sup>774</sup>

### **Greywater**

Greywater is wastewater originating from showers, baths, bathroom sinks, kitchen sinks, pools, spas, and laundry. It gets into the environment through municipal wastewater systems (discussed as a point source, below), septic systems, and through discharge from vessels. It can contain nutrients, bacteria, viruses, and a variety of chemicals, including endocrine disruptors associated with detergents and personal care products. According to the province, the cumulative effects of multiple vessels discharging greywater may result in the long-term disruption of nutrient levels and subsequent impacts on the ecology of a body of water, such as Shuswap Lake.<sup>775</sup>

Federally, greywater is not considered to be garbage or sewage and is not covered by the *Canada Shipping Act, 2001*, or *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*,\* as long as it does not contain a pollutant prescribed in those regulations.<sup>776</sup> However, in some circumstances the

general prohibition on discharges of deleterious substances set out in section 36 of the *Fisheries Act* could apply.

Provincially, the Ministry of Environment regulates greywater discharges under the authority of the *Environmental Management Act* (EMA). Section 13 prohibits a person from discharging "domestic sewage" or waste from trailers, campers, transportable housing units, boats, or houseboats onto land or into any reservoir, lake, pond, stream, or other natural water body except in compliance with a permit, approval, order, waste management plan, or EMA regulation, or if disposal facilities are provided. Domestic sewage in the EMA's *Municipal Sewage Regulation* includes greywater.<sup>777</sup>

The province is implementing compliance with the EMA, section 13, and its prohibition against greywater discharge from vessels into coastal marine waters in a phased-in approach. The province expected full compliance by spring 2010. Transport Canada has advised British Columbia that it is working on a regulatory approach for greywater discharge from small vessels that would be similar to sewage discharge. The provincial Ministry of Environment is working with Transport Canada to develop a draft greywater discharge regulation with a goal of completed draft sometime in 2011–12.<sup>778</sup>

The increase in rental boats has increased the amount of greywater entering Shuswap Lake. In 2007, the Ministry of Environment committed to a three-year compliance strategy focused on greywater discharges from boats on Shuswap Lake. As of July 28, 2010, the province had undertaken no authorization, compliance, and/or enforcement action under the EMA preventing the discharge of greywater from watercraft into Shuswap Lake.<sup>779</sup>

### **Point source contaminants**

Three point sources of contamination for Fraser River sockeye habitat were considered in the evidentiary hearings: municipal wastewater, pulp and paper mills, and metal mining. Each is discussed below.

\* After the hearings, these regulations were repealed and replaced by the *Vessel Pollution and Dangerous Chemicals Regulations*, SOR/2012-69, in force March 30, 2012. Greywater is not covered by these regulations, 2012-04-11 *Canada Gazette* Part II, vol. 146, no. 8, p. 1014.

## ***Municipal wastewater***

Municipal wastewater effluents consist of two basic types of liquid wastes: sanitary sewage and stormwater. Sanitary sewage typically contains human and other organic wastes originating from homes, industries, and businesses. Community sewer systems collect these wastes and transport them to wastewater treatment plants, where the effluents usually receive some level of treatment before being discharged into a receiving body of water. Stormwater contains many of the same compounds found in sewage, as well as surface runoff (for example, rain that drains off rooftops, lawns, roads, and other surfaces). Communities have either combined sewer systems, which combine raw sewage and stormwater, or separate sewer systems for sanitary sewage and stormwater. Stormwater carried in separate systems is discharged directly into receiving waters without treatment.<sup>780</sup>

One disadvantage with combined systems is that, during periods of heavy precipitation, they can become overloaded and wastewater is typically directed to combined sewer overflows, allowing raw sewage and untreated stormwater to overflow at many exit points upstream of the treatment facility and to enter receiving waters directly without any treatment.<sup>781</sup> Municipalities with combined sewer systems typically experience tens of overflows of such systems annually.<sup>782</sup> I heard from Dr. Ken Ashley, senior scientist, Northwest Hydraulic Consultants, that these discharges, depending on their magnitude and the timing, have the potential to harm Fraser River sockeye salmon. He said that there is a risk of acute toxicity and also of chronic toxicity and accumulation of persistent contaminants.<sup>783</sup> Dr. Ross added that research in Puget Sound, Washington State, has shown that runoff from combined sewer overflows has created problems for salmon.<sup>784</sup>

The City of Vancouver is separating sewers at the rate of approximately 1 percent of the system per year and has a timeline to complete this work by 2050.<sup>785</sup> Dr. Albert van Roodselaar, division manager, Utility Planning and Environmental Management,

Metro Vancouver,\* said that replacing combined sewer overflows has proceeded at a regular pace.<sup>786</sup>

Also, DFO and Metro Vancouver have worked to mitigate effects on riparian areas from stormwater through the development of an Integrated Stormwater Management Plan.<sup>787</sup> However, Mr. Salomi told me that the *Riparian Areas Regulation* (RAR) process results in smaller buffer zones along riparian areas than what is set out in this plan.<sup>788</sup> (The RAR and its relationship to Fraser River sockeye salmon habitat protection is discussed above.)

Technical Report 2, Contaminants, reports that the highest density of wastewater treatment facilities is in the Lower Fraser River area.<sup>789</sup> But the highest volume of municipal wastewater effluent in the province appears to be discharged into the Strait of Georgia.<sup>790</sup> According to Environment Canada, about 90 wastewater treatment facilities currently operate in the Fraser River basin.<sup>791</sup> Technical Report 2 has a full listing and description of municipal wastewater treatment plants in the Fraser River basin.<sup>792</sup> The three large Lower Fraser River area wastewater treatment plants that were addressed in the hearings are Iona Island Wastewater Treatment Plant, which receives wastewater from Vancouver and parts of Burnaby and Richmond; Annacis Island Wastewater Treatment Plant, which serves a large number of Lower Mainland municipalities; and Lulu Island Wastewater Treatment Plant, which serves Richmond.<sup>793</sup>

According to Dr. Ross, DFO Pacific Region does not monitor or research the impacts of municipal wastewater on Fraser River sockeye salmon.<sup>794</sup> Mr. van Aggelen testified that, in the Pacific Region, no one at Environment Canada is tasked with assessing the impact of municipal wastewater on salmon.<sup>795</sup> Dr. Ross further said that the lack of research on the effects of chemicals in wastewater on Fraser River sockeye makes it difficult to speak with certainty about potential effects on these fish stocks.<sup>796</sup>

## **Regulation**

Federal, provincial, and municipal levels of government share responsibility for managing the

\* Metro Vancouver is the name generally given to the Greater Vancouver Regional District. It includes three entities: the Greater Vancouver Regional District with member municipalities in the Lower Mainland; the Greater Vancouver Sewerage and Drainage District, which provides wastewater treatment services to its member municipalities; and the Greater Vancouver Water District, which provides drinking water services and treatment to its member municipalities.

collection and treatment of municipal wastewater, for the administration and performance of wastewater facilities, and for controlling the environmental and health impacts of municipal effluents.<sup>797</sup> Effluent from wastewater systems must comply with applicable federal legislation and with provincial or territorial legislation, permits, and licences.

Federally, the *Fisheries Act* and CEPA regulate the impacts of municipal wastewater. Subsection 36(3), the general pollution prevention provision of the *Fisheries Act*, applies to municipal wastewater discharges.<sup>798</sup> There are two instruments under CEPA related to wastewater effluent: the *Notice Requiring the Preparation and Implementation of Pollution Prevention Plans for Inorganic Chloramines and Chlorinated Wastewater Effluents* and *Guideline for the Release of Ammonia Dissolved in Water Found in Wastewater Effluents*.<sup>799</sup> These instruments outline performance objectives for chlorine and chlorine compounds and for ammonia in wastewater effluent.

Provincial and territorial governments are responsible for permitting municipal wastewater treatment facilities.<sup>800</sup> Generally, under the EMA,\* sewage facilities require authorization under either a permit, liquid waste management plan, or a regulation.<sup>801</sup> Section 3 of the *Waste Discharge Regulation* specifies industries, businesses, trades, operations, and activities that are exempt from the EMA and the *Waste Discharge Regulation*. British Columbia has moved to performance-based requirements for wastewater treatment facilities under the *Municipal Sewage Regulation*.<sup>802</sup> In some circumstances, local governments may be exempted from compliance with the *Municipal Sewage Regulation*.<sup>803</sup>

The province largely relies on local governments to monitor and report on their own wastewater effluent discharges, whether under the *Municipal Sewage Regulation* or under a liquid waste management plan with an operational certificate. The Ministry of Environment may conduct occasional spot checks to assess the credibility of data in municipal reports.<sup>804</sup> The minister

may make pollution prevention orders against a municipality if satisfied that a municipal activity or operation is performed in a manner that is likely to release a substance that will cause pollution, or if the minister considers that a municipality is causing pollution, he or she may exercise pollution abatement powers.<sup>805</sup>

Municipal governments across Canada provide sewage treatment, as well as control discharges into the sewer systems.<sup>806</sup> Each municipality is responsible for both its own sewers and the sewers from private properties that feed into municipal and Greater Vancouver Sewerage and Drainage District sewers.<sup>807</sup> Under the EMA, regional districts, in certain circumstances, may pass bylaws regarding the direct or indirect discharge of wastes into any sewer or drain connected to the district's sewerage facilities.<sup>808</sup> Sewer-use bylaws are the primary legal instruments used by local governments to control and limit the industrial, commercial, and institutional sources of wastes discharged to their sewer systems.<sup>809</sup>

Endocrine-disrupting chemicals like polybrominated diphenyl ethers (PBDEs) cannot be effectively treated by wastewater treatment plants. That is why, according to Dr. van Roodselaar, Metro Vancouver told the federal government that these compounds were best managed by prohibition (that is, by "source control") and the federal government put such a prohibition in place.<sup>810</sup> In addition, Dr. Ross testified that Metro Vancouver has very strong and important source control programs to prevent some chemicals from getting into the effluent stream.<sup>811</sup> Under the EMA, industries discharging to sewers within a municipal jurisdiction are regulated by the municipality through source control programs.<sup>812</sup>

Municipal wastewater is not currently governed by a specific regulation under section 36 of the *Fisheries Act*. However, in March 2010, Environment Canada proposed draft Wastewater Systems Effluent Regulations (WSER), which, if enacted, would apply nationwide.<sup>813</sup> The WSER are based, in part, on the *Canada-Wide Strategy for the*

\* Under the EMA, a "sewage facility" is "works operated by a municipality to gather, treat, transport, store, utilize or discharge sewage" (s. 23). A "waste management facility" means a facility for the treatment, recycling, storage, disposal or destruction of a waste, or recovery of reusable resources, including energy potential from waste (ss. 1(1)). A "permit" is issued under section 14 or under the regulations (ss. 1(1)). A "waste management plan" means a plan that contains provisions or requirements for the management of recyclable material or other waste or a class of waste within all or a part of one or more municipalities (ss. 1(1)).



*Management of Municipal Wastewater Effluents*, published by the Canadian Council of Ministers of the Environment (CCME Strategy).<sup>814</sup>

The WSER use the national effluent quality standards and the implementation timelines established in the CCME Strategy.<sup>815</sup> The purpose of the regulations is to provide national baseline standards for municipal wastewater treatment.<sup>816</sup> They specify conditions that must be met by any wastewater system with a capacity to deposit 10 cubic metres or more of effluent daily from its final discharge point into fish-bearing waters.<sup>817</sup> The regulations establish standards for effluent toxicity, effluent monitoring, receiving environment monitoring, record keeping, and reporting.<sup>818</sup>

Under WSER transitional provisions, municipal sewage facilities will have different timelines to meet the minimum effluent standard, depending on the level of risk assessed.<sup>819</sup> In addition to monitoring to ensure effluent quality standards, some wastewater treatment facilities will also be required to undertake environmental effects monitoring (for a discussion of environmental effects monitoring, see the sections below on pulp and paper and metal mining) to evaluate the effect of the effluent quality standards in the WSER, and this monitoring will specifically address protection of fish and fish habitat.<sup>820</sup>

In general, the WSER do not impose limits or require testing of emerging contaminants of concern, such as pharmaceuticals, surfactants, some persistent organic pollutants, and PBDEs.<sup>821</sup> However, James Arnott, manager, Wastewater Section, Public and Resources Sectors Directorate, Environmental Stewardship Branch, Environment Canada, suggested that environmental effects monitoring could perhaps address some of these issues, since a municipality could include monitoring for such substances in their existing monitoring programs.<sup>822</sup>

Dr. Ross and some of his DFO toxic chemical research colleagues reviewed the WSER and provided comments to Mr. Brown.<sup>823</sup> Dr. Ross summarized his view of the draft regulations:

I think my take-home message was, while it's important to have a clear set of terms of engagement and a national strategy[,] and national regulations would help on that front, I did express the concern that a national minimum standard does not necessarily

upgrade the performance of all wastewater treatment plants.

Certainly a minimum standard of secondary [treatment] will reduce the risk to some aspects of Fraser River sockeye habitat, because an upgrade from primary to secondary will reduce the release of a number of contaminants of concern.

Specifically, the proposed regulations cover the kinds of chemical constituents or activities thereof that we've been worried about ... But they do not, in looking at these four primary conventional pollutants, there is only fleeting mention of site-specific impacts and concerns, only fleeting mention of emerging chemicals of concerns, such as the flame retardants or the pharmaceuticals. The reporting of monitoring data appears fairly elementary, and the effects monitoring ceases to be a requirement if there are no adverse impacts observed after a certain number of years.

So I did have some concerns ... These regulations were not designed to protect salmon. They were not designed to prevent cumulative impacts associated with multiple treatment plants. And they were not really designed to deal with the concerns that I have about bioaccumulation and biomagnifications food webs.

So we did have a number of concerns about a national minimum standard ... and we did have some concerns about the fact that site-specific impacts would be subject in some form to local regulatory frameworks.<sup>824</sup>

Dr. Ross indicated that none of the concerns expressed by DFO contaminant scientists in their review of the WSER were incorporated into the draft regulations.<sup>825</sup> Mr. Arnott was not aware of the memo by DFO toxic chemical scientists commenting on the draft regulations.<sup>826</sup> He also said that there has been "ongoing communication with DFO" as Environment Canada moved from finalizing the CCME Strategy toward development of the WSER.<sup>827</sup>

Metro Vancouver has also expressed concern about the WSER.<sup>828</sup> It passed a resolution that it "cannot commit to the Iona Wastewater Treatment Plant and the Lions Gate Wastewater Treatment Plant upgrades, as required in the CCME Strategy and the Regulations, without a

funding formula that includes the senior levels of government funding contribution.” Metro Vancouver also recommended clarification on regulation of combined sewer overflows, sanitary sewer overflows, and acute lethality test procedures; and it said that some monitoring / testing protocols under the WSER are inappropriate for marine / estuary discharges.<sup>829</sup>

The WSER do not address biosolids, which are not broken down by treatment and can be transferred to land and thus re-enter Fraser River sockeye salmon habitats through runoff.<sup>830</sup>

Mr. Arnott said that CCME is currently working on a Canada-wide approach for the management of wastewater biosolids; however, federally, there is limited authority right now to manage biosolids. He said that, although Environment Canada was – at the time of hearings – still considering input on the WSER, there were no significant changes being contemplated in terms of effluent quality standards. However, Environment Canada was contemplating a series of “fairly technical” changes.<sup>831</sup> Canada could prescribe higher levels of treatment requirements for particularly sensitive or important receiving environments if it saw fit to do so.<sup>832</sup>

The WSER have not yet been enacted. At the time of the hearings, Environment Canada was aiming to finalize, publish, and start implementing the regulations by the end of 2011.<sup>833</sup>

### Monitoring and compliance

Metro Vancouver has an environmental monitoring program as part of its liquid waste management plan.<sup>834</sup> The objective of the environmental monitoring is to collect data on parameters that might indicate a cause for concern or significant effect on the environment.<sup>835</sup> Water column, benthos, sediments, and fish are surveyed.<sup>836</sup> According to Dr. van Roodselaar, the environmental monitoring programs of Metro Vancouver are the most comprehensive wastewater treatment plant programs in the country, possibly the continent. These programs are reviewed on a monthly basis by Metro Vancouver’s Environmental Monitoring Committee.<sup>837</sup> Representatives from the province, University of British Columbia, Simon Fraser University, the public, and Health Canada sit on this committee; neither DFO nor Environment Canada

is currently represented on the committee, though Environment Canada was present until 2009.<sup>838</sup> There are no First Nations representatives.<sup>839</sup> Based on his experience working with Metro Vancouver and in wastewater treatment, Dr. Ashley stated that it would be beneficial if Environment Canada and DFO participated.<sup>840</sup>

At the Iona Island Wastewater Treatment Plant (Iona), there is no environmental monitoring of migratory fish species.<sup>841</sup> Dr. Ashley said that, if one is concerned about Fraser River sockeye salmon, then environmental monitoring by wastewater plants should include the examination of pelagic species or salmon. Dr. Ross agreed.<sup>842</sup>

Dr. van Roodselaar testified that environmental monitoring at Iona indicates that the effects on the receiving environment from this plant are “negligible.”<sup>843</sup> In response to the testimony of Dr. Ashley and Dr. Ross that there are potential negative impacts on the receiving environment at Iona, Dr. van Roodselaar said, “[T]he whole point of our monitoring program and of our Cautions, Warnings and Triggers Process, and of our review with other authorities, is to ensure to the best of our capability that that is not the case. That to the ability we can affirm it, that we are not causing a significant environmental concern.”<sup>844</sup> Dr. Ashley recommended Metro Vancouver build upon existing studies and make monitoring of emerging contaminants a larger component of their program.<sup>845</sup>

Finally, both Dr. Ashley and Dr. Ross told me that an environmental effects monitoring program for municipal wastewater treatment plants would be useful. Dr. Ashley also said that data from environmental effects monitoring need to be shared. Dr. Ross added that the monitoring should look at sediment as well as water quality.<sup>846</sup>

### Upgrades to Iona Island Wastewater Treatment Plant

DFO and Environment Canada have urged timely upgrades to Iona since 2002.<sup>847</sup> The most recent liquid waste management plan (approved May 2011) mandates an upgrade by 2030 based on the CCME Strategy approved by Environment Canada and the province.<sup>848</sup> Metro Vancouver has had discussions with the province and the federal government about funding for the upgrades to Iona.<sup>849</sup>

The level of upgrade being contemplated for Iona is to secondary treatment,\* which is what the WSER requires. Funding is a significant issue with respect to the level of treatment that will be put in place at Iona. First Nations also need to be consulted regarding the upgrades.<sup>850</sup>

Although he acknowledged that upgrading Iona is of less immediate concern than a plant discharging directly into the Fraser River, Dr. Ashley still recommended that the plant be upgraded to the best available technology, which is “considerably beyond secondary treatment.”<sup>851</sup> In terms of priorities, Dr. Ross advocated for anything that would reduce the inputs of pesticides, persistent compounds, and pharmaceuticals. But he acknowledged that treatment, whether secondary or tertiary, does not necessarily solve the problem and that source control and preventing these chemicals from getting into the wastewater in the first place are important.<sup>852</sup>

### ***Pulp and paper***

As I describe in Volume 2 of this Report, pulp mills that could affect Fraser River sockeye salmon operate in the Fraser River watershed and on the shores of the Strait of Georgia and in other marine areas through which Fraser River sockeye may migrate.

### **Regulation**

The *Pulp and Paper Effluent Regulations* (PPER) were enacted under section 36 of the *Fisheries Act*.<sup>853</sup> They regulate effluent discharges from pulp and paper mills to Canadian fisheries waters. Environment Canada is responsible for administering and enforcing these Regulations. The PPER prescribe certain deleterious substances in pulp and paper mill effluent and in effluent from off-site treatment facilities.<sup>†</sup> Specifically, the PPER prescribe

limits to biochemical oxygen demand matter, total suspended solids, and effluent that is acutely lethal to fish.<sup>‡</sup> The Regulations prohibit the discharge of acutely lethal effluent and set out discharge limits for biological oxygen demand and total suspended solids. If these regulatory conditions are not met, the discharge is unauthorized and may constitute an offence under section 36. Each mill must monitor discharges in accordance with the Regulations.<sup>854</sup>

Environmental effects monitoring seeks to verify that the load limits for the receiving environment allowed under the PPER are adequate to protect fish, fish habitat, and the fisheries resource. According to Janice Boyd, program scientist, Natural Resources Sector Unit, Environmental Protection Operations, Environment Canada, the goal is to evaluate whether regulatory changes are required. Mill owners and operators are required to conduct environmental effects monitoring to study the potential effects of effluent on the fish population, fish tissue, and benthic invertebrates. Environment Canada verifies compliance. The PPER environmental effects monitoring program requires biological monitoring studies and sublethal toxicity testing, using prescribed methods and at prescribed intervals. There are local monitoring committees for each mill with Environment Canada, the provincial Ministry of Environment, and mill representatives, and sometimes representatives from environmental organizations and First Nations.<sup>855</sup>

The *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* (PPM Effluent Regulations) and the *Pulp and Paper Mill Defoamer and Wood Chip Regulations*, enacted under CEPA, aim to curtail the release of dioxins and furans into the receiving environment.<sup>856</sup> Under the federal Coastal Mills Dioxin and Furan Trend Monitoring Program, mills on the BC coast must monitor dioxins and furans around their effluent outfalls.<sup>857</sup>

\* Conventional wastewater treatment is categorized in three basic levels: primary, secondary, and tertiary. Each treatment level provides progressively greater removal of solids, metals, and certain contaminants. See Exhibit 1052, pp. 3–5, and Exhibit 833, p. 15.

† “Effluent” means (a) wastewater treated by an off-site treatment facility, or (b) wastewater from a mill, other than wastewater from the treatment of intake water, including process water, gas scrubbing water, boiler blow-down water, wash-down water, cooling water, leachate from any site at the mill where solid residues generated by any mill are treated or disposed of, and leachate from any site at the mill where wood chips or hog fuel are stored; “off-site treatment facility” refers to “a facility that treats effluent from a mill if the facility is neither owned nor operated by the owner of a mill” (PPER, s. 2).

‡ Biochemical oxygen demand is a measure of the oxygen demand in the receiving environment for organic matter to break down. “Acutely lethal” for effluent means that the effluent at 100 percent concentration “kills more than 50 per cent of the rainbow trout subjected to it during a 96-hour period, when tested in accordance with the acute lethality test” (PPER, s. 2).

British Columbia has a provincial regime dealing with pulp and paper mill effluent under the EMA. The *Pulp Mill and Pulp and Paper Mill Liquid Effluent Control Regulation* sets quality requirements for final effluent respecting dioxins, furans, biological oxygen demand, total suspended solids, and acute lethality. Each permittee mill is required to sample each effluent outfall at various minimum frequencies and report the data. A permittee who contravenes these provisions or intentionally submits false monitoring data commits an offence.<sup>858</sup>

### Monitoring and compliance

Douglas Hill, head, Environmental Management Section, Cariboo region, Environmental Protection Division, BC Ministry of Environment, told me that provincial mine and mill permits do not consistently require immediate reports of non-compliance by the permittee; rather, non-compliance is reported in the monthly (for mills) or quarterly (for mines) reports required by the province.<sup>859</sup> Spills or unauthorized releases exceeding certain thresholds must be reported in accordance with the *Spill Reporting Regulation* (pursuant to the EMA), and all permits require reporting of emergencies, unauthorized discharges, and equipment malfunctions.<sup>860</sup> Mr. Hill testified that clauses requiring reporting of non-compliance have recently been incorporated into some permits. He said it would be helpful if there were a province-wide policy directing how these clauses should be developed so they are consistent.<sup>861</sup>

A 2005 national assessment of pulp and paper mill environmental effects monitoring found that nutrient enrichment and metabolic disruption has been observed in fish. Some enrichment was seen in benthic invertebrate communities near BC mills, though incidents of smaller gonads were not as common in British Columbia.<sup>862</sup> Ms. Boyd explained that in the marine environment, Environment Canada has had difficulty in evaluating fish species effectively since the fish surveys used are designed for freshwater.<sup>863</sup> In 2009, another national assessment

of the results of environmental effects monitoring found the same general trends.<sup>864</sup>

Since the PPER were enacted in the early 1990s, improvements have been made in treatment processes, and the amount of dioxins and furans, as well as biological oxygen demand and total suspended solids, released from pulp mills in the province appears to have decreased significantly.<sup>865</sup> By 2002, six mills required annual monitoring; by 2004, only three did.<sup>866</sup> Coastal pulp mills no longer discharge detectable levels of dioxins to marine waters.<sup>867</sup> A 2002 paper summarizing environmental contaminants in Fraser River sockeye salmon habitat notes that research indicates a decline in the concentrations of a large number of endocrine-disrupting chemicals after secondary treatment of pulp mill effluent. All BC pulp mills have this secondary treatment in place because of the PPER.<sup>868</sup> Also, some mills in the Fraser River watershed have had two consecutive cycles (each cycle is a three-year monitoring period) of environmental effects monitoring with no measured effects on the receiving environment.<sup>869</sup>

Despite the improvements with respect to effluent discharges from pulp and paper mills along the Fraser River sockeye salmon migratory route, Ms. Boyd testified that Environment Canada does not know if pulp and paper effluent currently has any impact on Fraser River sockeye because Environment Canada does not design its studies for this species.<sup>870</sup> Environmental effects monitoring and effluent discharge monitoring do not evaluate health of sockeye since these programs are designed to look at resident fish species (although both she and Michael Hagen, program scientist, Natural Resources Sector Unit, Environmental Protection Operations, Environment Canada, said that sockeye are only in a discharge area for short periods of time, and thus, presumably, impacts on sockeye are less than for resident fish).<sup>871</sup> Mr. Hagen noted that, in the federal environmental assessment process for new projects,\* potential impacts on migratory salmon or salmon-bearing creeks would be considered.<sup>872</sup>

\* As discussed above, I note that Part 3, Division 1, of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012), which repeals the *Canadian Environmental Assessment Act* (CEAA) in force at the time of the hearings. As a result, the reference to the CEAA may not reflect the current law respecting environmental assessment in Canada, nor the applicability of environmental assessments to pulp and paper mills and metal mines.

According to Robert Grace, environmental impact assessment biologist, Thompson-Nicola sub-region, Environmental Protection Division, BC Ministry of Environment, monitoring under provincial permits similarly focuses on resident fish and does not evaluate effects on migratory fish like Fraser River sockeye salmon.<sup>873</sup> Also, provincial permits for pulp mills do not address endocrine-disrupting chemicals.<sup>874</sup>

Environmental effects monitoring does not address the cumulative effects of pulp and paper or mining effluent discharges into freshwater, but Ms. Boyd says that environmental effects monitoring “should go in that direction.”<sup>875</sup> Environment Canada has not done any assessment of cumulative sublethal effects from pulp and paper or mines on migratory fish as they move through different discharges over their life cycle.<sup>876</sup> In Ms. Boyd’s view, cumulative effects could be better assessed to understand impacts on Fraser River sockeye salmon, starting with bringing the different groups and scientists working in this area together to develop an assessment strategy.<sup>877</sup> In contrast, Mr. Hagen stated that it would be a “real challenge” to assess cumulative effects.<sup>878</sup> The province does not appear to assess cumulative effects, but Mr. Hill thought that cumulative effects may be something considered in an environmental assessment rather than the individual permitting process.<sup>879</sup>

I invited all witnesses who testified on pulp and paper and metal mining to comment on the recommendations regarding monitoring set out in Technical Report 2, Contaminants.<sup>880</sup> These recommendations relate to contaminants generally and not specifically to those in pulp and paper or mining effluents. All the witnesses agreed with Recommendation 5 that coordination among government agencies and regulated interests should be improved to ensure requisite data are collected and compiled into a single database or multiple compatible databases.<sup>881</sup> However, Mr. Hill noted that it would be useful to focus efforts on the types of discharges that might pose a risk to salmon.<sup>882</sup> Ms. Boyd suggested using existing databases where possible and noted that it would require resources to maintain the database as well as to develop it.<sup>883</sup> Finally, Mr. Hagen noted that to develop and maintain such a system would be difficult given scarce resources.<sup>884</sup>

Both Mr. Hill and Mr. Grace agreed that ambient monitoring should include direct measures of effects on sockeye (such as morphology, physiology, en route mortality, pre-spawn mortality, and egg viability), although Mr. Hill said that this work was fish health monitoring and not ambient environmental quality monitoring that might be part of routine or permit monitoring by the province.<sup>885</sup> Mr. Hagen pointed out that, because sockeye are migratory and are exposed to a variety of different environments, determining which exposure causes what effects is difficult.<sup>886</sup>

Ms. Boyd said the suggestion in Technical Report 2, Contaminants, that routine monitoring programs should be developed and implemented to provide the data needed to characterize exposure of sockeye to aquatic contaminants throughout their life cycle, would be appropriate as part of a monitoring program. Mr. Hill said such monitoring may not be part of routine water quality monitoring, but would rather be a special project. In Mr. Grace’s view, an initial monitoring program should be developed to look at a wide range of contaminants and habitats to identify which contaminants and habitats may be problematic or at least detectable. Subsequent monitoring should focus on problematic contaminants and habitats. Ms. Boyd, Mr. Hill, and Mr. Grace generally agreed that monitoring programs should address several environmental quality variables on different temporal and spatial scales.<sup>887</sup>

Technical Report 2, Contaminants, recommends that monitoring programs address contaminants of concern set out in Table 8.1 of that report.<sup>888</sup> Witnesses said the table identifies every potential contaminant and thus was unrealistic; they thought only relevant parameters or near-term priorities should be addressed. Each made specific suggestions as to what they thought would be the most relevant parameters for setting near-term priorities (as does Technical Report 2).<sup>889</sup>

Finally, with respect to recommendations regarding monitoring generally, Mr. Hagen said:

It is easy to agree that more monitoring studies should be done or that more data should be collected. The challenge is deciding how much of our scarce funding and manpower resources should be devoted to which studies collecting what data. It is often the case that new issues

will arise and there is no data to assess the issue because the issue could not be anticipated. Data gaps are easy to recognize in hindsight. Existing programs collect data on a generic set of indicator parameters at what is seen to be an appropriate temporal and spatial distribution. Yes, we should periodically review and evaluate these programs to check if they provide necessary and sufficient data – there is no point in monitoring for the sake of monitoring. If it is determined that there are unacceptable gaps that need to be filled, then programs can be developed and implemented to fill the gaps. It's complicated because decision makers also consider whether resources should instead be expended on programs addressing impacts which are even more unacceptable. And the judgment about what is “unacceptable” also needs to be made.<sup>890</sup>

### ***Metal mining***

Mines, and metal mines in particular, have the potential to adversely affect water quality.<sup>891</sup> Several public submissions raised concerns about metal mining in the Fraser River watershed.<sup>892</sup> At the time of the hearings there were seven active metal mines in the Fraser River watershed: Endako (Prince George area), Huckleberry (Houston area), Gibraltar (between Williams Lake and Quesnel), Mount Polley (near Williams Lake), Quesnel River (near Quesnel), Highland Valley (near Kamloops), and Bralorne (Bridge River area).<sup>893</sup> The first six of these are open-pit mines, and Bralorne is an underground gold mine. The Endako mine discharges into a creek that drains into François Lake (a sockeye-rearing lake) and into the Endako River that drains into Fraser Lake.<sup>894</sup> Huckleberry discharges into the Tahtsa Reach on the Nechako Reservoir, so some of the discharge may ultimately enter the Fraser River.<sup>895</sup> There are also a number of closed or abandoned mines in the Fraser River watershed, not all of which are known to Environment Canada or the province.<sup>896</sup> However, Mr. Hagen said that a fair bit is known about most of the closed mines, and although some of these mines could be discharging to the Fraser River system, where problems have been identified they have been addressed.<sup>897</sup>

### **Regulation**

Federally, the *Metal Mining Effluent Regulations* (MMER) are enacted under subsection 36(5) and other provisions of the *Fisheries Act*.<sup>898</sup> The MMER authorize metal mines to deposit deleterious substances into fish-bearing waters under certain conditions (these deposits would otherwise be prohibited by subsection 36(3) of the *Fisheries Act*). They apply to metal mines with an effluent flow rate exceeding 50 cubic metres per day into water frequented by fish.<sup>899</sup> Mines to which the MMER do not apply, including closed mines, remain subject to the general prohibition against depositing deleterious substances in subsection 36(3) of the *Fisheries Act*.<sup>900</sup> Of the seven active metal mines in the Fraser River watershed, four are subject to the MMER: Endako, Huckleberry, Gibraltar, and Bralorne.<sup>901</sup> Mines subject to the MMER must conduct monthly testing in accordance with specific procedures.<sup>902</sup> Frequency of testing can be reduced or increased depending on test results.<sup>903</sup> Mines submit annual reports summarizing effluent monitoring results.

Under the MMER, mines must conduct environmental effects monitoring, which is described above in relation to municipal wastewater and pulp and paper mills. Two types of environmental effects monitoring studies are required: (1) effluent and water quality monitoring; and (2) biological monitoring.<sup>904</sup> Results of effluent and water quality monitoring are reported annually.<sup>905</sup>

The parameters monitored are set nationally and do not necessarily reflect particular contaminants expected to be discharged from an individual mine. As described for pulp and paper mills (see above), there are local monitoring committees for each mine. Through these committees, Environment Canada may recommend that a mine monitor and report on additional parameters.<sup>906</sup> In contrast, the provincial permit-based monitoring parameters are determined on a site-specific basis (and this system is the same for permits for pulp and paper mills). The province usually includes within the permit parameters suggested by Environment Canada.<sup>907</sup>

In 2009, Environment Canada produced an *Environmental Code of Practice for Metal Mines*. Designed to support the MMER, these guidelines recommend various practices to mitigate identified environmental concerns. Mines are advised, but not required, to comply with the Code.<sup>908</sup>

A proposed mine may also trigger an environmental assessment under the CEAA. For example, if a proposed mine would harm fish habitat and thus require an authorization under subsection 35(2) of the *Fisheries Act*, or if it would involve a tailings impoundment area under Schedule II of the MMER, then an environmental assessment under the CEAA must be conducted.\*

The provincial *Mines Act* is the primary statute governing mining in British Columbia. A permit under section 10 of the *Mines Act* is generally required before starting any work at a mine. Pursuant to the *Mines Act*, the *Health, Safety and Reclamation Code for Mines in British Columbia* applies to all mines.<sup>909</sup> Part 9 of the Code addresses mining exploration in riparian areas. It establishes riparian setbacks on streams, wetlands, and lakes.<sup>910</sup> Part 9 of the Code also addresses protection of community watersheds, soil conservation to support vegetation regrowth, minimizing risks of erosion-related events, remediation for erosion-related events that harm fish habitat, road construction, stream crossings, water management, storage and use of fuel and lubricants, and reclamation.<sup>911</sup>

Subsection 120(3) of the EMA makes it an offence to discharge waste from a prescribed industry or activity without authorization. Mining is a prescribed industry, and therefore most mines require a waste discharge permit. Waste discharge permits may be subject to requirements for the protection of the environment.<sup>912</sup> For mines, the permits typically include requirements related to surface runoff, mine drainage, and monitoring and reporting. As discussed above, provincial mine permits do not consistently require immediate reports of non-compliance by the permittee; rather, non-compliance would be reported in quarterly reports required by the province.<sup>913</sup>

The BC Ministry of Energy and Mines (or predecessor ministries) and Ministry of Environment have jointly developed policies and guidelines on the management of mine effluent.<sup>914</sup> In 2009, the two ministries developed a Memorandum of Understanding on the Regulation of Impoundments

and Diversions on a Mine Site. Under this agreement, the Ministry of Environment's Environmental Protection Division is responsible for the protection of human health and the environment from any adverse effects of mine wastes or impoundments, the use of hazardous materials, and the management of contaminated sites. The Ministry of Environment is also responsible for regulating the quantity and quality of discharges to the environment from mining activities, and it will refer all applications for waste management permits and amendments dealing with mine tailings discharges to the Ministry of Energy and Mines for advice.<sup>915</sup>

### Monitoring and compliance

Environment Canada enforces the MMER in accordance with the Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the *Fisheries Act* (for a description of this policy, see Chapter 7, Enforcement).<sup>916</sup> Mr. Hagen's impression is that BC mines are generally in compliance with most MMER parameters, or if not, the non-compliance is usually a relatively minor issue.<sup>917</sup>

The three MMER mines in the Fraser River watershed that have submitted environmental effects monitoring reports (Endako, Huckleberry, and Gibraltar) have all exceeded limits for effluents and/or failed biological monitoring tests in the period 2006–9.<sup>918</sup> Mr. Hagen described the results from interpretative reports of environmental effects monitoring for Endako, Huckleberry, and Gibraltar mines (these reports are done on a three-year cycle as per environmental effects monitoring reports for pulp and paper mills as discussed above). Endako found enrichment effects on benthos and an "inhibitory" effect on young-of-the-year fish; Huckleberry did not find any effects on fish or benthos; and Gibraltar has not yet issued its first cycle report.<sup>919</sup> Mr. Hagen explained that an "inhibitory" effect in terms of fish means slower growth, poorer condition, lower abundance, and smaller size at age. Bralorne has not yet submitted an interpretive report.<sup>920</sup>

\* As discussed above, I note that Part 3, Division 1, of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, enacts a new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) and repeals the *Canadian Environmental Assessment Act* (CEAA) in force at the time of the hearings. Under the CEAA, 2012, these circumstances may no longer require an environmental assessment as they did under CEAA, para. 5(1)(d).

In December 2005, Environment Canada initiated a national review of the environmental effects monitoring program, and published the results in the *Metal Mining Environmental Effects Monitoring Review Team Report, 2007*.<sup>921</sup> Another report produced in 2007 presents a national assessment of environmental effects monitoring data collected in 2004 and 2005.<sup>922</sup> Mr. Hagen spoke about a recommendation from the Monitoring Review Team to continue communications among all stakeholders involved in environmental effects monitoring on an annual basis to discuss new science and other issues as they arise.<sup>923</sup> He said that Environment Canada is implementing this process, and he provided some examples where stakeholders, including First Nations, were invited to provide feedback on aspects of the environmental effects monitoring program or were part of local monitoring committees.<sup>924</sup>

As noted above for pulp and paper mills, environmental effects monitoring and the provincial process do not address cumulative effects of mining effluents, nor does Environment Canada assess cumulative sublethal effects on migratory fish as they move through different discharge areas over their life cycle.<sup>925</sup>

## Findings

### *Non-point source contaminants*

Environment Canada's water quality monitoring in the Fraser River system does not provide information about most contaminants of concern to Fraser River sockeye, likely because providing this information is not the purpose of Environment Canada's monitoring program. Furthermore, Environment Canada does not conduct any marine water quality monitoring that is relevant to the health of Fraser River sockeye. The Department of Fisheries and Oceans (DFO) does not take responsibility for water quality monitoring as it relates to sockeye in either the freshwater or the marine environment.

I accept the evidence of Environment Canada and DFO witnesses who testified that there were gaps in non-point source contaminant research and monitoring with respect to Fraser River sockeye salmon because of differences between what each department views as its responsibility. All witnesses

agreed that it would be beneficial to Fraser River sockeye to have improved communication, coordination of research, and a mechanism for DFO to advise Environment Canada about contaminants. I find that DFO and Environment Canada should clarify their respective responsibilities for research and monitoring of contaminants (other than contaminants covered by *Fisheries Act* regulations) that could affect Fraser River sockeye salmon and anadromous fish.

I also find that, as a result of the loss of the Pacific Region Water Quality Unit, Environment Canada no longer has access to DFO expertise on the effects of pollutant discharges (including discharges from marine spills) on water quality necessary to sustain fish.

Contaminant monitoring as it relates to the health of Fraser River sockeye salmon has been neglected by DFO and Environment Canada for jurisdictional reasons. It matters little whether Environment Canada considers its jurisdiction to cease at the end of an outfall pipe, or that DFO's decision to cut its Toxic Chemicals Research Program nearly a decade ago and to disband its Pacific Region Water Quality Unit was done without consultation. The effect is that neither department is currently monitoring contaminants in freshwater or marine habitat that may negatively affect Fraser River sockeye productivity.

Finally, I note that the province does not keep comprehensive information on the quantities and types of pesticides used in different areas of the province. Information regarding pesticide application to residential properties and the agricultural sector is not collected, nor is the applicator required to keep that information. Although pesticide vendors must keep a record of their sales, I was told that sales data for pesticides are extremely unreliable as to pesticide use in a region for any given year. I am satisfied that better data on the use of pesticides are important in order to understand their impacts on the Fraser River watershed.

### *Municipal wastewater*

In the Pacific Region, DFO is not involved in monitoring or researching the impacts of municipal wastewater on Fraser River sockeye or other salmon, nor is anyone from Environment Canada tasked with assessing the impacts of municipal



wastewater on salmon. Municipal wastewater is not currently governed by a specific regulation under section 36 of the *Fisheries Act*. However, in March 2010, Environment Canada proposed draft Wastewater Systems Effluent Regulations (WSER) which, if enacted, would apply nationwide. From the evidence I heard, the WSER would provide a useful regulatory tool, and I encourage Canada to finalize these regulations.

I also agree with Dr. Ken Ashley, senior scientist, Northwest Hydraulic Consultants, and Dr. Peter Ross, research scientist, Marine Environmental Quality Section, Institute of Ocean Sciences, Science Branch, who said that an environmental effects monitoring program for municipal wastewater plants would be useful to protect Fraser River sockeye salmon. This program should impose limits or require testing of emerging contaminants of concern such as pharmaceuticals, surfactants, and some persistent organic pollutants and polybrominated diphenyl ethers (PBDEs). Also, Canada should have a regulatory strategy to limit impacts of wastewater biosolids on fisheries resources.

With respect to monitoring of wastewater effluent in the Fraser River watershed, I heard that the Iona Island Wastewater Treatment Plant (Iona) does not monitor effluent effects on migratory fish species, but Dr. Ross and Dr. Ashley said that environmental monitoring of wastewater plants should include the examination of pelagic species or salmon. I accept this evidence. I also accept the evidence of Graham van Aggelen, head, Environmental Toxicology Section, Pacific Environmental Science Centre, Environment Canada, and Dr. Ross that it is important to change current toxicological methods to gauge effluent quality of point source discharges.

Based on the testimony of Dr. Albert van Roodselaar, division manager, Utility Planning and Environmental Management, Metro Vancouver, and Dr. Ross, I find that treatment of wastewater cannot effectively reduce some contaminants of concern such as PBDEs, and thus source control programs are important.

Finally, although based on the limited evidence before me I do not make any recommendations regarding upgrades to Iona, I encourage Metro Vancouver to upgrade this facility to the best available technology by 2030 or before if possible.

### ***Pulp and paper mills and metal mines***

I accept the evidence of Janice Boyd, program scientist, Natural Resources Sector Unit, Environmental Protection Operations, Environment Canada, that there have been improvements with respect to effluent discharges from pulp and paper mills along the Fraser River sockeye salmon migratory route. However, I also accept her evidence and that of Robert Grace, environmental impact assessment biologist, Thompson-Nicola sub-region, Environmental Protection Division, BC Ministry of Environment, that current monitoring of pulp and paper and metal mining effluents does not evaluate the health of Fraser River sockeye, nor does Environment Canada assess the cumulative sublethal effects of pulp and paper and metal mining effluent on migratory fish. DFO and Environment Canada should co-operatively work to ensure the consideration of Fraser River sockeye in environmental effects monitoring of pulp and paper mills and metal mines.

I discuss these findings and any related recommendations in Volume 3 of this Report.

## **Habitat enhancement and restoration**

In Volume 2 of this Report, I summarize the expert evidence relating to salmon enhancement activities and the decline in productivity of Fraser River sockeye. I summarize the evidence on fish health management in relation to enhancement facilities in Chapter 9, Fish health management. In the section that follows, I describe the evidence regarding salmon habitat enhancement and restoration activities relevant to the management of Fraser River sockeye salmon.

### **Enhancement and restoration policies**

As described previously in this chapter, one goal of the 1986 Habitat Policy for the Management of Fish Habitat (1986 Habitat Policy) is fish habitat restoration, which involves rehabilitating “the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved

through the fisheries resource.” Another stated goal is fish habitat development, which involves improving and creating “fish habitats in selected areas where the production of fisheries resources can be increased for the social or economic benefit of Canadians.”<sup>926</sup>

One of the implementation strategies in the 1986 Habitat Policy is “habitat improvement.” It is the means by which DFO says it will support projects and provide advice to community and conservation groups to restore and develop fish habitats. Under this strategy,

habitats may be restored by rehabilitating streams; eliminating or controlling exotic species, predators, parasites, and competitors; removing man-made and storm-related physical barriers; and, in co-operation with Environment Canada, requiring the installation and operation of suitable waste treatment technology.<sup>927</sup>

Co-operative action is another implementation strategy of the 1986 Habitat Policy. This strategy involves DFO supporting involvement by government agencies, public interest groups, and the private sector to conserve, restore, and develop fish habitats. Implementation is to be assisted by co-operative arrangements, such as national or regional committees and foundations, or boards with industry, non-government groups, other government agencies, and DFO representatives.<sup>928</sup>

The Wild Salmon Policy (WSP) states that enhancement-based production of salmon will continue to address social and biological objectives by rebuilding populations with an unacceptable chance of extirpation, and by providing harvest opportunities and fishery benefits.<sup>929</sup> It also states:

- The enhancement program will continue to evolve towards greater emphasis on community stewardship, habitat restoration and rebuilding of priority CUs [Conservation Units].
- Enhancement may be used to provide harvest opportunities and fishery benefits as part of an integrated strategic plan.
- The risks of hatchery production to wild salmon will be assessed through

the development of a biological risk assessment framework.<sup>930</sup>

Strategy 5 of the WSP deals with annual program delivery. Action steps 5.3 and 5.4 relate to habitat enhancement and restoration. Action Step 5.3 states that annual work plans will specify priorities for habitat rehabilitation or restoration work to be done by DFO alone or in partnership with others and will specify investigative work needed to fill knowledge gaps. Planning for restoration and habitat improvements will incorporate projects conducted by First Nations, volunteers, and stakeholders and make use of more accessible data from a number of sources. Annual reports on regulatory functions related to key habitats and restoration and rehabilitation works are supposed to be prepared. Action Step 5.4 stipulates that long-term objectives for enhancement projects will be set as part of a planning or recovery process for a Conservation Unit. Enhancement programs will last more than a year, but annual production targets and strategies will be documented in yearly Integrated Fisheries Management Plans (described in Chapter 5, Sockeye fishery management) and will be consistent with objectives for CUs. Also under Action Step 5.4, adult salmon production is to be assessed for adherence to the rebuilding schedule and enhancement guidelines and practices.<sup>931</sup>

The draft 2008 Enhancement Guidelines for Salmon Enhancement Programs (Enhancement Guidelines) describe the Salmonid Enhancement Program (SEP) and its objectives, identify risks of enhancement, outline considerations in planning enhancement programs, and identify policies that govern these programs. The Enhancement Guidelines state that “populations targeted for enhancement should be those stocks believed likely to become extinct in a few generations without intervention,” or populations currently at a level substantially below the carrying capacity of a given system. The Enhancement Guidelines also say that enhancement for sustaining fisheries aims “to increase a population above a natural productivity level (or return it to a former productivity level), and may be used to establish, stabilize, or maintain harvest opportunities for First Nations [and other sectors].”<sup>932</sup>

The Enhancement Guidelines contain specific directions about what managers should consider

when assessing management strategies and weighing associated risks, benefits, and costs of enhancement.<sup>933</sup>

## Initiatives and programs

### *Salmonid Enhancement Program*

The Salmonid Enhancement Program (SEP) is unique to the Pacific Region and includes hatcheries, community stewardship, and resource restoration activities.<sup>934</sup> SEP applies to all salmonids: sockeye, chum, coho, pink, and chinook salmon, as well as cutthroat and steelhead trout (although the latter two species are managed by the province).<sup>935</sup> The program was established in 1977 primarily to increase harvest,<sup>936</sup> but it now has three major functions:

- a. Fish production: To conserve and preserve vulnerable salmon stocks and to sustain fisheries;
- b. Community involvement: To increase public awareness and build community stewardship; and
- c. Resource restoration: restoring, developing and improving fish habitat.<sup>937</sup>



*Inch Creek Hatchery, BC, 2010*

Until 2007, SEP unit managers at regional headquarters all reported directly to the regional director of OHEB. Since approximately 2008, these managers have reported to a director of SEP who reports functionally to the regional director of OHEB and directly to the regional director general.<sup>938</sup> Although the program is part of OHEB

in the Pacific Region, it reports functionally to, and is funded through, the Ecosystems and Fisheries Management sector nationally.<sup>939</sup>

An executive-level SEP Leadership Team provides direction. Its members include: regional director, OHEB (team lead); regional director, Fisheries and Aquaculture Management; Fisheries Management staff at national headquarters; regional director, Science; director, SEP; area directors; and SEP managers / OHEB area managers as required. The Regional Management Committee makes key decisions about the program.<sup>940</sup>

Although SEP was launched with the goal of doubling the catch of salmon within 30 years, many salmon stocks, despite enhancement efforts, have declined, including Fraser River sockeye and South Coast chinook and coho. Total catch of Pacific salmon by Canada has declined dramatically since the mid-1990s as well. SEP's original goal of doubling the commercial catch has failed, although Upper Adams sockeye are cited as an example of an enhancement success, and enhancement may play a role in keeping the Cultus Lake stock from extinction.<sup>941</sup>

SEP has a multi-pronged approach to enhancing wild salmon stocks that includes:

- *hatcheries* – provision of controlled spawning, protected incubation, and, usually, rearing of salmon to fry or smolt size;
- *spawning channels* – groundwater or river-fed man-made structures that increase the available spawning and incubation area and improve conditions for spawning and in-gravel incubation;
- *semi-natural fish culture structures* – incubation boxes, side-channel spawning / rearing, etc. to increase freshwater survival with low-tech / low-cost intervention;
- *fishways* – placement of structures or removal of obstructions to improve fish passage;
- *habitat improvements* – placement or removal of structures to increase spawning and rearing productivity;
- *lake and stream enrichment* – addition of nutrients / carcasses to lakes and streams to increase primary productivity and hence food availability for juvenile salmon; and
- *public education* – classroom and educational activities; outdoors club; and other community-

based activities to increase awareness and stewardship of fish stocks and habitat and to provide economic opportunities in remote communities.<sup>942</sup>

As of the hearings in May 2011, there were 23 major enhancement facilities and spawning channels managed by government employees, 21 community hatcheries operated as part of the Community Economic Development Program, and about 350 public involvement projects supported by 18 DFO community advisors in the area offices.<sup>943</sup>

DFO's major facilities have been licensed under the *Pacific Aquaculture Regulations* since December 2010 (for more information on these regulations, see chapters 8, Salmon farm management, and 9, Fish health management).<sup>944</sup> According to Dr. Christine MacWilliams, fish health veterinarian, SEP, the licence conditions and protocols for hatcheries are not as detailed as the ones under which salmon farms operate. She said the different licences are

constructed to demonstrate the differences between those practices and how they operate and what their goals are. So the licences for the enhancement programs are not as detailed as the aquaculture industry licence but it's a reflection of what we do and that we are releasing fish as juveniles. We're not holding them throughout their entire lives.<sup>945</sup>

She also added that hatcheries use native stocks in native watersheds.<sup>946</sup>

In the Fraser River watershed, there are four spawning channels (Weaver, Gates, Horsefly, and Nadina) and two hatcheries that produce sockeye (Upper Pitt River and Cultus Lake).<sup>947</sup> There was also hatchery production in the Upper Adams area in 1988, 1992, 1996, 2000, and 2001.<sup>948</sup> The average annual Fraser River hatchery sockeye releases for 2006–9 were 2.7 million, and average annual Fraser River total enhanced sockeye (hatchery and spawning channel) releases for 2006–9 were 40 million with about 90 percent from spawning channels.<sup>949</sup> For comparison, the average annual BC enhanced sockeye releases for 2006–9 were 170 million with about 97 percent from spawning channels, and the average annual BC enhanced salmon releases for 2006–9 were 348 million, which contributed about

6 percent of the total releases of all salmon species into the North Pacific.<sup>950</sup> Although most DFO major facilities are not producing Fraser River sockeye salmon, 13 of these facilities are located within the Fraser River watershed and Strait of Georgia.<sup>951</sup>



*Weaver Creek Spawning Channel, BC, 2010*

DFO's Community Involvement Program aims to bring people from communities throughout the province together to participate in locally based enhancement efforts. This program includes the following:

- Community Economic Development Program;
- Public Involvement Program, which helps to secure donated labour, expertise, and other resources to re-establish salmonid populations in rivers and streams and includes:
  - Streamkeepers Program, which trains and supports citizens in the monitoring, protection, and improvement of aquatic habitat;
  - Community Advisors who provide technical advice and financial support to volunteer salmon enhancement and watershed stewardship projects;
  - A range of educational material to teach school children about the value of the salmon resource (e.g. "Salmonids in the Classroom");
  - StreamTalk stewardship newsletter; and
  - Storm Drain Marking Program; and
- Salmon Enhancement and Habitat Advisory Board, which is a public consultation group intended to assist DFO in developing policy.<sup>952</sup>

Through SEP's Community Economic Development Program, DFO contracts with community-based groups to operate local enhancement projects, such as hatcheries, raceways, spawning channels, or aeration towers. DFO intends the program to help restore depleted salmonid stocks in British Columbia and to improve the self-reliance, independence, and social and economic stability of Aboriginal people. More than half of the 21 Community Economic Development Program projects are operated by First Nations and the rest by community organizations. Most projects are located in remote or rural communities.<sup>953</sup> Nine of the projects are located within the Fraser River watershed and Strait of Georgia.<sup>954</sup>

The Public Involvement Program provides seed funding (usually less than \$10,000) and in-kind contributions of technical support by a DFO community advisor to volunteer-based projects operated by individuals and community organizations at arm's length from DFO. This program includes projects focused on habitat conservation and restoration, stewardship, public education and outreach, and small volunteer-run hatcheries. Projects also include stream monitoring, assessment, watershed planning, advisory services, and streamkeepers. Across the province, DFO community advisors have an annual operating budget of approximately \$1.35 million.<sup>955</sup>

SEP also undertakes significant or major habitat rehabilitation projects beyond the skills, ability, duration, and budget of volunteers. These efforts fall under the Resource Restoration Program and include building side channels, improving water flows and stabilizing stream banks, rebuilding estuaries, removing barriers to fish migration, and planting streamside vegetation. SEP works on these projects\* with a wide variety of partners, including First Nations, industry, community and conservation groups, private landowners, and other government agencies.<sup>956</sup>

The annual portion of the SEP budget allocated to the Resource Restoration Program is about \$3 million,<sup>†</sup> and from this money about \$25 million more is contributed by non-government participants.<sup>957</sup>

SEP funding is approximately \$26 million annually and has been stabilized at this level since 2004.<sup>958</sup> Consistent with testimony I heard regarding other DFO program budgets, there is no annual adjustment for inflation.<sup>959</sup>

According to Greg Savard, former director, SEP, and Carol Cross, former manager, SEP Strategic Initiatives, approximately 75 percent of SEP's budget supports DFO's major fish production operations and facilities (major enhancement facilities) and the remainder goes to the Resource Restoration Program (approximately \$3 million) and the Community Involvement Program (which includes the Community Economic Development Program, about \$3 million).<sup>960</sup> Mr. Savard also explained that, in addition to its \$26 million annual budget, SEP also gets between \$2 million and \$5 million annually from a national infrastructure fund to support its major enhancement facilities.<sup>961</sup> Further, for 2009–11, SEP also received \$8 million from Canada's Economic Action Plan for infrastructure upgrades.<sup>962</sup>

Because of inflation and increasing and competing demands for SEP resources, there is no flexibility in the program to address new priorities or even to maintain existing facilities. Closure of major enhancement facilities could provide funding flexibility, but senior managers told me that ministerial approval is required to close down hatchery facilities and that previous public resistance to hatchery closures makes this option unattractive to the department.<sup>963</sup> When significant changes to fish production plans are proposed, a comprehensive briefing process is undertaken that includes regional senior officials and national sector staff including the sector assistant deputy minister in Ottawa. In the past, it appears that decisions to close and divest DFO fish production facilities were ministerial decisions.<sup>964</sup>

When asked about whether she had any concerns with the level of SEP funding, Ms. Cross indicated that she was generally content with the budget as it currently is (amount and allocation). She testified that the current level of funding is adequate to substantially address the programs that SEP needs to carry out. She also said she thought that \$3 million

\* A list of Lower Fraser area habitat restoration projects carried out by SEP's Resource Restoration Program that may provide benefits to Fraser River sockeye is set out in Table 3 of Exhibit 735 (TR 12, Lower Fraser Habitat), p. 57.

† I note that Ms. Reid testified that the funding for the Resource Restoration Program is approximately \$5 million, but on this detail I prefer the evidence of Mr. Savard and Ms. Cross that the amount is around \$3 million.



in funding for all the resource restoration work in the province is enough, since DFO is able to raise a lot of private funds for this work.<sup>965</sup> However, Mr. Savard said that some resource restoration projects are not done because they have no funding.<sup>966</sup>

The Pacific Fisheries Resource Conservation Council's 2001 report, *The Role of Public Groups in Protecting and Restoring Habitats in British Columbia, with a Special Emphasis on Urban Streams*, states that SEP's focus on artificial restoration methodologies rather than restoration or protection of habitat may have done more damage than good over the years because it gave the public the perception that unnatural human intervention is sufficient to maintain fish stocks in the face of increasing watershed degradation.<sup>967</sup> Several of the public submissions to the Commission recommended restoration, community stewardship, and education as priorities for DFO.<sup>968</sup> Some members of the public thought that the role of fish production in fisheries management and hatchery programs should be reviewed and reconsidered.<sup>969</sup> In contrast, I also heard from some people who stressed the importance of hatcheries and thought that DFO should increase hatchery production and/or funding.<sup>970</sup>

### ***Freshwater Fisheries Society of BC***

In addition to the salmon production managed by DFO (discussed above), the Freshwater Fisheries Society of BC also operates hatcheries. The Freshwater Fisheries Society of BC is a non-profit organization that works in conjunction with the province to support the British Columbia fish-stocking program and conservation fish culture activities. Several hatcheries are located in areas through which Fraser River sockeye salmon migrate.<sup>971</sup>

### ***Lake Enrichment Program***

Lake enrichment (or fertilization) is a salmon enhancement technique that attempts to improve the freshwater rearing conditions of wild sockeye salmon. It involves adding nutrients to surface waters of selected lakes during the sockeye growing season to increase the amount of plankton (food) for juvenile salmon. Nutrient addition does not increase sockeye salmon abundance in every

lake, perhaps because the size of some sockeye populations is not dependent on food availability in their freshwater growth phase. According to DFO, nutrient addition cannot solve all the problems with sockeye stocks in the province.<sup>972</sup>

In 1977, under the direction of DFO Science, a Lake Enrichment Program was initiated. From its inception, the program was considered primarily a research program to investigate the ecology of BC coastal lakes. This research-focused approach continued until 1997, when the SEP Enhancement Operations Division took over administration of the program from Science Branch. With respect to Fraser River sockeye, Chilko Lake was fertilized in 1988 and in 1990–93 and Adams Lake was fertilized in 1997 and 2001.<sup>973</sup> Great Central Lake on Vancouver Island is the only lake still being enriched.<sup>974</sup>

### ***Sunsetted habitat enhancement and restoration programs***

I heard evidence that DFO used to invest more funds and resources on habitat enhancement and restoration, as opposed to fish production, than it did at the time of the Commission's hearings.

In the 1990 federal budget, the Fraser River watershed was singled out as requiring priority action because of its high fisheries, ecosystem, and environmental values. In 1991, as part of its Green Plan, the government established the Fraser River Action Plan, sponsored by DFO and Environment Canada. The plan was to last six years and came with \$100 million in funding. It ended on March 30, 1997. Fraser River Action Plan goals were to build partnerships, reverse environmental degradation in the Fraser River basin, rehabilitate degraded areas, and develop a management program to achieve sustainable development. Specific objectives included a 30 percent reduction in the discharge of harmful industrial effluents by 1996, and the virtual elimination of releases of persistent toxic substances by the year 2000. Another objective was to double sockeye salmon stocks within 20 years from an average of 8 million fish in the 1975–86 period to 16 million. The first objective, building partnerships, involved the creation of the Fraser River Estuary Management Program, the Burrard Inlet Environmental Action Plan, and the precursor to the Fraser Basin Council.<sup>975</sup>

In 1998, the minister of fisheries and oceans announced a five-year, \$100 million Resource Rebuilding Strategy aimed at conserving and protecting Pacific salmon and their habitat.<sup>976</sup> This strategy was part of the Pacific Fisheries Adjustment and Restructuring Program. Key components included the Habitat Conservation and Stewardship Program; the Habitat Restoration and Salmon Enhancement Program; the Strategic Stock Enhancement Program; and the Pacific Salmon Endowment Fund.

The Habitat Conservation and Stewardship Program was in place from 1998 to March 31, 2003.<sup>977</sup> In British Columbia, the program was managed primarily through a program manager in OHEB, the five area chiefs, and five area coordinators, as well as a steering committee, an operations committee, and DFO regional headquarters' support staff.<sup>978</sup> Under the program, new staff were hired and positions created to liaise with potential stewardship partners and community organizations and to help provide funding and support for projects, programs, and activities to benefit fish and fish habitat.<sup>979</sup> Four types of positions were developed and funded: stewardship coordinator, habitat steward, habitat auxiliary, and habitat fishery officer.<sup>980</sup> The role of habitat fishery officers in enforcement is discussed in Chapter 7, Enforcement.

The Habitat Restoration and Salmon Enhancement Program provided funding for habitat restoration projects from fiscal year 1997/98 to 2001/02. The focus was habitat restoration, stock rebuilding, and resource and watershed stewardship.<sup>981</sup> Some parts of the Strategic Stock Enhancement Program – for example, certain hatchery operations – are still operational.

The Pacific Salmon Endowment Fund Society is a non-profit society established by DFO to be the custodian of the Pacific Salmon Endowment Fund. The society is responsible for setting program priorities for funding. Since 2001, the Pacific Salmon Foundation has had an agreement with the society to be the program manager for the annual funds and to participate in the growth of the fund. The monies are to be used to develop recovery plans for specific watersheds and coordinate actions aimed at rebuilding Pacific salmon stocks. These recovery plans are supposed to include an understanding of the current state of salmon and their habitat, biological limits to recovery, local and

regional fisheries, and the potential and requirements for recovery.<sup>982</sup>

## Interactions between wild and enhanced salmon

Expert evidence about potential interactions between wild and enhanced fish is summarized in Volume 2 of this Report.<sup>983</sup> In short, I heard that increasing fish densities in the North Pacific may have negative impacts on wild stocks, including Fraser River sockeye salmon.

DFO witnesses told me there are no studies by SEP or DFO Science to try to quantify the risk of over-exploitation of wild Fraser River sockeye salmon in mixed-stock fisheries with co-migrating enhanced populations.<sup>984</sup> Ms. Cross stated that this issue is not one that SEP would research.<sup>985</sup> There are also no studies by SEP or DFO looking at the effects of competition between wild and hatchery salmon in the marine environment.<sup>986</sup> In Ms. Cross's view, such studies are "complex and large and require significant resources to undertake," and there is limited capacity to undertake such large studies.<sup>987</sup> SEP has, however, recently asked DFO Science to develop a study to determine the carrying capacity for salmonids in the Strait of Georgia to aid production planning decisions at Strait of Georgia hatchery facilities. At the time of the hearings in May 2011, this study had not yet been designed.<sup>988</sup>

There is also no biological risk assessment framework within which to evaluate the risks of hatchery production to wild salmon as envisioned by the Wild Salmon Policy.<sup>989</sup> Ms. Cross said SEP is working on a biological assessment framework to assess hatchery impacts on wild salmon. Under this framework, SEP has produced a Hatchery Risk Analysis Tool, which is intended to enable identification and description of localized risks to wild salmon stocks in freshwater associated with hatchery production. The current draft framework does not identify or consider risks relating to competition among juveniles. For freshwater adult interactions, it includes a risk assessment of competition for spawning area and interbreeding owing to enhanced populations straying from their hatchery of origin during spawning. The framework also does not identify any risks associated with

hatchery production in the marine environment except for an evaluation of the effect of enhancement on harvest rates of a wild stock.<sup>990</sup> The framework is intended to be completed in another year and will be updated on an ongoing basis.<sup>991</sup> Ms. Cross testified that this biological assessment framework is different from the biological *risk* assessment framework referred to in the WSP.<sup>992</sup>

Both Mr. Savard and Ms. Cross said that, if the department better understood interactions between wild and enhanced salmon in the marine environment, it could better manage enhancement.<sup>993</sup> Dr. Randall Peterman, professor and Canada Research Chair in Fisheries Risk Assessment and Management, School of Resource and Environmental Management, SFU, testified about the pressing need for research into the early marine survival of Pacific salmonids and the role of hatchery production.<sup>994</sup> In his view, potential interactions between enhanced and wild fish are known and should be investigated further.<sup>995</sup> He also said that, as part of the management regime, the enhancement of salmon of any species should be planned as large-scale experiments, and evaluations of such plans should take into account density-dependent processes in the benefit / cost analyses (see discussion of density-dependent processes in Volume 2 of this Report).<sup>996</sup> On an international scale, he advocated for coordinated programs organized by the North Pacific Anadromous Fish Commission or an analogous international treaty organization to address potential interactions on the high seas among salmon from different countries.<sup>997</sup>

## Findings

Interactions between enhanced and wild salmon in the marine environment have not yet been researched and taken into account in the management of the fishery by the Department of Fisheries and Oceans (DFO). This situation should be remedied immediately by research aimed at understanding the interactions between enhanced and wild salmon in the marine environment. In order to meet DFO's

obligation to ensure the health of wild stocks, management steps such as those described in the Wild Salmon Policy (WSP) should be taken to manage the risk of harm to the wild stocks in a manner consistent with the precautionary approach.

The WSP provides that Salmonid Enhancement Program (SEP) will “continue to evolve towards greater emphasis on community stewardship, habitat restoration, and rebuilding of priority conservation units (CUs).” The policy states that risks to wild salmon because of hatchery production will be assessed through the development of a biological risk assessment framework. SEP has not yet incorporated the required elements of the WSP. The policy also contemplates that annual SEP production targets and strategies will be consistent with objectives for CUs. Annual enhancement targets and strategies are currently set out in Integrated Fisheries Management Plans. Because the enhancement targets and strategies are not provided at the CU level, there is no indication of whether these targets are consistent with Wild Salmon Policy CU objectives.<sup>998</sup> As well, Action Step 5.4 of the WSP stipulates that long-term objectives for enhancement projects will be set as part of a planning or recovery process for a CU.<sup>999</sup> I note, however, that no recovery plans are yet developed under Strategy 4 of the WSP.

Based on the evidence before me, DFO does not appear to have considered closing hatcheries or changing SEP funding allocations to increase funding to the Resource Restoration Program and Community Involvement Program. It is important to note that habitat restoration and stewardship education do not create the risk to wild populations that the large production of hatchery fish may pose (see the discussion in Volume 2). A shift in funding priorities from hatchery infrastructure to habitat restoration programs would appear to be consistent with the precautionary principle, with the acknowledged shift from SEP's historical focus on providing harvest opportunities to supporting fish conservation, and with implementation of the WSP.<sup>1000</sup>

I discuss these findings and any related recommendations in Volume 3 of this Report.



## Notes

- 1 Presentation by Rob Dainow (New Westminster Public Forum, September 20, 2010), summary available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 2 Public submission 0256-BRAUER, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 3 Presentation by Terry Slack (New Westminster Public Forum, September 20, 2010), summary available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 4 Public submission 0268-GUERIN, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 5 Public submission 0271-REZANSOFF, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 6 Presentation by Laura Dupont (New Westminster Public Forum, September 20, 2010), summary available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 7 Public submission 0682-SWANSTON, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 8 Public submission 0268-GUERIN, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 9 Public submission 0328-NICKERSON, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 10 Public submission 0327-WATER\_588416, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 11 SC 1992, c. 37.
- 12 Public submission 0824-SWANSTON, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 13 Public submission 0608-TRAYNOR, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 14 Presentation by Elena Edwards (Chilliwack Public Forum, September 29, 2010), summary available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 15 Public submission 0328-NICKERSON, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 16 RSC 1985, c. F-14.
- 17 Public submission 0216-HENSELWOOD, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 18 Public submission 0216-HENSELWOOD, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 19 Public submission 0245-HUSBAND, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 20 Public submission 0274-LOEWEN, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 21 Public submission 0329-WILSON, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 22 Jason Hwang, Transcript, April 5, 2011, p. 1; Rebecca Reid, Transcript, April 5, 2011, pp. 1-2; Patrice LeBlanc, Transcript, April 5, 2011, p. 2.
- 23 Randy Nelson, Transcript, April 8, 2011, p. 75.
- 24 Exhibit 8, pp. 12-13.
- 25 Exhibit 260.
- 26 Exhibit 33-27, p. 6; Exhibit 33-28, p. 6; Exhibit 654, p. 11
- 27 Rebecca Reid, Transcript, April 4, 2011, p. 56; Exhibit 33-30, p. 2; Exhibit 654, p. 2.
- 28 Rebecca Reid, Transcript, April 4, 2011, p. 55; Exhibit 654, p. 2.
- 29 Exhibit 33-27, pp. 6-7; Exhibit 33-28, pp. 6-7. See also PPR 8, pp. 7-11, and PPR 14, pp. 14-15.
- 30 Exhibit 654, p. 5.
- 31 Exhibit 671, p. 1.
- 32 Patrice LeBlanc, Transcript, April 4, 2011, pp. 56-57.
- 33 Transcript, April 4, 2011, p. 57.
- 34 Rebecca Reid, Transcript, April 4, 2011, pp. 55-56; see also PPR 8, p. 9.
- 35 Rebecca Reid, Transcript, April 5, 2011, pp. 53, 55.
- 36 Exhibit 654, p. 10.
- 37 Exhibit 654, p. 5.
- 38 Canada's written submissions, pp. 74, 204, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 39 Transcript, April 4, 2011, p. 30.
- 40 Transcript, April 4, 2011, pp. 30-31; Rebecca Reid, Transcript, April 4, 2011, p. 46.
- 41 Transcript, April 4, 2011, p. 59.
- 42 PPR 8, p. 90.
- 43 Exhibit 35, p. 29.
- 44 Exhibit 653, pp. 2-4.
- 45 Rebecca Reid, Transcript, April 4, 2011, pp. 48-49; Exhibit 653, p. 2.
- 46 See Exhibit 1923.
- 47 PPR 8, p. 93.
- 48 Exhibit 88, pp. 12-13.
- 49 Exhibit 35, pp. 29-30.
- 50 Exhibit 653; Jason Hwang, Transcript, April 4, 2011, pp. 45-46; see also Michael Crowe, Transcript, June 8, 2011, p. 23.
- 51 Jason Hwang, Transcript, April 4, 2011, pp. 47.
- 52 Transcript, April 6, 2011, p. 31.
- 53 *Fish Protection Act*, SBC 1997, c. 21, s. 6(2).
- 54 *Sensitive Streams Designation and Licensing Regulation*, BC Reg 89/2000, Schedule of Designated Streams.
- 55 *Fish Protection Act*, SBC 1997, c. 21, ss. 4(1)(g) and 4(3).
- 56 *Riparian Areas Regulation*, BC Reg 376/2004.
- 57 *Water Act*, RSBC 1996, c. 483, s. 2.
- 58 *Water Regulation*, BC Reg 204/88, s. 44.
- 59 *Forest and Range Practices Act*, SBC 2002, c. 69 [FRPA].
- 60 *Forest Planning and Practices Regulation*, BC Reg 14/2004 [FPPR].
- 61 *Environmental Management Act*, SBC 2003, c. 53 [EMA], s. 6(2).
- 62 EMA, ss. 6(4) and (5).
- 63 *Waste Discharge Regulation*, BC Reg 320/2004, s. 4(1).
- 64 *Waste Discharge Regulation*, BC Reg 320/2004, s. 3(2).
- 65 *Municipal Sewage Regulation*, BC Reg 129/99.
- 66 Patrice LeBlanc, Transcript, April 4, 2011, p. 6.
- 67 Exhibit 260, p. 6-7.
- 68 Exhibit 260, pp. 6, 9-12; Patrice LeBlanc, Transcript, April 4, 2011, p. 6.
- 69 Randy Nelson, Transcript, April 8, 2011, p. 75.
- 70 Transcript, April 4, 2011, pp. 59-60.
- 71 Exhibit 737, pp. 345-49; Jason Hwang, Transcript, April 4, 2011, p. 31.
- 72 Exhibit 260 pp. 9-11; Patrice LeBlanc, Transcript, April 4, 2011, pp. 6-7.
- 73 Exhibit 260, p. 11.
- 74 Exhibit 260, pp. 11-12; Figure 1.
- 75 Exhibit 260, pp. 15-21.
- 76 Exhibit 260 p. 22.
- 77 Exhibit 260, pp. 22-23.
- 78 Exhibit 260, p. 23.
- 79 Patrice LeBlanc, Transcript, April 4, 2011, p. 7; Exhibit 260, p. 23.
- 80 Exhibit 260, p. 26.
- 81 PPR 8, p. 19.
- 82 PPR 8, p. 20.
- 83 PPR 8, p. 20.
- 84 Exhibit 8, p. 13.
- 85 Conservation Coalitions's written submissions, pp. 20-21, paras. 65-66; First Nations Coalition's written submissions, pp. ix, 218-19; Métis Nation of British Columbia's written submissions, p. 19; Stó:lō Tribal Council and Cheam Indian Band's submissions, pp. 24-25, available at [www.cohencommission.ca](http://www.cohencommission.ca); Transcript, November 8, 2011, p. 14; Transcript, November 10, 2011, p. 30.
- 86 Exhibit 88, p. 12.
- 87 Exhibit 35, p. 12.
- 88 Exhibit 35, p. 33; Exhibit 650, p. 2; Patrice LeBlanc, Transcript, April 4, 2011, p. 23.
- 89 Patrice LeBlanc, Transcript, April 4, 2011, p. 24.
- 90 Transcript, November 2, 2010, pp. 36-37.

- 91 Patrice LeBlanc, Transcript, April 4, 2011, p. 24; Transcript, April 5, 2011, p. 45; Rebecca Reid, Transcript, April 4, 2011, pp. 25-26.
- 92 Patrice LeBlanc, Transcript, April 4, 2011, p. 24.
- 93 PPR 8, pp. 20-21.
- 94 Exhibit 730, pp. 20-29.
- 95 Exhibit 88, p. 12.
- 96 Exhibit 649, p. 1.
- 97 PPR 8, p. 23.
- 98 Transcript, April 4, 2011, p. 19.
- 99 Patrice LeBlanc, Transcript, April 4, 2011, p. 19; Transcript, April 5, 2011, p. 79.
- 100 Transcript, April 4, 2011, pp. 13-14; Transcript, April 5, 2011, p. 4.
- 101 Transcript, April 5, 2011, p. 4.
- 102 Transcript, April 4, 2011, pp. 14-15; Transcript, April 5, 2011, p. 3.
- 103 Transcript, April 5, 2011, pp. 3-4.
- 104 Transcript, April 8, 2011, pp. 7-8.
- 105 Transcript, April 8, 2011, p. 33.
- 106 Transcript, November 2, 2010, p. 32.
- 107 Transcript, September 22, 2011, pp. 26-27.
- 108 Transcript, September 22, 2011, p. 26.
- 109 Transcript, September 22, 2011, p. 28.
- 110 Transcript, September 22, 2011, p. 27.
- 111 Transcript, April 5, 2011, p. 93.
- 112 Transcript, April 6, 2011, p. 32.
- 113 Exhibit 260, p. 6.
- 114 PPR 8, p. 20.
- 115 Exhibit 35, pp. 12, 31.
- 116 Transcript, April 4, 2011, p. 30; Transcript, April 5, 2011, p. 4.
- 117 Transcript, April 4, 2011, p. 14.
- 118 Transcript, April 4, 2011, pp. 16-17.
- 119 Transcript, April 5, 2011, p. 28.
- 120 Patrice LeBlanc, Transcript, April 4, 2011, pp. 14, 30; Claire Dansereau, Transcript, November 2, 2010, p. 33.
- 121 Transcript, April 4, 2011, pp. 15, 27, 75; Transcript, April 5, 2011, p. 5.
- 122 Transcript, April 4, 2011, p. 15; Transcript, April 5, 2011, p. 7; Transcript, April 6, 2011, p. 34.
- 123 Rebecca Reid, Transcript, April 4, 2011, p. 16.
- 124 Exhibit 260, p. 15.
- 125 Jason Hwang, Transcript, April 4, 2011, pp. 89-90; Michael Crowe, Transcript, June 8, 2011, p. 6; Corino Salomi, Transcript, June 8, 2011, pp. 70-71.
- 126 Transcript, April 4, 2011, pp. 28, 61, 89-90.
- 127 Transcript, April 4, 2011, p. 29.
- 128 Transcript, April 4, 2011, p. 61.
- 129 Transcript, June 8, 2011, p. 73.
- 130 Transcript, September 22, 2011, p. 34.
- 131 Patrice LeBlanc, Transcript, April 4, 2011, pp. 8-10.
- 132 Patrice LeBlanc, Transcript, April 4, 2011, p. 10; Rebecca Reid, Transcript, April 4, 2011, pp. 11-12; Jason Hwang, Transcript, April 4, 2011, pp. 11-12.
- 133 Transcript, April 4, 2011, pp. 10-13; Transcript, April 5, 2011, pp. 63, 69-70.
- 134 Transcript, April 4, 2011, pp. 11-12.
- 135 Transcript, April 4, 2011, p. 12.
- 136 Transcript, September 22, 2011, p. 28.
- 137 Exhibit 35, p. 33; Exhibit 650, p. 2; Patrice LeBlanc, Transcript, April 4, 2011, p. 23.
- 138 Transcript, September 22, 2011, pp. 29-30.
- 139 Exhibit 260, p. 23. See also PPR 8, pp. 31-47.
- 140 Exhibit 260, p. 25.
- 141 Patrice LeBlanc, Transcript, April 4, 2011, p. 68; Rebecca Reid, Transcript, April 4, 2011, p. 68; Exhibit 654, p. 11.
- 142 Patrice LeBlanc, Transcript, April 4, 2011, pp. 69-70.
- 143 PPR 8, p. 18.
- 144 PPR 8, p. 32.
- 145 Michael Crowe, Transcript, June 8, 2011, pp. 12, 18.
- 146 PPR 8, p. 32.
- 147 Exhibit 1624, pp. 6-7.
- 148 Exhibit 1624, pp. 9, 14-15.
- 149 Exhibit 1624, p. 18.
- 150 Exhibit 1624, p. 19.
- 151 PPR 8, p. 40.
- 152 Exhibit 1624, pp. 19-21.
- 153 PPR 8, p. 40.
- 154 Exhibit 1624, p. 22.
- 155 Exhibit 671, p. 3. Note, during the hearings Canada entered into evidence an earlier (July 2009) version of this document as Exhibit 658.
- 156 Rebecca Reid, Transcript, April 4, 2011, p. 64.
- 157 PPR 8, pp. 42-43.
- 158 Exhibit 671, pp. 17-20.
- 159 Exhibit 671, pp. 12-14.
- 160 Exhibit 671, pp. 6, 16.
- 161 Exhibit 671.
- 162 Corino Salomi, Transcript, June 8, 2011, pp. 12-20; Patrice LeBlanc, Transcript, April 4, 2011, p. 90; Michael Crowe, Transcript, June 8, 2011, p. 12; PPR 8, p. 37; PPR 8, Appendix 5 and Appendix 6; Dave Carter, Transcript, April 6, 2011, p. 66; Exhibit 671, p. 2.
- 163 Michael Crowe, Transcript, June 8, 2011, pp. 12, 18.
- 164 Michael Crowe, Transcript, June 8, 2011, pp. 4-5.
- 165 Exhibit 671, p. 13.
- 166 Exhibit 35, p. 27; Patrice LeBlanc, Transcript, April 4, 2011, p. 35. See also PPR 8, pp. 23-28.
- 167 PPR 8, pp. 24-25.
- 168 Transcript, April 4, 2011, p. 34.
- 169 PPR 8, p. 25; Exhibit 1624, p. 5.
- 170 Exhibit 680, p. 1; Dave Carter, Transcript, April 6, 2011, p. 5; Patrice LeBlanc, Transcript, April 4, 2011, p. 35.
- 171 PPR 8, p. 26.
- 172 PPR 8, pp. 26-27.
- 173 PPR 8, p. 27.
- 174 PPR 8, p. 28.
- 175 Exhibit 680, p. 1; Exhibit 673, p. 2; Exhibit 703.
- 176 PPR 8, p. 29.
- 177 Michael Crowe, Transcript, June 8, 2011, pp. 1-3, 24-25; Corino Salomi, Transcript, June 8, 2011, p. 3.
- 178 Michael Crowe, Transcript, June 8, 2011, p. 24; Exhibit 1003, p. 1.
- 179 Jason Hwang, Transcript, April 4, 2011, p. 87; Exhibit 647.
- 180 Corino Salomi, Transcript, June 7, 2011, pp. 20-21, 99; Michael Crowe, Transcript, June 7, 2011, pp. 98, 100.
- 181 PPR 8, p. 28.
- 182 Exhibit 651, p. 6.
- 183 Exhibit 651, p. 10; Rebecca Reid, Transcript, April 5, 2011, p. 11.
- 184 Transcript, April 4, 2011, p. 37; Transcript, April 5, 2011, p. 93.
- 185 Exhibit 662; Jason Hwang, Transcript, April 5, 2011, p. 19.
- 186 Transcript, April 5, 2011, p. 20.
- 187 Michael Crowe and Corino Salomi, Transcript, June 8, 2011, pp. 21-22.
- 188 Transcript, June 8, 2011, pp. 25-27; Exhibit 1003.
- 189 Corino Salomi, Transcript, June 8, 2011, pp. 10-12; Michael Crowe, Transcript, June 8, 2011, pp. 3-4.
- 190 Patrice LeBlanc, Transcript, April 4, 2011, p. 91.
- 191 Jason Hwang, Transcript, April 4, 2011, p. 32; Patrice LeBlanc, April 4, 2011, pp. 90-91; Claire Dansereau, Transcript, September 22, 2011, p. 31.
- 192 Transcript, April 4, 2011, p. 91.
- 193 Transcript, April 4, 2011, pp. 32-33.
- 194 Jason Hwang, Transcript, April 5, 2011, pp. 12-13.
- 195 Transcript, April 4, 2011, pp. 31-32.
- 196 Rebecca Reid, Transcript, April 4, 2011, pp. 33-34.
- 197 Transcript, September 22, 2011, p. 32.
- 198 Transcript, September 22, 2011, p. 33.
- 199 Jason Hwang, Transcript, April 5, 2011, p. 78; Dave Carter, Transcript, April 6, 2011, pp. 66-67.
- 200 Michael Crowe, Transcript, June 8, 2011, p. 14.

- 201 Transcript, April 8, 2011, pp. 34–35.
- 202 Michael Crowe, Transcript, June 8, 2011, pp. 16–18; Corino Salomi, Transcript, June 8, 2011, pp. 14–15.
- 203 Transcript, June 8, 2011, p. 15.
- 204 Corino Salomi, Transcript, June 8, 2011, p. 16.
- 205 Transcript, June 8, 2011, pp. 5–7.
- 206 *Canadian Environmental Assessment Act*, SC 1992, c. 37 [CEAA], s. 4(1)(a). See also PPR 8, pp. 49–73.
- 207 *Environmental Assessment Act*, SBC 2002, c 43 [BC EAA].
- 208 BC EAA, ss. 5(1), 6(1).
- 209 *Reviewable Projects Regulation*, BC Reg 370/2002.
- 210 *Law List Regulations*, SOR/94–636.
- 211 CEAA, ss. 11(1), 2 (definition of “responsible authority”).
- 212 CEAA, ss. 5(1)(a), (b), and (c).
- 213 CEAA, ss. 12(1) and (2).
- 214 CEAA, ss. 7(1)(a), (b) and (c), 7.1, and Schedule; the *Exclusion List Regulations*, 2007, SOR/2007–108.
- 215 CEAA, ss. 14–45; Patrice LeBlanc, Transcript, April 4, 2011, p. 81.
- 216 CEAA, s. 20.
- 217 CEAA, ss. 37(2), (2.1), and (2.2).
- 218 CEAA, ss. 5(1)(d), 11(2), and 13.
- 219 CEAA, s. 38 and s. 2 (definition of “follow up program”).
- 220 PPR 8, pp. 56, 60; Exhibit 654, p. 11.
- 221 CEAA, s. 18(3).
- 222 PPR 8, pp. 69–70.
- 223 Dave Carter, Transcript, April 6, 2011, p. 9; Exhibit 260, p. 21.
- 224 Exhibit 678, p. 4; Dave Carter, Transcript, April 6, 2011, pp. 3, 7.
- 225 Transcript, April 6, 2011, pp. 8, 38.
- 226 See, e.g., Exhibit 673, p. 7; Exhibit 678, pp. 4–5.
- 227 Exhibit 680, p. 5.
- 228 Exhibit 678, p. 5.
- 229 Exhibit 678, p. 5; Exhibit 680, p. 2.
- 230 Exhibit 678, p. 5.
- 231 Dave Carter, Transcript, April 6, 2011, pp. 12, 18; Exhibit 676, p. 2.
- 232 Transcript, April 6, 2011, pp. 10, 12, 15, 17, 57; Exhibit 678, p. 5.
- 233 Exhibit 680, p. 1.
- 234 Dave Carter, Transcript, April 6, 2011, pp. 3–4, 42.
- 235 Exhibit 680, p. 1.
- 236 Jason Hwang, Transcript, April 4, 2011, pp. 81–82.
- 237 Exhibit 680, pp. 1, 5–6.
- 238 Exhibit 656.
- 239 Exhibit 657; Patrice LeBlanc, Transcript, April 4, 2011, p. 62.
- 240 Exhibit 657, pp. 4–6, 9.
- 241 Transcript, April 4, 2011, p. 63. See also Exhibits 657, 703, 704, and Paul Steele, Transcript, April 7, 2011, p. 49; Transcript, April 8, 2011, p. 7.
- 242 Paul Steele, Transcript, April 7, 2011, p. 50; Patrice LeBlanc, Transcript, April 4, 2011, p. 72.
- 243 Randy Nelson, Transcript, April 7, 2011, pp. 50–51; Paul Steele, Transcript, April 7, 2011, p. 52.
- 244 Exhibit 657, p. 2. See also Paul Steele, Transcript, April 8, 2011, p. 10; Exhibit 705; Exhibit 714 is the existing Regional Operational Protocol developed under the 2007 Compliance Protocol.
- 245 Transcript, April 8, 2011, p. 12.
- 246 Transcript, April 6, 2011, pp. 3, 5–6, 37.
- 247 Dave Carter, Transcript, April 6, 2011, pp. 20–22.
- 248 Dave Carter, Transcript, April 6, 2011, pp. 22, 23, 53; Exhibit 678.
- 249 Transcript, April 6, 2011, p. 20.
- 250 Dave Carter, Transcript, April 6, 2011, pp. 12, 10, 52, 57, 82.
- 251 Exhibit 678, p. 5; Dave Carter, Transcript, April 6, 2011, pp. 15, 17.
- 252 Transcript, April 6, 2011, pp. 15–16.
- 253 Transcript, April 6, 2011, p. 51.
- 254 Dave Carter, Transcript, April 6, 2011, pp. 16–17, 19.
- 255 Exhibit 678, p. 5.
- 256 Transcript, April 6, 2011, p. 62.
- 257 Exhibit 35, p. 23.
- 258 Transcript, April 6, 2011, pp. 24, 26–27; Exhibit 679, p. 6.
- 259 Exhibit 35, p. 25.
- 260 Transcript, April 6, 2011, pp. 33, 36.
- 261 Dave Carter, Transcript, April 6, 2011, pp. 64–65.
- 262 Jason Hwang, Transcript, April 5, 2011, p. 78; Dave Carter, Transcript, April 6, 2011, pp. 66–67.
- 263 Michael Crowe, Transcript, June 8, 2011, pp. 5–6.
- 264 Transcript, April 5, 2011, p. 53.
- 265 Transcript, April 6, 2011, pp. 68–69.
- 266 PPR 8, p. 85; Dave Carter, Transcript, April 6, 2011, p. 30.
- 267 PPR 8, pp. 86–87; Dave Carter, Transcript, April 6, 2011, p. 30.
- 268 PPR 8, pp. 86–87; Dave Carter, Transcript, April 6, 2011, p. 30.
- 269 Dave Carter, Transcript, April 6, 2011, pp. 28–29, 60–61; PPR 8, pp. 84–89; Exhibit 679, p. 10; Exhibit 35, pp. 20, 26.
- 270 PPR 8, p. 85; Dave Carter, Transcript, April 6, 2011, p. 30; Exhibit 678, p. 9.
- 271 SOR/92–269; SOR/2002–222; Janice Boyd, Transcript, June 13, 2011, p. 12; Exhibit 1025.
- 272 Janice Boyd, Transcript, June 13, 2011, p. 18; *Metal Mining Effluent Regulations*, s. 23.
- 273 Janice Boyd, Transcript, June 13, 2011, p. 12.
- 274 PPR 19, pp. 27–28.
- 275 Exhibit 8, pp. 20, 22, 25.
- 276 Transcript, September 22, 2011, p. 30.
- 277 Michael Crowe, Transcript, June 7, 2011, p. 89.
- 278 Transcript, June 8, 2011, p. 70.
- 279 *Fish Protection Act*, s. 12(1)
- 280 Stacey Wilkerson, Transcript, June 8, 2011, p. 29.
- 281 Exhibit 1007, p. iii; Stacey Wilkerson, Transcript, June 8, 2011, p. 30.
- 282 *Riparian Areas Regulation*, BC Reg 376/2004, s. 2(a) and (b).
- 283 PPR 14, p. 21.
- 284 Exhibit 1007, pp. 4–8; Stacey Wilkerson, Transcript, June 8, 2011, p. 30.
- 285 *Riparian Areas Regulation*, BC Reg 376/2004, s. 1(1).
- 286 *Riparian Areas Regulation*, BC Reg 376/2004, s. 3(2).
- 287 Exhibit 1007, pp. 9–11; see also Stacey Wilkerson, Transcript, June 8, 2011, pp. 55–56.
- 288 *Riparian Areas Regulation*, s. 12(4)
- 289 Corino Salomi, Transcript, June 8, 2011, p. 52.
- 290 Stacey Wilkerson, Transcript, June 8, 2011, p. 33.
- 291 Exhibit 1007, p. iii.
- 292 *Riparian Areas Regulation*, BC Reg 376/2004, s. 4(2).
- 293 Michael Crowe, Transcript, June 8, 2011, p. 35; Jason Hwang, Transcript, September 16, 2011, p. 95.
- 294 *Riparian Areas Regulation*, BC Reg 376/2004, s. 4(3); Exhibit 1007, p. 36.
- 295 Stacey Wilkerson, Transcript, June 8, 2011, p. 34.
- 296 Michael Crowe, Transcript, June 8, 2011, p. 35; Exhibit 1007, p. 37; see also Exhibit 1008; Michael Crowe, Transcript, June 8, 2011, p. 38.
- 297 Michael Crowe, Transcript, June 8, 2011, p. 59.
- 298 *Yanke v. Salmon Arm (City)*, 2010 BCSC 814.
- 299 *Yanke v. Salmon Arm (City)*, 2011 BCCA 309 at paras. 48, 61–63.
- 300 Transcript, June 8, 2011, p. 39.
- 301 Jason Hwang, Transcript, September 16, 2011, p. 95.
- 302 Stacey Wilkerson, Transcript, June 8, 2011, pp. 41, 49.
- 303 Exhibit 1009, p. 2.
- 304 Exhibit 1009, p. 4.
- 305 Stacey Wilkerson, Transcript, June 8, 2011, p. 43; see also Exhibit 1009.
- 306 Transcript, June 8, 2011, pp. 44–45, 48–49; see also Exhibit 1009, pp. 6–9; Exhibit 1010, pp. 13–15.
- 307 Stacey Wilkerson, Transcript, June 8, 2011, pp. 41–43, 45–46; Exhibit 1010, p. 13; Exhibit 1009.
- 308 Stacey Wilkerson, Transcript, June 8, 2011, p. 44; Exhibit 1010, p. 15.
- 309 Exhibit 1010, p. 15.
- 310 PPR 14, p. 32.
- 311 Transcript, June 8, 2011, p. 43.
- 312 Stacey Wilkerson, Transcript, June 8, 2011, p. 57; Corino Salomi, Transcript, June 8, 2011, p. 60.
- 313 Transcript, June 8, 2011, p. 57.

- 314 Michael Crowe, Transcript, June 8, 2011, p. 58.
- 315 Michael Crowe, Transcript, June 8, 2011, p. 9; Stacey Wilkerson, Transcript, June 8, 2011, p. 33.
- 316 Michael Crowe, Transcript, June 8, 2011, pp. 46–47, 81.
- 317 Michael Crowe, Transcript, June 8, 2011, pp. 47, 58–59, 81; Stacey Wilkerson, Transcript, June 8, 2011, pp. 57, 74, 81–82.
- 318 Michael Crowe, Transcript, June 8, 2011, pp. 58, 61.
- 319 Corino Salomi, Transcript, June 8, 2011, p. 60.
- 320 Stacey Wilkerson, Transcript, June 8, 2011, p. 75; see also Michael Crowe, Transcript, June 8, 2011, p. 75.
- 321 Corino Salomi, Transcript, June 8, 2011, pp. 55–56; Stacey Wilkerson, Transcript, June 8, 2011, p. 55.
- 322 Corino Salomi, Transcript, June 8, 2011, p. 32.
- 323 Corino Salomi, Transcript, June 8, 2011, p. 75.
- 324 *Water Act*, RSBC 1996, c. 483,
- 325 Transcript, June 8, 2011, pp. 8–9; see also Exhibit 1018.
- 326 PPR 14, p. 33.
- 327 Public submission 0327–WATER\_588416; Public submission 0271–REZANSOFF; Public submission 0001–SLC\_768205, all available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 328 PPR 14, p. 34.
- 329 PPR 14, p. 33.
- 330 *Canadian Environmental Assessment Act*, SC 1992, c 37, s. 7(1)(b)–(c).
- 331 PPR 14, pp. 33–34.
- 332 Exhibit 1014, p. 4.
- 333 Michael Crowe, Transcript, June 8, 2011, p. 64.
- 334 Jason Hwang, Transcript, April 4, 2011, p. 15.
- 335 Randy Nelson, Transcript, April 8, 2011, p. 76.
- 336 Exhibit 1014, pp. 4, 6, 12–15; Michael Crowe, Transcript, June 8, 2011, pp. 62–63; Jason Hwang, Transcript, April 4, 2011, p. 46.
- 337 Transcript, June 8, 2011, pp. 64–65.
- 338 Stacey Wilkerson, Transcript, June 8, 2011, pp. 65–66; Exhibit 1015, pp. 4, 11.
- 339 Public submission 0216–HENSELWOOD, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentation by Carl Alexander (Lillooet Public Forum, August 18, 2010); presentation by Laura Dupont (New Westminster Public Forum, September 20, 2010); presentation by Rob Dainow (New Westminster Public Forum, September 20, 2010); presentation by Ruth Madsen (Kamloops Public Forum, October 21, 2010), summaries of presentations are all available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 340 Public submission 0246–SEIOBC\_228825, p. 8, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 341 Public submission 0216–HENSELWOOD, p. 11, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 342 PPR 21, p. 9.
- 343 PPR 21, p. 10.
- 344 Transcript, September 16, 2011, pp. 9–11.
- 345 Transcript, September 16, 2011, pp. 8, and 46.
- 346 *Water Act*, s. 3(1); *Water Protection Act*, RSBC 1996, c. 484, s. 3(2).
- 347 Exhibit 1871, p. 4.
- 348 *Water Act*, RSBC 1996, c. 483, s. 42.
- 349 *Water Act*, RSBC 1996, c. 483, ss. 8, 12; see also Glen Davidson, Transcript, September 16, 2011, p. 4.
- 350 Transcript, September 16, 2011, pp. 4, 5, and 65.
- 351 *Fish Protection Act*, SBC 1997, c. 21.
- 352 Transcript, September 15, 2011, p. 88.
- 353 *Fish Protection Act*, SBC 1997, c. 21, s. 6(6).
- 354 *Fish Protection Act*, SBC 1997, c. 21, ss. 6(7)–(9).
- 355 *Water Act*, RSBC 1996, c. 483, ss. 18(1), 23(a)–(h).
- 356 PPR 21, pp. 29–30; Glen Davidson, Transcript, September 16, 2011, p. 9.
- 357 Transcript, September 15, 2011, p. 6.
- 358 Transcript, September 15, 2011, p. 106.
- 359 Transcript, September 16, 2011, pp. 57–59.
- 360 Transcript, September 16, 2011, p. 11.
- 361 *Water Act*, RSBC 1996, c. 483, s. 1.1(1); Glen Davidson, Transcript, September 16, 2011, p. 12.
- 362 PPR 21, p. 18.
- 363 *Environmental Assessment Act*, SBC 2002, c. 43.
- 364 *Reviewable Projects Regulation*, BC Reg 370/2002, s. 11 (Table 9).
- 365 *Ground Water Protection Regulation*, BC Reg 299/2004, ss. 2–14; Lynn Kriwoken, Transcript, September 16, 2011, p. 55.
- 366 PPR 21, pp. 18–19; Craig Orr, Transcript, September 15, 2011, p. 9.
- 367 Exhibit 1871, pp. 2, 9.
- 368 Transcript, September 16, 2011, p. 13.
- 369 Lynn Kriwoken, Transcript, September 16, 2011, pp. 14, 21, 48; Exhibit 1882.
- 370 Exhibit 1856, p. 3.
- 371 Exhibit 1870; Exhibit 1873; Exhibit 1874, pp. 4–32; Lynn Kriwoken, Transcript, September 16, 2011, pp. 15–16.
- 372 Lynn Kriwoken, Transcript, September 16, 2011, pp. 16–17; Exhibit 1856.
- 373 Exhibit 1856, p. 5.
- 374 Exhibit 1856, pp. 7–13; see also Lynn Kriwoken, Transcript, September 16, 2011, pp. 18, 54–55.
- 375 Transcript, September 15, 2011, p. 61.
- 376 Transcript, September 16, 2011, pp. 21, 39, 76.
- 377 Lynn Kriwoken, Transcript, September 16, 2011, p. 20.
- 378 Transcript, September 16, 2011, pp. 18, 56.
- 379 Transcript, September 16, 2011, p. 57.
- 380 Transcript, September 16, 2011, pp. 63–64, 79.
- 381 Transcript, September 15, 2011, p. 59.
- 382 Transcript, September 16, 2011, pp. 18–19.
- 383 Glen Davidson, Transcript, September 16, 2011, pp. 5–6, 65.
- 384 Lynn Kriwoken, Transcript, September 16, 2011, p. 65.
- 385 Jason Hwang, Transcript, September 16, 2011, p. 7.
- 386 Transcript, September 16, 2011, p. 11.
- 387 Exhibit 1877, p. 3.
- 388 Transcript, September 16, 2011, p. 38.
- 389 Transcript, September 16, 2011, pp. 21–22.
- 390 Transcript, September 16, 2011, p. 82.
- 391 *Hydro and Power Authority Act*, RSBC 1996, c. 212, s. 12; see also PPR 21, pp. 36–40.
- 392 PPR 21, pp. 42–44.
- 393 Transcript, September 16, 2011, p. 27.
- 394 Transcript, September 16, 2011, pp. 29, 40.
- 395 Transcript, September 15, 2011, p. 17.
- 396 PPR 21, pp. 44–45.
- 397 PPR 21, p. 55.
- 398 PPR 21, p. 54; Paul Higgins, Transcript, September 16, 2011, p. 26.
- 399 Transcript, September 16, 2011, p. 23.
- 400 Craig Orr, Transcript, September 15, 2011, p. 11; Paul Higgins, Transcript, September 16, 2011, p. 25.
- 401 PPR 21, p. 45.
- 402 PPR 21, p. 57.
- 403 PPR 21, p. 60.
- 404 Exhibit 75, pp. 186–91; Steve MacDonald, Transcript, September 15, 2011, pp. 19–20.
- 405 Exhibit 562, p. 37.
- 406 Transcript, September 15, 2011, p. 23.
- 407 PPR 21, pp. 62–64.
- 408 Steve MacDonald, Transcript, September 15, 2011, pp. 19, 22.
- 409 PPR 21, p. 64.
- 410 PPR 21, p. 65.
- 411 Transcript, September 16, 2011, p. 31.
- 412 Transcript, September 15, 2011, pp. 23–26; Exhibit 1847; Exhibit 1848.
- 413 Exhibit 1849, p. 6.
- 414 Transcript, September 15, 2011, pp. 28–29, 84.
- 415 Transcript, September 15, 2011, pp. 46–47.
- 416 PPR 21, pp. 69–79.
- 417 Michael Bradford, Transcript, September 15, 2011, p. 37.

- 418 Exhibit 1876.  
419 Jason Hwang, Transcript, September 16, 2011, pp. 35–36.  
420 Exhibit 1876.  
421 Transcript, September 15, 2011, p. 39.  
422 PPR 21, p. 73.  
423 Transcript, September 15, 2011, pp. 38–39, 66, 106.  
424 Transcript, September 16, 2011, p. 29.  
425 Transcript, September 16, 2011, p. 29.  
426 PPR 16, p. 11.  
427 Public submission 0256–BRAUER, p. 4, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentation by Glen Thompson (Chilliwack Public Forum, September 29, 2010), p. 1, summary available at [www.cohencommission.ca](http://www.cohencommission.ca).  
428 *Navigable Waters Protection Act*, RSC 1985, c. N–22.  
429 *Water Act*, RSBC 1996, c. 483.  
430 *Water Regulation*, BC Reg 204/88.  
431 *Dike Maintenance Act*, RSBC 1996, c. 95.  
432 *Land Act*, RSBC 1996, c. 245.  
433 *Crown Land Fees Regulation*, BC Reg 177/2003.  
434 *Mines Act*, RSBC 1996, c. 293.  
435 Laura Rempel, Transcript, June 16, 2011, pp. 8–9; Julia Berardinucci, Transcript, June 16, 2011, p. 74; Jason Hwang, Transcript, July 7, 2011, p. 2.  
436 Jason Hwang, Transcript, June 16, 2011, pp. 76–77.  
437 Exhibit 1076.  
438 Exhibit 1077.  
439 Jason Hwang, Transcript, June 16, 2011, pp. 75–76, 80–81; Exhibits 1093; Exhibit 1094, p. 2.  
440 Exhibit 1076, p. 2.  
441 PPR 16, pp. 17–18.  
442 Laura Rempel, Transcript, June 16, 2011, p. 7; Exhibit 1078.  
443 Exhibit 1078.  
444 PPR 16, p. 19.  
445 Jason Hwang, Transcript, June 16, 2011, p. 75.  
446 Laura Rempel, Transcript, June 16, 2011, pp. 8–9.  
447 PPR 16, pp. 19–20.  
448 Exhibit 1078; Exhibit 1094, p. 2.  
449 Exhibit 1076, pp. 6–7; PPR 16, pp. 26–27; Exhibit 1080, pp. 5–6; Exhibit 1082.  
450 Exhibit 1094, p. 3.  
451 PPR 16, p. 28.  
452 Laura Rempel, Transcript, June 16, 2011, pp. 18–19; Exhibit 1085; Exhibit 1086, p. 2.  
453 Exhibit 1086, p. 3; see also Exhibit 1085, pp. 2–3.  
454 Exhibit 1085, p. 3.  
455 Transcript, June 16, 2011, pp. 21–22, 36–37.  
456 Exhibit 1087; Laura Rempel, Transcript, June 16, 2011, p. 16.  
457 Laura Rempel, Transcript, June 16, 2011, p. 16; Exhibit 1087.  
458 Jason Hwang, Transcript, June 16, 2011, pp. 82–83.  
459 Transcript, June 16, 2011, p. 34.  
460 Laura Rempel, Transcript, June 16, 2011, pp. 17, 59.  
461 Transcript, June 16, 2011, pp. 83–84.  
462 Transcript, June 16, 2011, pp. 55–56.  
463 Transcript, June 16, 2011, p. 56.  
464 *Constitution Act, 1867*, 30 & 31 Vict, c. 3, s. 92A(1)(b).  
465 *Forest and Range Practices Act*, SBC 2002, c. 69.  
466 Exhibit 1108, p. 1.  
467 PPR 17, p. 29.  
468 *Forest Range and Practices Act*, SBC 2002, c. 69, s. 21.  
469 *Forest Planning and Practices Regulation*, BC Reg 14/2004, ss. 8–8.1.  
470 *Forest Planning and Practices Regulation*, BC Reg 14/2004, ss. 47–52.  
471 *Forest Planning and Practices Regulation*, BC Reg 14/2004, ss. 47–49, 53, 55–57.  
472 Exhibit 1109, p. 24.  
473 Ian Miller, Transcript, June 17, 2011, p. 26.  
474 Ian Miller, Transcript, June 17, 2011, p. 22.  
475 Exhibit 1112.  
476 Exhibit 1110.  
477 Exhibit 1115.  
478 Exhibit 1111.  
479 Exhibit 1116; PPR 17, p. 47.  
480 PPR 8, Appendix 6, p. 115.  
481 Peter Delaney, Transcript, June 17, 2011, pp. 29–30, 55; Exhibit 1117; Exhibit 1127.  
482 Exhibit 1117, p. 1.  
483 Exhibit 1116, p. 4.  
484 PPR 17, pp. 59–60.  
485 Peter Tschaplinski, Transcript, June 17, 2011, p. 14; Exhibit 1108, pp. 6–7.  
486 PPR 17, p. 60.  
487 PPR 17, p. 61.  
488 PPR 17, pp. 63–64.  
489 Transcript, June 17, 2011, p. 37.  
490 Exhibit 1130, pp. 1, 19, 20.  
491 Transcript, June 17, 2011, p. 69.  
492 Exhibit 1130, pp. 3, 19.  
493 PPR 17, pp. 66–67.  
494 Exhibit 1109, pp. 5, 10.  
495 Transcript, June 17, 2011, p. 9.  
496 Transcript, June 17, 2011, p. 51.  
497 Transcript, June 17, 2011, pp. 56, 69.  
498 Ian Miller, Transcript, June 17, 2011, p. 70.  
499 Transcript, June 17, 2011, p. 56.  
500 Exhibit 1107; Peter Tschaplinski, Transcript, June 17, 2011, p. 11.  
501 Transcript, June 17, 2011, p. 31.  
502 PPR 17, pp. 53–54; Peter Delaney, Transcript, June 17, 2011, pp. 34–35.  
503 Peter Delaney, Transcript, June 17, 2011, pp. 19, 81–82.  
504 Exhibit 1003, pp. 9–10.  
505 Transcript, June 17, 2011, p. 20.  
506 Peter Delaney, Transcript, June 17, 2011, pp. 52–53.  
507 Exhibit 662; PPR 17, p. 55.  
508 Transcript, June 17, 2011, pp. 20, 72.  
509 Transcript, June 17, 2011, p. 82.  
510 Peter Delaney, Transcript, June 17, 2011, pp. 19, 53–54; Peter Tschaplinski, Transcript, June 17, 2011, pp. 57, 59.  
511 Peter Delaney, Transcript, June 17, 2011, p. 59.  
512 Peter Delaney, Transcript, June 17, 2011, p. 77.  
513 Peter Delaney, Transcript, June 17, 2011, pp. 62–63.  
514 Transcript, June 17, 2011, pp. 19, 52.  
515 PPR 17, pp. 69–74; Exhibit 1109, p. 55.  
516 PPR 17, p. 70.  
517 PPR 17, p. 73.  
518 PPR 17, pp. 73–74.  
519 PPR 17, p. 74.  
520 Peter Tschaplinski, Transcript, June 17, 2011, p. 45; Exhibit 1124, p. 5.  
521 Ian Miller, Transcript, June 17, 2011, pp. 80–81.  
522 Peter Tschaplinski, Transcript, June 17, 2011, pp. 75–76.  
523 PPR 19, p. 42.  
524 PPR 19, pp. 43–44.  
525 PPR 19, p. 44.  
526 Exhibit 562, pp. 27–29; Public submission 0100–WL–SASC\_971766, available at [www.cohencommission.ca](http://www.cohencommission.ca).  
527 Canada's written submissions, p. 205, available at [www.cohencommission.ca](http://www.cohencommission.ca).  
528 See PPR 19, pp. 14–18, 25–31.  
529 *Canadian Environmental Protection Act, 1999*, SC 1999, c. 33.  
530 CEPA, s. 120. An overview of CEPA instruments addressing municipal wastewater is provided in PPR 15, Municipal Wastewater, and the section of this chapter addressing municipal wastewater effluents.  
531 *Environmental Management Act*, SBC 2003, c. 53.  
532 *Waste Discharge Regulation*, BC Reg 320/2004.  
533 *Canada Shipping Act*, SC 2001, c. 26.  
534 See also PPR 19, pp. 30–31.

- 535 Sergio Di Franco, Transcript, August 17, 2011, p. 56. See also PPR 19, p. 27.
- 536 Sergio Di Franco, Transcript, August 17, 2011, pp. 55, 82; *Oceans Act*, SC 1996, c. 31.
- 537 See Exhibit 1380, called the “National Contingency Plan” in the hearings.
- 538 *The Marine Liability Act*, SC 2001, c. 6, makes shipowners and operators liable in relation to pollution, passengers, cargo, and property damage. It sets limits of liability and establishes uniformity by balancing the interests of ship owners and other parties.
- 539 Sergio Di Franco, Transcript, August 17, 2011, p. 55.
- 540 PPR 19, pp. 28–29.
- 541 PPR 19, p. 29.
- 542 Sergio Di Franco, Transcript, August 17, 2011, pp. 98–99.
- 543 Sergio Di Franco, Transcript, August 17, 2011, pp. 56–59.
- 544 Transcript, August 18, 2011, pp. 32–33, 58–58; Exhibit 1380.
- 545 Sergio Di Franco, Transcript, August 17, 2011, pp. 61, 68–69.
- 546 Transcript, August 17, 2011, p. 61.
- 547 Peter Ross, Transcript, August 17, 2011, p. 61; Bruce Reid, Transcript, August 17, 2011, p. 62; Sergio Di Franco, Transcript, August 17, 2011, p. 63.
- 548 Transcript, August 17, 2011, pp. 63–64, 72.
- 549 Transcript, August 17, 2011, p. 61.
- 550 Sergio Di Franco, Transcript, August 17, 2011, pp. 64, 67–68, 72.
- 551 Sergio Di Franco, Transcript, August 17, 2011, pp. 64–65.
- 552 Sergio Di Franco, Transcript, August 17, 2011, pp. 65, 67.
- 553 Exhibit 1375, pp. 5–6; Exhibit 1374
- 554 Transcript, August 17, 2011, p. 67.
- 555 Sergio Di Franco, Transcript, August 17, 2011, p. 63.
- 556 Sergio Di Franco, Transcript, August 17, 2011, p. 68.
- 557 Peter Ross, Transcript, August 17, 2011, p. 70.
- 558 Bruce Reid, Transcript, August 17, 2011, p. 71.
- 559 Exhibit 1374; Exhibit 1375.
- 560 Transcript, August 17, 2011, pp. 73–74.
- 561 Exhibit 1376.
- 562 Transcript, August 17, 2011, pp. 74–75; Exhibit 1376.
- 563 Transcript, August 17, 2011, pp. 75–76.
- 564 Sergio Di Franco, Transcript, August 17, 2011, p. 76–78, 80; Peter Ross, Transcript, August 17, 2011, p. 79.
- 565 Transcript, August 17, 2011, p. 71.
- 566 Sergio Di Franco, Transcript, August 17, 2011, pp. 59–60; Bruce Reid, Transcript, August 17, 2011, pp. 60–61.
- 567 Peter Ross, Transcript, August 17, 2011, p. 89; Bruce Reid, Transcript, August 17, 2011, p. 90; Exhibit 1379, p. 7.
- 568 Sergio Di Franco, Transcript, August 17, 2011, p. 83.
- 569 Transcript, August 17, 2011, pp. 83–84.
- 570 Exhibit 1377, pp. 2–3; Exhibit 1379, p. 8.
- 571 Transcript, August 17, 2011, pp. 61–63.
- 572 Transcript, August 17, 2011, p. 71.
- 573 Bruce Reid, Transcript, August 17, 2011, p. 90; Exhibit 1379, p. 9.
- 574 Transcript, August 18, 2011, p. 28.
- 575 Bruce Reid, Transcript, August 17, 2011, p. 91.
- 576 Transcript, August 17, 2011, pp. 61–63.
- 577 Transcript, August 18, 2011, p. 25.
- 578 Exhibit 1395.
- 579 Robin Brown, Transcript, August 18, 2011, p. 56; Exhibit 1395.
- 580 See, e.g., Dick Beamish, David Welch, and Stuart McKinnell, Transcript, July 7, 2011, pp. 19–23; Exhibit 131, p. 11; Exhibit 748; Exhibit 759; Exhibit (Exhibit A, p. 5); Randall Peterman, Transcript, May 2, 2011, pp. 84, 87; David Welch, Transcript, July 7, 2011, pp. 21, 25–26; Stuart McKinnell, Transcript, July 7, 2011, p. 27, and Transcript, July 8, 2011, p. 57; Dick Beamish, Transcript, July 7, 2011, p. 25; Tim Parsons, Transcript, July 8, 2011, pp. 102–3, 108; Jim Irvine, Transcript, July 8, 2011, p. 108.
- 581 Transcript, September 23, 2011, pp. 16–19.
- 582 Transcript, September 23, 2011, p. 20.
- 583 Transcript, September 23, 2011, pp. 24–26, 33–34.
- 584 Exhibit 48. See also PPR 19, pp. 71–72.
- 585 Exhibit 48, p. 9.
- 586 Exhibit 1402, p. 27.
- 587 Transcript, August 18, 2011, pp. 78–79.
- 588 Transcript, August 18, 2011, p. 67.
- 589 Transcript, August 18, 2011, pp. 67–68, 70.
- 590 Exhibit 1400, pp. 34–36.
- 591 Robin Brown, Transcript, August 18, 2011, pp. 69–70.
- 592 Exhibit 1403, p. 13.
- 593 Robin Brown, Transcript, August 18, 2011, pp. 78–79. DFO’s response is found at p. 15 of Exhibit 1403.
- 594 Transcript, August 18, 2011, p. 68.
- 595 Transcript, September 23, 2011, p. 17.
- 596 Transcript, August 18, 2011, pp. 69–70, 74; Exhibit 1400, pp. 3–4, 32, 34–36.
- 597 Exhibit 40, pp. 8–9.
- 598 Transcript, August 18, 2011, pp. 71–72.
- 599 Robin Brown, Transcript, August 18, 2011, p. 73. See also John Ford, Transcript, May 4, 2011, p. 91.
- 600 Transcript, August 18, 2011, p. 80.
- 601 See also PPR 19, pp. 72–78.
- 602 PPR 19, p. 75.
- 603 PPR 19, pp. 75–76.
- 604 Exhibit 1363 (Exhibit C, pp. 2 and 5); Jack Rensel, Transcript, August 17, 2011, pp. 9, 38, 42, 44; Robin Brown, Transcript, August 18, 2011, pp. 62–63; Exhibit 1397; Exhibit 1417.
- 605 Robin Brown, Transcript, August 18, 2011, p. 63.
- 606 Transcript, August 18, 2011, p. 95.
- 607 Exhibit 1417.
- 608 Transcript, September 23, 2011, p. 26.
- 609 Exhibit 1359, p. 112; Transcript, August 17, 2011, p. 43.
- 610 Robin Brown, Transcript, August 18, 2011, pp. 63–64; Exhibit 1398, p. 12.
- 611 Exhibit 1399, p. 10.
- 612 Robin Brown, Transcript, August 18, 2011, p. 95; Exhibit 1371.
- 613 Laura Richards, Transcript, September 23, 2011, p. 29.
- 614 Robin Brown, Transcript, August 18, 2011, p. 65.
- 615 Transcript, September 23, 2011, pp. 27–28.
- 616 Transcript, August 17, 2011, p. 52.
- 617 Transcript, August 18, 2011, p. 96.
- 618 Robin Brown, Transcript, August 18, 2011, p. 66.
- 619 Jack Rensel, Transcript, August 17, 2011, pp. 9, 14, 31, 41–42; Exhibit 1363 (Exhibit C, p. 3). See also Exhibit 73, pp. 74–75; Exhibit 1359, pp. 111–12; Exhibit 1364; and Exhibit 1365 for suggestions as to how this research and monitoring could be done.
- 620 Jack Rensel, Transcript, August 17, 2011, p. 49; Robin Brown, Transcript, August 18, 2011, p. 104.
- 621 *Oceans Act*, ss. 29–36. See also PPR 19, pp. 50–72.
- 622 Exhibit 654, p. 5. See also PPR 19, p. 57.
- 623 Exhibit 263.
- 624 Exhibit 654, p. 9.
- 625 Bruce Reid, Transcript, August 18, 2011, p. 5; Exhibit 1382.
- 626 PPR 19, p. 50.
- 627 Exhibit 654, p. 9.
- 628 Exhibit 263, p. 4.
- 629 Robin Brown, Transcript, August 18, 2011, p. 51; Exhibit 263, p. 1.
- 630 Exhibit 263, pp. 12, 22–25.
- 631 Exhibit 263, pp. 12–13.
- 632 Exhibit 263, p. 14.
- 633 Bruce Reid, Transcript, August 17, 2011, p. 97.
- 634 Exhibit 263, p. 21.
- 635 Transcript, August 18, 2011, pp. 51–54.
- 636 Exhibit 1390, p. 5.
- 637 Exhibit 1390, pp. 15–16.
- 638 PPR 19, p. 56.
- 639 PPR 19, pp. 56–57.
- 640 PPR 19, p. 64.
- 641 Bruce Reid, Transcript, August 18, 2011, p. 8; PPR 19, p. 65; Exhibit 1385, p. 3; Exhibit 1384, p. 5; Exhibit 1346, p. 15.

- 642 PPR 19, p. 66.
- 643 Transcript July 4, 2011, p. 68.
- 644 Marcel Shepert, Ernie Crey, and Ross Wilson, Transcript, July 4, 2011, p. 68.
- 645 Transcript, July 4, 2011, p. 79.
- 646 Heiltsuk Tribal Council's written submissions, pp. 33–34, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 647 First Nations Coalition's written submissions, pp. x–xi, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 648 Public submission 0838–WARES, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 649 PPR 19, pp. 31–32. See also pp. 31–41.
- 650 *Canadian Environmental Protection Act, 1999* [CEPA], s. 122.1; PPR 19, p. 32.
- 651 CEPA, Part 7.
- 652 PPR 19, p. 34.
- 653 *Disposal at Sea Regulations*, SOR/2001–275; *Regulations Respecting Applications for Permits for Disposal at Sea*, SOR/2001–276; CEPA, Part 7, Division 3.
- 654 CEA, s. 5(1)(d); *Law List Regulations*, SOR/94–636; PPR 19, p. 36.
- 655 PPR 19, pp. 38–39; CEPA, Schedule 6, para. 11.
- 656 CEPA, Schedule 6, para. 18.
- 657 PPR 19, p. 40.
- 658 PPR 19, p. 40; CEPA, s. 132.
- 659 *Species at Risk Act*, SC 2002, c. 29.
- 660 PPR 19, pp. 40–41.
- 661 Canada's written submissions, pp. 90–91, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 662 Canada's written submissions, p. 92, available at [www.cohencommission.ca](http://www.cohencommission.ca).
- 663 PPR 14, pp. 46–47.
- 664 Public submissions 0016–STOCK, 0101–GIBERSON, 0246–SEIOBC\_228825, 0250–MCISAAC, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentations by George M. George Sr. (Prince George Public Forum, September 21, 2010), Tanis Reynolds (Prince George Public Forum), Bill White (Prince Rupert Public Forum, September 1, 2010), David Beach (New Westminster Public Forum, September 20, 2010) and Cliff Armouse (Kamloops Public Forum, October 21, 2010), summaries available at [www.cohencommission.ca](http://www.cohencommission.ca); see also related submissions on municipal wastewater, pesticides, and greywater in Volume 2 of this Report.
- 665 *Canada Water Act*, RSC 1985.
- 666 Exhibit 689; Exhibit 690.
- 667 CEPA, ss. 77(2), 90(1).
- 668 *Canada Water Act*, s.11.
- 669 *Canada Water Act*, s.11(2)(a); see also *State of Freshwater Ecosystems* (2007), p. 108.
- 670 PPR 15, pp. 24–25.
- 671 PPR 14, p. 58.
- 672 CEPA, s. 44.
- 673 Exhibit 986, p. 2.
- 674 Exhibit 973, p. 1; Andre Talbot, Transcript, June 6, 2011, pp. 24–25.
- 675 John Carey, Transcript, June 7, 2011, p. 5; Exhibit 992, pp. 10–24; Schedule B sets out the monitoring sites in British Columbia and what is measured at the sites.
- 676 John Carey, Transcript, June 7, 2011, pp. 7, 14; Exhibit 977; Robie Macdonald, Transcript, June 6, 2011, p. 16; Peter Ross, Transcript, June 14, 2011, p. 87; Don MacDonald, Transcript, May 9, 2011, pp. 13–14. Mr. MacDonald (Technical Report 2 author) also stated that he is not aware of any water quality monitoring program designed explicitly for Fraser River sockeye salmon.
- 677 John Carey, Transcript, June 7, 2011, pp. 9–10; Exhibit 993, p. 6.
- 678 John Carey, Transcript, June 7, 2011, pp. 14–15.
- 679 Robie Macdonald, Transcript, June 6, 2011, pp. 12 and 17; John Carey, Transcript, June 7, 2011, p. 11.
- 680 Exhibit 1396, p. 7.
- 681 Exhibit 263, p. 23; s. 32 of the *Oceans Act* empowers the minister of fisheries and oceans to establish marine environmental quality guidelines, objectives, and criteria respecting estuaries, coastal, and marine waters.
- 682 Peter Ross, Transcript, August 17, 2011, p. 97.
- 683 Transcript, June 7, 2011, p. 72.
- 684 Lisa Walls, Transcript, June 6, 2011, p. 82; Exhibit 987; see also PPR 14, pp. 54–55.
- 685 Lisa Walls, Transcript, June 6, 2011, p. 81.
- 686 Lisa Walls, Transcript, June 6, 2011, pp. 81, 84.
- 687 Exhibit 689; Lisa Walls, Transcript, June 6, 2011, pp. 82–83; Exhibit 690.
- 688 Lisa Walls, Transcript, June 6, 2011, p. 85; Exhibit 988.
- 689 Lisa Walls, Transcript, June 6, 2011, pp. 90, 91, 92.
- 690 Transcript, June 7, 2011, p. 2.
- 691 Transcript, August 17, 2011, p. 60.
- 692 Transcript, June 14, 2011, p. 85.
- 693 Transcript, August 18, 2011, pp. 41–42.
- 694 Peter Ross, Transcript, June 14, 2011, p. 85; Transcript, August 18, 2011, pp. 41–42.
- 695 Peter Ross, Transcript, August 18, 2011, pp. 41–42.
- 696 Transcript, August 18, 2011, p. 42.
- 697 Transcript, August 17, 2011, p. 95.
- 698 Peter Ross, August 18, 2011, p. 31.
- 699 Transcript, June 6, 2011, pp. 12–13.
- 700 See discussion below; see also Claire Dansereau, Transcript, September 22, 2011, pp. 35–36.
- 701 Robie Macdonald, Transcript, June 6, 2011, pp. 11, 50; Sylvain Paradis, Transcript, June 7, 2011, p. 34; Robin Brown, Transcript, August 18, 2011, pp. 60–61; Exhibit 976; Exhibit 995, p. 16.
- 702 Lisa Walls, Transcript, June 6, 2011, pp. 76–77; Graham van Aggelen, Transcript, June 14, 2011, p. 68.
- 703 Transcript, June 7, 2011, p. 82; Exhibit 980, p. 3.
- 704 Transcript, June 6, 2011, pp. 19–20, 24–25.
- 705 Exhibit 982, p. 6; Exhibit 995, pp. 2–4; PPR 14, pp. 54–55; Robie Macdonald, Transcript, June 6, 2011, p. 12; see also Exhibit 979; Exhibit 1960.
- 706 Transcript, June 7, 2011, p. 64.
- 707 Transcript, June 7, 2011, pp. 81–82; Exhibit 980, p. 2.
- 708 Transcript, September 22, 2011, p. 37.
- 709 Transcript, September 22, 2011, pp. 37, 39–40.
- 710 Exhibit 1394, p. 26.
- 711 Transcript, August 18, 2011, pp. 57–58.
- 712 Transcript, August 18, 2011, p. 58.
- 713 Exhibit 1394, pp. 6–7.
- 714 Exhibit 1394, p. 30.
- 715 Exhibit 1394, p. 31.
- 716 Transcript, August 18, 2011, p. 56.
- 717 See, e.g., Peter Ross, Transcript, June 14, 2011, pp. 80–81.
- 718 Exhibit 980; Exhibit 995; PPR 14, pp. 55–56.
- 719 Sylvain Paradis, Transcript, June 7, 2011, p. 24; Robie Macdonald, Transcript, June 6, 2011, p. 35.
- 720 Sylvain Paradis, Transcript, June 7, 2011, pp. 24–25, 28; Robie Macdonald, Transcript, June 6, 2011, pp. 5, 6, 12, 17, 37–38.
- 721 Sylvain Paradis, Transcript, June 7, 2011, pp. 25, 49.
- 722 Sylvain Paradis, Transcript, June 7, 2011, pp. 26–27; John Carey, Transcript, June 7, 2011, p. 27.
- 723 Transcript, June 7, 2011, pp. 27, 43.
- 724 Robie Macdonald, Transcript, June 6, 2011, pp. 5–6, 7–8; Sylvain Paradis, Transcript, June 7, 2011, pp. 29, 48, 51–52; Exhibit 981, p. 9.
- 725 Sylvain Paradis, Transcript, June 7, 2011, pp. 52–53.
- 726 Robie Macdonald, Transcript, June 6, 2011, pp. 10–11; Sylvain Paradis, Transcript, June 7, 2011, p. 34; Peter Ross, Transcript, June 14, 2011, pp. 79, 82; Transcript, August 18, 2011, p. 27; Exhibit 976; Exhibit 995, p. 16.
- 727 John Carey, Transcript, June 7, 2011, pp. 41, 42.

- 728 John Carey, Transcript, June 7, 2011, pp. 44–44.  
 729 Transcript, June 14, 2011, pp. 67–68.  
 730 Transcript, June 14, 2011, pp. 79–80.  
 731 Transcript, June 6, 2011, pp. 11, 38.  
 732 Transcript, June 6, 2011, pp. 8–9, 38–39; see also Peter Ross, Transcript, June 14, 2011, p. 78.  
 733 Transcript, August 17, 2011, p. 93, other than a small program Dr. Ross has with Chris Kennedy at SFU looking at the effect of single pesticide exposures to salmon.  
 734 Transcript, September 22, 2011, p. 43.  
 735 Peter Ross, Transcript, June 14, 2011, pp. 6, 40–39.  
 736 Transcript, September 22, 2011, pp. 41–43.  
 737 André Talbot, Transcript, June 6, 2011, pp. 24, 25; however, see Robie Macdonald, Transcript, June 6, 2011, p. 27 (Environment Canada is weak in marine system expertise).  
 738 Robie Macdonald, Transcript, June 6, 2011, p. 23; André Talbot, Transcript, June 6, 2011, p. 24.  
 739 André Talbot, Transcript, June 6, 2011, p. 29; John Carey, Transcript, June 7, 2011, p. 37.  
 740 Transcript, June 6, 2011, pp. 26, 29.  
 741 Peter Ross, Transcript, June 14, 2011, p. 83; Peter Ross, Transcript, August 17, 2011, pp. 86, 88; Transcript, August 18, 2011, p. 26; Graham van Aggelen, Transcript, June 14, 2011, pp. 83–84; Sylvain Paradis, Transcript, June 7, 2011, p. 84; Claire Dansereau, Transcript, September 22, 2011, p. 39; Exhibit 1377; Exhibit 1378, p. 1.  
 742 Robie Macdonald, Transcript, June 6, 2011, p. 28; Sylvain Paradis, Transcript, June 7, 2011, p. 35.  
 743 Transcript, September 22, 2011, p. 35.  
 744 Robie Macdonald, Transcript, June 6, 2011, pp. 17–18; see also PPR 14, pp. 59–61.  
 745 Robie Macdonald, Transcript, June 6, 2011, p. 62.  
 746 Robie Macdonald, Transcript, June 6, 2011, p. 18.  
 747 Transcript, June 14, 2011, p. 59.  
 748 Peter Ross, Transcript, June 14, 2011, pp. 79–80.  
 749 Robie Macdonald, Transcript, June 6, 2011, p. 28; André Talbot, Transcript, June 6, 2011, p. 29; John Carey, Transcript, June 7, 2011, p. 15; see also Peter Ross, Transcript, June 14, 2011, pp. 23, 65; James Arnott, Transcript, June 15, 2011, pp. 68, 69.  
 750 Sylvain Paradis, Transcript, June 7, 2011, p. 16.  
 751 André Talbot, June 6, 2011, pp. 18–19; Robie Macdonald, Transcript, June 6, 2011, p. 19; Graham van Aggelen, Transcript, June 14, 2011, p. 68.  
 752 Robie Macdonald and André Talbot, Transcript, June 6, 2011, p. 74.  
 753 Sylvain Paradis, Transcript, June 7, 2011, pp. 17, 21; John Carey, Transcript, June 7, 2011, pp. 17–18, 21; Peter Ross, Transcript, June 14, 2011, p. 83; Graham van Aggelen, Transcript, June 14, 2011, pp. 83–84; Exhibit 994.  
 754 John Carey, Transcript, June 7, 2011, pp. 18, 19–20.  
 755 Robie Macdonald, Transcript, June 6, 2011, pp. 12–13; John Carey, Transcript, June 7, 2011, pp. 78, 79–80, 85–86; Sylvain Paradis, June 7, 2011, p. 78.  
 756 Sylvain Paradis, June 7, 2011, p. 80; John Carey, Transcript, June 7, 2011, pp. 80–81 (agreed about collaboration, but suggested that DFO should be the lead because it is responsible for population-level impacts on fish).  
 757 Exhibit 833, p. 37; see also PPR 14, pp. 61–64.  
 758 Public submissions 0020–JUDD, 0246–SEIOBC\_228825 (Social Ecology Institute of BC), 250–MCISAAC and 0527–JUDD, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentation by Zvonko Bezvák (Chilliwack Public Forum, September 29, 2010), summary available at [www.cohencommission.ca](http://www.cohencommission.ca).  
 759 Don MacDonald, Transcript, May 9, 2011, pp. 91–92; Exhibit 826, pp. 34–36.  
 760 Transcript, June 14, 2011, p. 30.  
 761 Exhibit 826, pp. 36–38.  
 762 Exhibit 997, p. 7.  
 763 RSC 1985, c. F-27; PPR 14, pp. 62–63.  
 764 *Integrated Pest Management Act*, SBC 2003, c. 58 (IPMA).  
 765 PPR 14, p. 63.  
 766 IPMA, s. 4. and *Integrated Pest Management Regulation*, BC Reg. 604/2004 [IPMR], ss. 5–6.  
 767 Don MacDonald, Transcript, May 9, 2011, pp. 50–51  
 John Carey, Transcript, June 7, 2011, p. 39; Exhibit 997.  
 768 IPMR, s. 39.  
 769 IPMA, s. 17, and IPMR, ss. 35–37.  
 770 IPMR, s. 34; Transcript, June 7, 2011, p. 39.  
 771 John Carey, Transcript, June 7, 2011, pp. 39–40; Don MacDonald, Transcript, May 9, 2011, pp. 52–53.  
 772 Peter Ross, Transcript, June 14, 2011, p. 13; André Talbot, Transcript, June 6, 2011, pp. 30–31; John Carey, Transcript, June 7, 2011, p. 38.  
 773 Robie Macdonald, Transcript, June 6, 2011, p. 28.  
 774 Transcript, June 6, 2011, p. 31.  
 775 PPR 14, p. 66; see also PPR 14, pp. 66–68; PPR 19, pp. 22–23.  
 776 *Canada Shipping Act, 2001*, SC 2001, ss. 26, 187, and 190(1); *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*, SOR/2007–86  
 777 *Municipal Sewage Regulation*, BC Reg. 129/99, s. 1.  
 778 PPR 19, p. 23; PPR 14, p. 66.  
 779 PPR 14, p. 67.  
 780 Exhibit 1052, pp. 1–2, 10–11; Ken Ashley, Transcript, June 14, 2011, p. 36.  
 781 Ken Ashley, Transcript, June 14, 2011, pp. 36–37; Exhibit 833, p. 15; Exhibit 1052, p. 1.  
 782 Exhibit 1052, p. 12.  
 783 Transcript, June 14, 2011, p. 37.  
 784 Transcript, June 14, 2011, p. 38.  
 785 Transcript, Ken Ashley, June 14, 2011, p. 37; Albert van Roodselaar, Transcript, June 15, 2011, pp. 23, 36; Exhibit 1052, p. 45.  
 786 Transcript, June 15, 2011, p. 22.  
 787 Corino Salomi, Transcript, June 8, 2011, pp. 53–54; Exhibit 1016.  
 788 Corino Salomi, Transcript, June 8, 2011, p. 55.  
 789 Exhibit 826, p. 30.  
 790 PPR 15, p. 59.  
 791 PPR 15, p. 58.  
 792 Exhibit 826, pp. T-45–T-47 (Table 3.15).  
 793 Albert van Roodselaar, Transcript, June 15, 2011, p. 34.  
 794 Transcript, June 14, 2011, pp. 6–7.  
 795 Transcript, June 14, 2011, p. 7.  
 796 Transcript, June 14, 2011, pp. 14–15.  
 797 Exhibit 1052, pp. 39–40.  
 798 PPR 15, p. 33.  
 799 Exhibit 1047, p. 491; PPR 15, p. 44.  
 800 Exhibit 1052, p. 39.  
 801 Albert van Roodselaar, Transcript, June 15, 2011, p. 17.  
 802 *Municipal Sewage Regulation*, BC Reg. 129/99; PPR 15, p. 45.  
 803 *Municipal Sewage Regulation*, s. 4.  
 804 PPR 15, p. 48.  
 805 EMA, ss. 81(1), 82, 84 and 83(2).  
 806 Exhibit 1052, p. 39.  
 807 Albert van Roodselaar, Transcript, June 15, 2011, p. 37.  
 808 EMA, s. 25.  
 809 PPR 15, p. 48.  
 810 Transcript, June 15, 2011, pp. 65–66.  
 811 Transcript, June 14, 2011, p. 31; see also Graham van Aggelen, Transcript, June 14, 2011, pp. 93–94.  
 812 PPR 15, p. 28.  
 813 James Arnott, Transcript, June 15, 2011, p. 8; see Exhibit 1042, pp. 511–54 (WSER).  
 814 Exhibit 1058; Exhibit 1047, p. 480.  
 815 Exhibit 1047, p. 480.  
 816 James Arnott, Transcript, June 15, 2011, p. 43; Exhibit 1047, p. 492.



- 817 Exhibit 1047, pp. 513–14 (WSER, s. 2).  
 818 Exhibit 1047, p. 481.  
 819 James Arnott, Transcript, June 15, 2011, p. 13; Exhibit 1047, pp. 486, 524–37 (WSER, ss. 21–41).  
 820 James Arnott, Transcript, June 15, 2011, pp. 9, 47.  
 821 James Arnott, Transcript, June 15, 2011, pp. 7–8.  
 822 Transcript, June 15, 2011, pp. 4, 8, 46.  
 823 Peter Ross, Transcript, June 14, 2011, p. 23; Exhibit 1048.  
 824 Transcript, June 14, 2011, pp. 23–24; see also Peter Ross, Transcript, June 14, 2011, pp. 66–67.  
 825 Transcript, June 14, 2011, p. 66.  
 826 Transcript, June 15, 2011, p. 68; Exhibit 1048.  
 827 Transcript, June 15, 2011, p. 69.  
 828 Albert van Roodselaar, Transcript, June 15, 2011, p. 3.  
 829 PPR 15, pp. 42–43.  
 830 James Arnott, Transcript, June 15, 2011, p. 13; Peter Ross, Transcript, June 14, 2011, p. 25; Ken Ashley, Transcript, June 14, 2011, pp. 25–26; Graham van Aggelen, Transcript, June 14, 2011, p. 26.  
 831 Transcript, June 15, 2011, pp. 13–15.  
 832 James Arnott, Transcript, June 15, 2011, p. 75.  
 833 James Arnott, Transcript, June 15, 2011, p. 15.  
 834 Albert van Roodselaar, Transcript, June 15, 2011, pp. 16, 17, 39; see also Exhibit 1059; Exhibit 1060; Exhibit 1061.  
 835 Albert van Roodselaar, Transcript, June 15, 2011, pp. 20–21.  
 836 Albert van Roodselaar, Transcript, June 15, 2011, p. 40.  
 837 Transcript, June 15, 2011, p. 26; Exhibit 1064.  
 838 Albert van Roodselaar, Transcript, June 15, 2011, pp. 26, 28–29.  
 839 Albert van Roodselaar, Transcript, June 15, 2011, p. 74.  
 840 Transcript, June 14, 2011, p. 36.  
 841 Albert van Roodselaar, Transcript, June 15, 2011, p. 19.  
 842 Transcript, June 14, 2011, pp. 34–35.  
 843 Transcript, June 15, 2011, pp. 21, 26.  
 844 Transcript, June 15, 2011, p. 27.  
 845 Transcript, June 14, 2011, p. 34.  
 846 Peter Ross, Transcript, June 14, 2011, p. 87; Ken Ashley, Transcript, June 14, 2011, pp. 86–87.  
 847 Albert van Roodselaar, Transcript, June 15, 2011, p. 22; Exhibit 1062.  
 848 Albert van Roodselaar, Transcript, June 15, 2011, pp. 23, 24; Exhibit 1049, p. 19; Exhibit 1050.  
 849 Albert van Roodselaar, Transcript, June 15, 2011, pp. 67, 68.  
 850 Albert van Roodselaar, Transcript, June 15, 2011, pp. 30, 32, 66–67, and 74.  
 851 Transcript, June 14, 2011, pp. 29, 33.  
 852 Transcript, June 14, 2011, pp. 30–31.  
 853 *Pulp and Paper Effluent Regulations*, SOR/92–269; Janice Boyd, Transcript, June 13, 2011, p. 7; see also PPR 15, pp. 60–72.  
 854 Janice Boyd, Transcript, June 13, 2011, pp. 8–10; *Pulp and Paper Effluent Regulations*, SOR/92–269 (PPER), Schedule 2; *Fisheries Act*, s. 36(4).  
 855 Janice Boyd, Transcript, June 13, 2011, pp. 14–17; PPER, ss. 28(1), 29, 30, Schedule VI.  
 856 *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations*, SOR/92–267; *Pulp and Paper Mill Defoamer and Wood Chip Regulations*, SOR/92–268; Janice Boyd, Transcript, June 13, 2011, p. 8.  
 857 PPR 15, p. 65.  
 858 *Pulp Mill and Pulp and Paper Mill Liquid Effluent Control Regulation* (Pulp and Paper Effluent Control Regulation) BC Reg. 470/90, ss. 5(1), 5(4), 5(5), 9(1), 9(2).  
 859 Transcript, June 13, 2011, p. 56.  
 860 *Spill Reporting Regulations*, BC Reg. 263/90; Douglas Hill, Transcript, June 13, 2011, pp. 56, 77–78.  
 861 Transcript, June 13, 2011, pp. 56, 57–58.  
 862 Janice Boyd, Transcript, June 13, 2011, pp. 19–20; Exhibit 1026, p. v.  
 863 Transcript, June 13, 2011, p. 22.  
 864 Janice Boyd, Transcript, June 13, 2011, p. 26; Exhibit 1029, p. ii (Executive Summary).  
 865 Janice Boyd, Transcript, June 13, 2011, pp. 7, 31, 74; Michael Hagen, Transcript, June 13, 2011, p. 32; Exhibit 1030; Exhibit 1031.  
 866 PPR 15, pp. 70–71.  
 867 PPR 15, p. 70.  
 868 Exhibit 833, p. 22; Janice Boyd, Transcript, June 13, 2011, p. 84.  
 869 Janice Boyd, Transcript, June 13, 2011, pp. 23, 27.  
 870 Transcript, June 13, 2011, p. 73.  
 871 Janice Boyd, Transcript, June 13, 2011, pp. 32–33, 62, 73; Michael Hagen, Transcript, June 13, 2011, p. 63.  
 872 Transcript, June 13, 2011, p. 62.  
 873 Transcript, June 13, 2011, p. 63.  
 874 Robert Grace, Transcript, June 13, 2011, pp. 53–54.  
 875 Transcript, June 13, 2011, p. 61.  
 876 Janice Boyd, Transcript, June 13, 2011, p. 62; Michael Hagen, June 13, 2011, pp. 62–63.  
 877 Janice Boyd, Transcript, June 13, 2011, p. 63.  
 878 Transcript, June 13, 2011, p. 72.  
 879 Robert Grace, Transcript, June 13, 2011, p. 61; Douglas Hill, Transcript, June 13, 2011, pp. 61–62.  
 880 Exhibit 826, pp. 140–41.  
 881 Exhibit 1362; Exhibit 1362A; Exhibit 1362B; Exhibit 1362C.  
 882 Exhibit 1362B, p. 2.  
 883 Exhibit 1362C, pp. 3–4.  
 884 Exhibit 1362A, p. 1.  
 885 Exhibit 1362, p. 2, Exhibit 1362B, p. 2.  
 886 Exhibit 1362A.  
 887 Exhibit 1362, p. 1; Exhibit 1362B, p. 1; Exhibit 1362C, pp. 1–2.  
 888 Exhibit 826, pp. T-253–T-266 (Table 8.1).  
 889 Exhibit 1362, p. 2; Exhibit 1362B, pp. 1–2; Exhibit 1362C, pp. 2–3; Exhibit 826, p. 140.  
 890 Exhibit 1362A.  
 891 Exhibit 826, p. 21.  
 892 Public submissions 0216–HENSELWOOD, 0246–SEIOBC\_228825, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentations by Anne Ketto (Prince George Public Forum, September 23, 2010), Gwen O’Mahoney (Chilliwack Public Forum, September 29, 2010), Wilfred Robbins (Kamloops Public Forum, October 21, 2010), summaries available at [www.cohencommission.ca](http://www.cohencommission.ca).  
 893 Michael Hagen, Transcript, June 13, 2011, p. 34; Exhibit 826, pp. T-23–T-26 (Table 3.7); PPR 15, p. 75; see also PPR 15, pp. 75–77, and references therein for a more thorough description of each of these mines.  
 894 Michael Hagen, Transcript, June 13, 2011, pp. 35–36.  
 895 Michael Hagen, Transcript, June 13, 2011, p. 67.  
 896 Michael Hagen, Transcript, June 13, 2011, p. 36; Robert Grace, Transcript, June 13, 2011, p. 51.  
 897 Transcript, June 13, 2011, pp. 69–70.  
 898 *Metal Mining Effluent Regulations*, SOR/2002–222 (MMER).  
 899 Michael Hagen, Transcript, June 13, 2011, p. 36; MMER, s. 2(a).  
 900 Michael Hagen, Transcript, June 13, 2011, p. 37.  
 901 Michael Hagen, Transcript, June 13, 2011, pp. 34, 35.  
 902 MMER, s. 14(1).  
 903 MMER, ss. 15, 16.  
 904 MMER, Schedule 5, s. 2; see also e.g., Exhibit 1032.  
 905 MMER, Schedule 5, s. 8.  
 906 Michael Hagen, Transcript, June 13, 2011, pp. 39–40.  
 907 Douglas Hill, Transcript, June 13, 2011, pp. 52–53.  
 908 PPR 15, p. 104.  
 909 *Mines Act*, s. 34, and *Health, Safety and Reclamation Code for Mines in British Columbia* (Health, Safety and Reclamation Code), s. 1.1.1.1.  
 910 PPR 15, p. 86.  
 911 Health, Safety and Reclamation Code.  
 912 EMA, s. 14(1).

- 913 Douglas Hill, Transcript, June 13, 2011, p. 56.  
 914 PPR 15, p. 85.  
 915 PPR 15, pp. 95–96.  
 916 Exhibit 1032, p. 5.  
 917 Transcript, June 13, 2011, p. 48.  
 918 Exhibit 1032, pp. 22–30 (Table C1, Table C2); PPR 15, p. 105.  
 919 Transcript, June 13, 2011, p. 43.  
 920 Michael Hagen, Transcript, June 13, 2011, p. 43.  
 921 Exhibit 1033.  
 922 Exhibit 1034.  
 923 Exhibit 1033, p. vii.  
 924 Transcript, June 13, 2011, pp. 96–97.  
 925 Janice Boyd, Transcript, June 13, 2011, pp. 61, 62;  
 Robert Grace, Transcript, June 13, 2011, p. 61;  
 Michael Hagen, Transcript, June 13, 2011, p. 62.  
 926 Exhibit 260, pp. 11–12.  
 927 Exhibit 260, p. 20.  
 928 Exhibit 260, p. 20.  
 929 Exhibit 8, p. 30.  
 930 Exhibit 8, p. 36.  
 931 Exhibit 8, pp. 32–33.  
 932 Exhibit 760, pp. 7 and 17.  
 933 Exhibit 760, pp. 20–21.  
 934 Exhibit 654, p. 5; see also PPR 11, pp. 14–16.  
 935 PPR 11, p. 14; Carol Cross, Transcript, May 4, 2011, p. 11.  
 936 PPR 11, p. 14; Exhibit 771, pp. 4–5.  
 937 Exhibit 654, p. 8; Exhibit 767, pp. 5–7.  
 938 Exhibit 758, p. 3.  
 939 Exhibit 771, p. 4.  
 940 PPR 11, pp. 16–17.  
 941 PPR 11, pp. 62–63; see also Dick Beamish, Transcript, July 7,  
 2011, p. 57; Exhibit 1319, pp. 581–82.  
 942 Exhibit 1454, p. 9.  
 943 Exhibit 767, p. 4; Carol Cross, Transcript, May 4, 2011, p. 11.  
 944 *Pacific Aquaculture Regulation*, SOR/2010 270; Christine  
 MacWilliams, Transcript, August 22, 2011, p. 78; Exhibit  
 1463; Exhibit 1593.  
 945 Transcript, August 22, 2011, p. 82.  
 946 Transcript, August 22, 2011, p. 82.  
 947 Greg Savard, Transcript, May 2, 2011, p. 20; Exhibit 767, p. 12.  
 948 Exhibit 767, p. 12.  
 949 Exhibit 758, p. 8 (Question 15, Question 16).  
 950 Exhibit 758, pp. 8–9 (Question 17, Question 18); Exhibit 768,  
 p. 11; Randall Peterman, Transcript, May 2, 2011, p. 38.  
 951 Exhibit 1454, p. 9.  
 952 PPR 11, pp. 25–26.  
 953 PPR 11, pp. 26–27.  
 954 Exhibit 1454, p. 9.  
 955 PPR 11, p. 28; Exhibit 1454, p. 8.  
 956 PPR 11, p. 30; Jason Hwang, Transcript April 5, 2011, p. 48.  
 957 Rebecca Reid, Transcript, April 5, 2011, p. 47; Greg Savard,  
 Transcript, May 2, 2011, pp. 28, 64; Carol Cross, Transcript,  
 May 2, 2011, p. 70; Exhibit 767, p. 4.  
 958 Greg Savard, Transcript, May 2, 2011, p. 28; Exhibit 758, pp. 5–6  
 (Exhibit A, Questions 6.a and 6.e); see also PPR 11, pp. 31–32,  
 61–62.  
 959 Exhibit 758, p. 6 (Exhibit A, Question 6.f).  
 960 Greg Savard, Transcript, May 2, 2011, pp. 28, 64; Carol Cross,  
 Transcript, May 2, 2011, p. 70; Exhibit 767, p. 4.  
 961 Transcript, May 4, 2011, pp. 12–13.  
 962 PPR 11, pp. 31–32.  
 963 PPR 11, p. 61.  
 964 Exhibit 758, p. 7 (Exhibit A, Questions 8 and 9).  
 965 Transcript, May 2, 2011, pp. 70–71.  
 966 Transcript, May 4, 2011, pp. 6–7.  
 967 PPR 11, p. 62.  
 968 Public submissions 0220–NORTH, 0268–GUERIN,  
 0300–CLAYDON, 0327–WATER\_588416; see also Public submis-  
 sions 0178–SLIB\_943727, 0216–HENSELWOOD, 0229–COX,  
 0297–FULTON, 0328–NICKERSON, 0347–HOLMESMSCROPBIO,  
 0413–HOLMES, available at [www.cohencommission.ca](http://www.cohencommission.ca);  
 presentations by Don Demill (Chilliwack Public Forum, Sep-  
 tember 29, 2010), Jack Mussallem (Prince Rupert Public Forum,  
 September 1, 2010), Jerry Jensen (Kamloops Public Forum,  
 October 21, 2010), Lothar Sciese (Prince Rupert Public Forum),  
 Fred Fortier (Kamloops Public Forum), summaries available at  
[www.cohencommission.ca](http://www.cohencommission.ca).  
 969 Public submissions 0236–NCFNSS\_350390, 0245–HUSBAND,  
 available at [www.cohencommission.ca](http://www.cohencommission.ca); presentations by  
 Fred Fortier (Kamloops Public Forum, October 21, 2010),  
 summary available at [www.cohencommission.ca](http://www.cohencommission.ca).  
 970 Public submissions 0204–VERRENDELBRIDGE, 0229–COX,  
 0271–REZANSOFF, 0328–NICKERSON, available at [www.cohencommission.ca](http://www.cohencommission.ca); presentation by Jack Mussallem  
 (Prince Rupert Public Forum, September 1, 2010), summary  
 available at [www.cohencommission.ca](http://www.cohencommission.ca).  
 971 Exhibit 1454, p. 10.  
 972 PPR 11, pp. 39–40.  
 973 PPR 11, p. 40; Exhibit 767, p. 12.  
 974 Carol Cross, Transcript, May 2, 2011, p. 74.  
 975 PPR 11, pp. 32–33.  
 976 PPR 11, p. 34.  
 977 Exhibit 660, p. 1; Jason Hwang, Transcript, April 4, 2011, p. 65.  
 978 PPR 11, pp. 34–35.  
 979 Jason Hwang, Transcript, April 4, 2011, p. 66.  
 980 Exhibit 660, p. 1.  
 981 PPR 11, p. 36.  
 982 PPR 11, pp. 38–39.  
 983 See also Public submission 0059–HEAVENOR, available at  
[www.cohencommission.ca](http://www.cohencommission.ca), in which Mr. Heavenor refers to  
 the effects of increased competition from hatchery fish in the  
 Gulf of Alaska affecting wild salmon.  
 984 Exhibit 757, p. 2 (Exhibit A, question 8.a); Exhibit 758, p. 9  
 (Exhibit A, Question 19.a); see also Laura Richards, Tran-  
 script, September 23, 2011, p. 21.  
 985 Transcript, May 2, 2011, p. 45.  
 986 Carol Cross, Transcript, May 2, 2011, p. 46; Exhibit 757, p. 3  
 (Exhibit A, Question 8.c); Exhibit 758, p. 9 (Exhibit A,  
 Question 19.c).  
 987 Exhibit 757, p. 3 (Exhibit A, Question 9).  
 988 Exhibit 757, p. 3 (Exhibit A, Question 10); Exhibit 758, p. 10  
 (Exhibit A, Question 21); Exhibit 766.  
 989 Carol Cross, Transcript, May 2, 2011, p. 15; Exhibit 8, p. 36.  
 990 Exhibit 757, p. 4 (Exhibit A, Question 17); Exhibit 763, pp. 37–38.  
 991 Exhibit 758, p. 4 (Exhibit A, Question 5.e).  
 992 Transcript, May 2, 2011, p. 15; Exhibit 8, p. 36 (see sidebar).  
 993 Exhibit 757, p. 3 (Exhibit A, Question 12); Exhibit 758 p. 10  
 (Exhibit A, Question 23).  
 994 Transcript, May 2, 2011, p. 82.  
 995 Exhibit 759, p. 5 (Exhibit A, Question 5.b).  
 996 Transcript, May 2, 2011, pp. 97–98; Exhibit 759, p. 5  
 (Exhibit A, Question 5).  
 997 Transcript, May 2, 2011, pp. 84–85, 87; Exhibit 759, p. 5  
 (Exhibit A, Question 6).  
 998 See, e.g., Exhibit 317, pp. 36–47.  
 999 Exhibit 8, p. 33.  
 1000 See, e.g., Exhibit 8, pp. 30, 36.