

Comprehensive Study Report
Upgrading of the Drinking Water Supply
System for the City of Rimouski

By
Economic Development Agency of Canada
for the Regions of Quebec

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Table of Contents

1	Introduction.....	7
1.1	Overview and purpose of the project	7
1.2	General description of the community and the drinking water supply system of the City of Rimouski.....	7
1.3	Project description.....	8
1.3.1	Purpose of the project.....	8
1.3.2	Proposed solution	8
	Neigette River area.....	8
	Neigette Dam area.....	8
1.4	Regulatory context	11
1.2.2	Federal environmental assessment requirements.....	11
1.2.2	Provincial environmental assessment requirements	11
1.5	Role of federal agencies	11
1.5.1	Responsible authorities	11
1.5.2	Federal Environmental Assessment Coordinator	12
1.5.3	Expert departments	12
1.6	Scope of the environmental assessment	13
1.6.1	Comprehensive study scoping document and report to Minister	13
1.6.2	Project scope	13
1.6.3	Scope of the assessment	14
	Factors to be considered	14
	Scope of the factors to be considered.....	14
1.7	Temporal and spatial boundaries.....	16
1.7.1	Spatial boundaries	16
1.7.2	Temporal boundaries.....	16
2	Environmental assessment objectives, approach and methodology	17
2.1	Objectives and general approach	17
2.2	Related studies.....	17
2.2.1	Hydrogeology.....	17
2.2.2	Wildlife and plant species	18
3	Evaluation of alternatives	19
3.1	Alternatives evaluated.....	19
3.1.1	Non-intervention.....	19
3.1.2	Increased use of the existing surface water source, Lac à l'Anguille, use of existing supply sources and addition of ultraviolet disinfection	19
3.1.3	Filtration of all water removed from the three existing sources	19
3.1.4	Maximum use of the Neigette River aquifer and filtration of the surface water captured by the Neigette Dam	19

3.2	Comparison of the alternatives considered.....	19
4	Comments from the public on the environmental aspects of the project.....	21
4.1	Public consultation on the scope of the project.....	21
4.2	Public participation in the environmental assessment	21
4.3	Public comment period for the comprehensive study report.....	22
4.4	Aboriginal consultations	22
5	Project components and activities.....	23
5.1	Project location.....	23
5.2	Project components.....	23
5.2.1	Groundwater prospecting activities.....	23
5.2.2	Construction of permanent wells and related facilities – Neigette River area	23
5.2.3	Construction of permanent wells and related facilities – Neigette Dam area	24
5.2.4	Operation of the supply system	28
5.2.5	Closure and decommissioning of the three wells at the end of their operational life	28
6	Environmental setting of the project.....	29
6.1	Surface water	29
6.2	Hydraulic characteristics and quality of the aquifer.....	29
6.2.1	Groundwater vulnerability in the Neigette River area	30
	Zone 1 – Hydraulically upgradient from the wells.....	30
	Zone 2 – Vicinity of the wells and drillhole FE 8/79.....	31
	Zone 3 – Downgradient from the wells	31
6.2.2	Groundwater vulnerability in the Neigette Dam area.....	31
6.3	Surface water-groundwater exchanges	31
6.3.1	Neigette River aquifer	31
6.3.2	Neigette Dam aquifer.....	32
6.4	Wildlife.....	33
6.5	Plants	33
6.6	Threatened, vulnerable or at-risk species.....	34
6.7	Surface and groundwater usage	34
6.8	Land use.....	34
6.9	Aboriginal use of lands for traditional purposes	35
6.10	Heritage, historical, archaeological and paleontological resources	35
7	Environmental effects analysis of the project.....	36
7.1	Approach	36
7.2	Groundwater quality	37
7.2.1	Groundwater quality in the Neigette River area.....	37
7.2.2	Groundwater quality in the Neigette Dam area	38
7.2.3	Mitigation measures and conclusion on the significance of adverse environmental effects 38	
7.3	Groundwater quantity.....	39

7.3.1	Groundwater mining	39
7.3.2	Water-table drawdown and impact on domestic wells.....	39
7.4	Surface water quantity and quality	40
7.4.1	Effects of the project on surface water quantity.....	40
7.4.2	Effects of the project on surface water quality.....	40
7.4.3	Mitigation measures and conclusion on the significance of adverse environmental effects	40
7.5	Migratory birds and their habitat.....	41
7.6	Fish and their habitat.....	41
	Watercourse crossings for the supply line (coffer dams and trench)	42
	Management of fish confined in the work area.....	42
	Work on stream banks.....	42
	Groundwater use	43
7.7	Terrestrial wildlife and habitat	43
7.8	Species of special concern, including species at risk within the meaning of subsection 2(1) of the <i>Species at Risk Act</i>	44
7.9	Human environment.....	44
7.9.1	Land use	44
7.9.2	Recreational activities.....	45
7.9.3	Landscape	45
8	Effects of the environment on the project	47
8.1	Climate change	47
9	Accidents and malfunctions	48
9.1	Accidental spills of hazardous materials	48
9.2	Other emergency situations	49
10	Cumulative environmental effects.....	50
10.1	Identification of valued environmental components to be considered	50
10.2	Identification of past, present and future projects and their impacts on valued environmental components.....	50
10.3	Identification of potential cumulative impacts.....	51
10.3.1	Cumulative effects of the overlapping of area well drawdown cones on groundwater quantity	51
10.3.2	Cumulative effects on other valued environmental components.....	52
11	Sustainable use of the resource.....	53
12	Surveillance and monitoring program	54
12.1	Surveillance program	54
12.2	Monitoring program	54
13	Conclusions and recommendations.....	55
14	References	56

Annexs

Annex 1 – Document of Consultation on the Scope of the Comprehensive Study Under the Canadian Environmental Assessment Act (CEAA)

Tables

Table 1 – Environmental components considered in the comprehensive study, their scope and spatial boundaries

Table 2 – Comparison of the various drinking water supply alternatives for the City of Rimouski

Table 3 – Hydraulic characteristics and quality of the Neigette Dam and Neigette River aquifers

Table 4 – Summary of the environmental effects of the project

Table 5 – Valued ecosystem components

Table 6 – List of other projects and activities that could interact with the Rimouski water supply project

Figures

Figure 1 – General site plan showing work site locations

Figure 2 – Work zone in the Lac à l'Anguille area

Figure 3 – Work zones in the Neigette Dam and Neigette River areas

Figure 4 – Work planned in the Neigette River area

Figure 5 – Work planned in the Neigette Dam area

Figure 6 – Location of the more permeable areas of the valley in the vicinity of the pumping wells

Figure 7 – Location of the peregrine falcon nest at the river site

1 Introduction

1.1 Overview and purpose of the project

Quebec municipalities must bring their facilities into line with the Quebec *Regulation Respecting the Quality of Drinking Water* (RQEP) before June 28, 2008. The purpose of this project, therefore, is to upgrade the drinking water supply system of the City of Rimouski. The project will be implemented within the City of Rimouski, which is located in the Bas-Saint-Laurent administrative region.

The project involves the installation of a new drinking water supply point to serve about 42,000 to 47,000 people over the 10- and 30-year horizons. The population to be served is located in Rimouski, Rimouski-Est, Pointe-au-Père and Saint-Anaclet.

The work involves construction of four wells, which will all be interconnected before being linked up to the distribution network. The project also provides for construction of a chlorination system and installation of a supply line, as well as changes to the configuration of the water supply system.

The resource persons for this project are as follows:

Proponent:	Rémy Fiola City of Rimouski Engineering-Public Works Department 205 Avenue de la Cathédrale P.O. Box 710 Rimouski, Quebec G5L 7C7	Telephone:	(418) 724-3104
		Fax:	(418) 724-3284
Consultant:	Hubert Lamontagne BPR – Infrastructures Inc. 4655 Wilfrid-Hamel Boul. Quebec City, Quebec G1P 2J7	Telephone:	(418) 871-8151
		Fax:	(418) 871-9625

1.2 General description of the community and the drinking water supply system of the City of Rimouski

In 2007, the City of Rimouski had 40,097 residents and a total of 11,435 families.¹ A site plan showing the location of the city is provided in Figure 1.

The City of Rimouski has two surface-water sources of drinking water: the Neigette Dam reservoir and Lac à l'Anguille. It is also supplied by groundwater from a well located in the Neigette River area. Between November and June, drinking water is obtained from Lac à l'Anguille, and between July and October, from the Neigette Dam and the Neigette River aquifer.

The water from these three sources is piped to the 22,500 m³ Lamontagne reservoir, where it is disinfected with chlorine before being distributed by gravity through the City of Rimouski system. The municipality of St. Anaclet is provided with raw water by the City of Rimouski through a supply line connected to the line that supplies the Rimouski reservoir. The municipality of Saint-Anaclet has its own continuous chlorination system, but does not have a reservoir. The City of Rimouski also provides water for the municipality of Sainte-Luce, but very sporadically.

¹ Online, August 6, 2008 [<http://www.ville.rimouski.qc.ca/decouvrez/portrait/portrait.asp>]

1.3 Project description

1.3.1 Purpose of the project

During the summer, the water in Lac à l'Anguille is of poor quality, with substantially increased levels of phytoplankton, as is characteristic of a eutrophic lake. This problem would have necessitated a costly upstream physico-chemical pre-treatment process. Turbidity values in the lake are high in both winter and summer. In addition, the lake is surrounded by farmland, which is a source of contamination. Characterization of water from the Neigette Dam indicates that average turbidity values measured over 30 consecutive days exceed the 1 NTU² criterion for exemption from filtration requirements.

Despite the use of a chlorination system to protect water quality, the City of Rimouski's drinking water supply system does not meet the quality requirements of Quebec's new *Regulation Respecting the Quality of Drinking Water*. As a result, the province's Department of Sustainable Development, Environment and Parks (MDDEP) has required the municipalities of Rimouski and Saint-Anaclet to upgrade their drinking water supply facilities to meet the standards.

1.3.2 Proposed solution

The City plans to install four wells in the Neigette River and Neigette Dam areas. The total capacity of all the wells used on a permanent basis would be 32,600 m³/d and would correspond to the maximum daily flow for a 10-year horizon. According to studies and analyses carried out by the City, the well water in both areas is of very high quality and is not directly affected by surface water. No specific treatment would be required other than the chlorination already being carried out at the Lamontagne reservoir. The wells in the two areas would be located on land belonging to the City. Figures 2 and 3 indicate the location of the wells in each area. The two sites are located on farm and forest land.

Neigette River area

The City of Rimouski already uses two wells in this area, with a unit capacity of 6,500 m³/d. It plans to dig a third well near the other two, with a capacity estimated by long-duration pumping tests at 7,620 m³/d. The total capacity of the three wells would be on the order of 20,620 m³/d. The new well would be connected to one of the existing wells (main pumping station).

Neigette Dam area

The City plans to dig three new wells in this area, so as to ensure the water supply. Their unit capacity has been estimated by long-duration pumping tests at 5,990 m³/d, for a total capacity of 17,970 m³/d. The three wells would be connected to the existing Neigette Dam pumping station, which would have to be modified to allow for these new supply sources. It should be noted that one of the three new wells would be used only in the event of an emergency. The total capacity of all the wells used on a permanent basis would be 32,600 m³/d and would correspond to the maximum daily flow for a 10-year horizon. The City expects to pump 10,900 m³/d in this area on a regular basis.

² NTU: Nephelometric turbidity unit

Figure 1 – General site plan showing work site locations

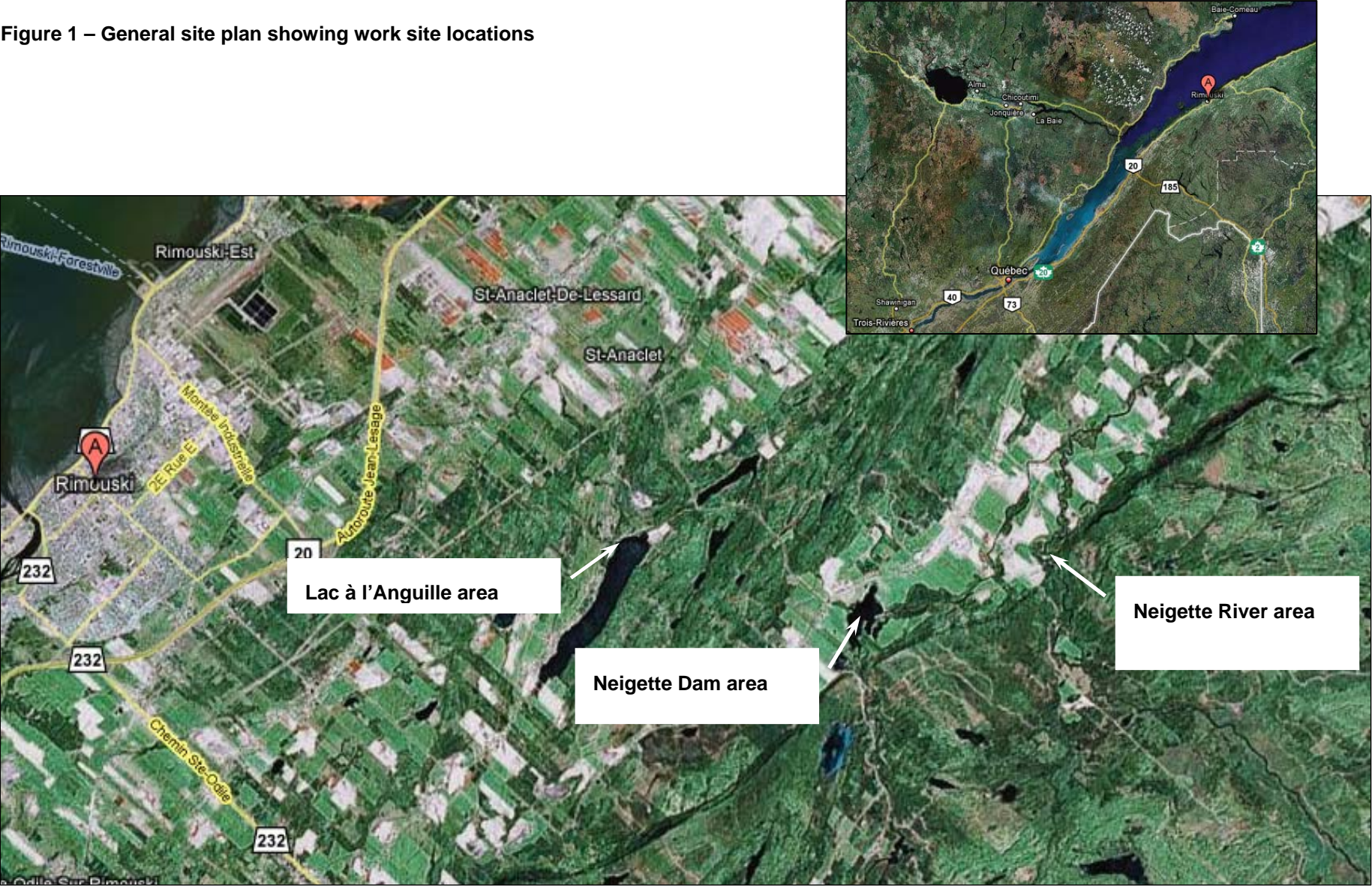
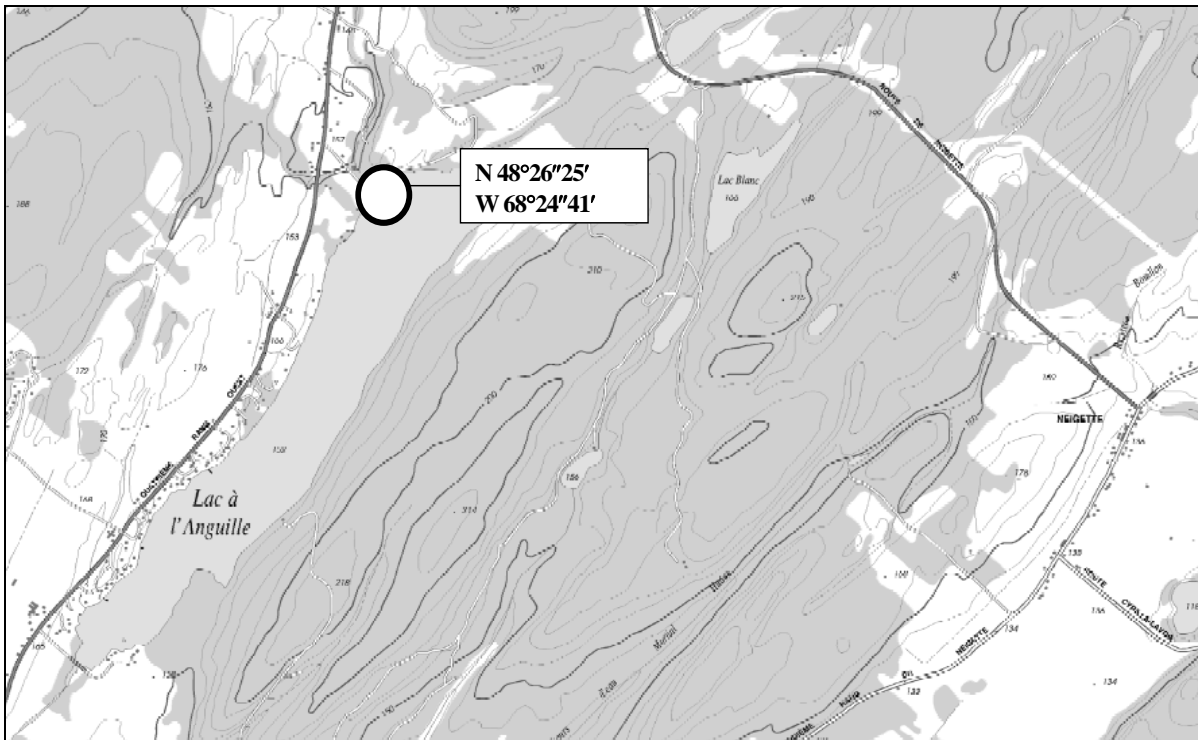
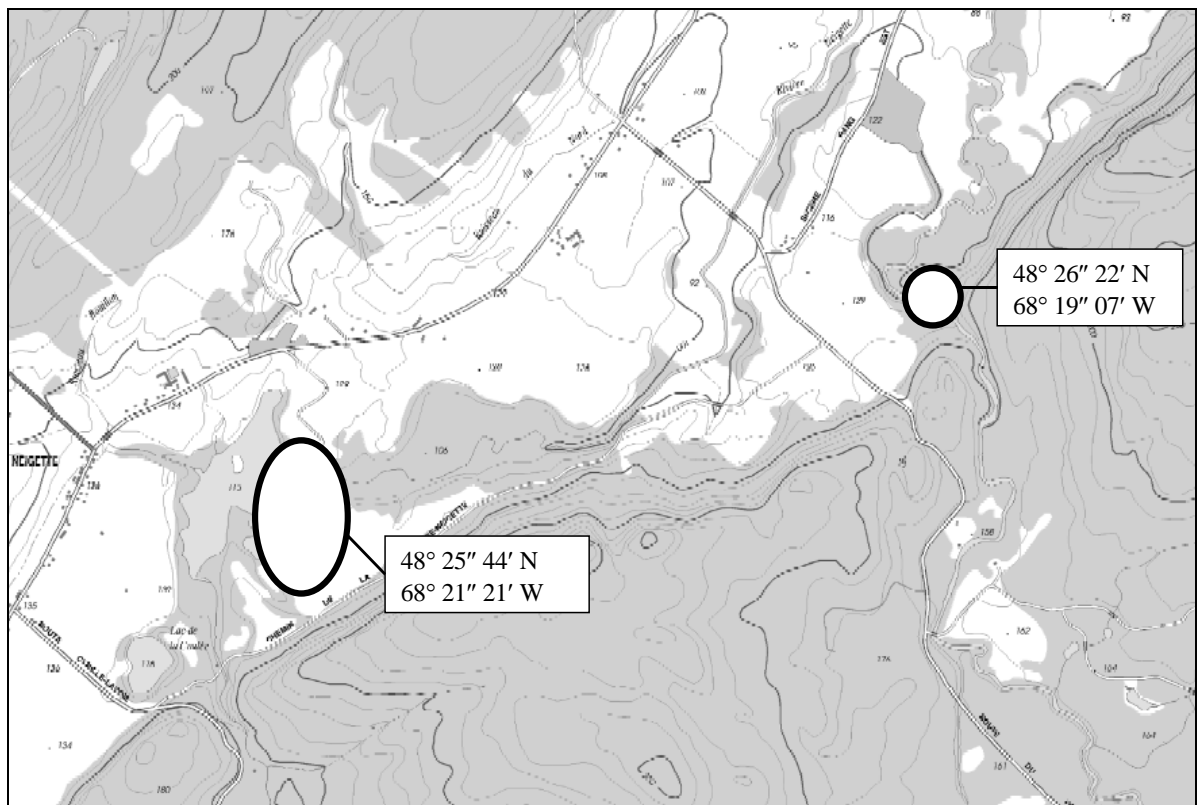


Figure 2 – Work zone in the Lac à l'Anguille area



[From BPR 2008, p. 18]

Figure 3 – Work zones in the Neigette Dam and Neigette River areas



[From BPR 2008, p. 18]

1.4 Regulatory context

1.2.2 Federal environmental assessment requirements

The project to upgrade the City of Rimouski's drinking water supply system would be funded under the Canada-Quebec Infrastructure Works Program (CQIW), for which the Quebec Department of Municipal Affairs and the Regions (MAMR) is the lead player and which is co-managed federally by the Economic Development Agency of Canada for the Regions of Quebec (CED). Established in 2000, the CQIW is a tripartite program involving Quebec, Canada and the applicant aimed at improving urban and rural infrastructure in Quebec.

The *Canadian Environmental Assessment Act* (CEAA) applies to federal authorities when they contemplate some action in relation to a project that would enable the project to proceed in whole or in part. A federal environmental assessment may be required when a federal authority:

- is the proponent of a project;
- provides financial assistance;
- makes federal lands available for the project, and/or
- issues permits or licences, or other approvals.

Because CED expects to provide financial assistance for the project, an environmental assessment was required before a final decision could be made. No other CEAA trigger was identified in the context of implementation of the project.

The *Comprehensive Study List Regulations* (Part III, section 10) stipulate that a comprehensive study is required for the proposed construction of a facility for the extraction of 200,000 m³/a or more of groundwater. Because the project to upgrade the drinking water supply system of the City of Rimouski calls for the installation of wells with a total extraction capacity of approximately 7,000,000 m³/a, a comprehensive study was therefore carried out.

1.2.2 Provincial environmental assessment requirements

The project is not included on the list of projects requiring an impact assessment in Quebec under section 31 of the *Environment Quality Act* (EQA). Under sections 22 and 32 of the EQA, however, certificates of authorization must be obtained for the project from the Quebec Department of Sustainable Development, the Environment and Parks (MDDEP).

Under section 22, a certificate of authorization is required for any activity to be carried out in a watercourse, whether it is constant or intermittent. Section 32 makes it necessary to obtain a certificate of authorization for work related to waterworks, a water supply intake, water purification appliances, work respecting sewers or the installation of devices for the treatment of waste water.

The proponent has not yet initiated steps to obtain these permits from MDDEP, but intends to do so before work begins.

1.5 Role of federal agencies

1.5.1 Responsible authorities

As the responsible authority for this comprehensive study, it is the duty of CED to:

- coordinate consultations on project scope as well as environmental assessment documentation;
- make a recommendation to the federal Minister of the Environment concerning the probability that the work planned in connection with the project will have significant adverse environmental impacts.

Responsible authority	Area of responsibility	Review factors and scope	Representative
Economic Development Agency of Canada for the Regions of Quebec	Funding	All factors within the limits described in the scoping document	Suzie Roy Dominion Square Building 1255 Peel Street, 9th Floor Montreal, Quebec H3B 2T9 (514) 283-1120

1.5.2 Federal Environmental Assessment Coordinator

For purposes of this comprehensive study, the Canadian Environmental Assessment Agency (CEAA) is the Federal Environmental Assessment Coordinator (FEAC).

It is the duty of the FEAC to:

- coordinate the participation of the federal authorities in the comprehensive study;
- implement a "one window" approach to collating and disseminating information on the project;
- facilitate coordination and collaboration among the federal authorities and other participants in the study;
- harmonize the federal and provincial environmental assessment processes, as required.

FEAC	Review factors and scope	Representative
Canadian Environmental Assessment Agency		Dominique Lagueux Canadian Environmental Assessment Agency 1141 Route de l'Église, 2nd Floor Sainte-Foy, Quebec G1V 4B8 (418) 649-6104

1.5.3 Expert departments

At the start of the comprehensive study process, several expert departments were identified that have the necessary expertise or knowledge to provide advice and information in support of the environmental assessment. As a result, Natural Resources Canada, Fisheries and Oceans Canada and Environment Canada were consulted in the context of this study. The expert departments have no decision-making responsibilities with respect to the environmental assessment of the project.

Expert departments	Review factors and scope	Representative
Natural Resources Canada	Aquifer protection and capacity	Yanick Matteau 580 Booth Street, 3rd Floor Ottawa, Ontario K1A 0E4 (613) 947-5861
Fisheries and Oceans Canada	Fish habitat, specifically watercourse crossings	Maryse Lemire Maurice-Lamontagne Institute 850 Route de la Mer Mont-Joli, Quebec G5H 3Z4 (418) 775-0726
Environment Canada	Potential presence of species at risk Wetland crossings Protection of migratory birds	Stéphanie Larouche-Boutin Environment Canada Environment Conservation Branch 1141 Route de l'Église Sainte-Foy, Quebec G1V 4H5 (418) 648-2272

1.6 Scope of the environmental assessment

The scope establishes the limits of an environmental assessment. It identifies the components of the project that will be examined and the aspects of the environment to be covered by the analysis. The following sections list the components examined by CED in the environmental assessment.

1.6.1 Comprehensive study scoping document and report to Minister

A comprehensive study scoping document was prepared for this project in October 2006. Pursuant to subsection 21(2) of the CEAA, the public was consulted on the proposed scope of the project for purposes of the environmental assessment, on the factors to be considered in the assessment and their extent, and on the capacity of the comprehensive study to address all the issues related to the project. The scoping document is included as Appendix 1 to this report.

Pursuant to subsection 21(2) of the CEAA, and as a result of this consultation, CED incorporated the scoping document into the Environmental Assessment Track Report that was submitted to the Minister of the Environment for a decision on whether to continue the environmental assessment as a comprehensive study, or to refer the analysis of the project to a mediator or a review panel in accordance with section 29 of the CEAA. The Minister of the Environment's decision to continue the assessment as a comprehensive study was released on April 27, 2007.

1.6.2 Project scope

The project scope includes the work and operating activities related to the wells. The scope includes all phases of the project, i.e., construction, operation, modification, maintenance and closure of the facilities. It is defined as follows:

- groundwater prospecting activities: pumping tests and discharge of pumped water;
- construction of a permanent well with a capacity of 7,620 m³/d in the Neigette River area, including:
 - a complete service building;
 - connection of the new well to the main pumping station;
 - pumping mechanism;
 - telemetry controls;
 - landscaping;
 - installation of a safety fence;
 - rebuilding of the existing access road;
- construction of two permanent wells with a unit capacity of 5,990 m³/d and an emergency well of the same capacity, in the Neigette Dam area, including:
 - a complete service building;
 - pumping mechanism;
 - telemetry controls;
 - landscaping;
 - installation of a safety fence surrounding the three wells;
 - clearing and grubbing;
 - construction of an access road to the wells, including a 10-m bridge;
 - power supply for the wells;
 - installation of two air valve chambers, a drain chamber and 350-mm diameter water supply pipes, 350 m in length, linking the wells to the existing Neigette Dam pumping station, including across the Neigette River;

- modification of the pumping mechanism (piping, accessories and couplings), controls and telemetry for the existing Neigette Dam pumping station;
- repairs to the existing reservoir;
- decommissioning of the existing water intake in Lac à l'Anguille;
- operation of the three wells in the Neigette River and Neigette Dam areas;
- restoration of the site (roads); and
- closure and decommissioning of the three wells at the end of their operational life.

1.6.3 Scope of the assessment

Factors to be considered

In accordance with subsections 16(1) and 16(2) of the CEAA, CED considered the following factors in the comprehensive study:

- the purpose of the project;
- alternative means³ of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the adverse environmental effects referred to above;
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future;
- comments from the public on the environmental aspects of the project that are received in accordance with the Act and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the need for, and the requirements of, any follow-up program in respect of the project.

Scope of the factors to be considered

The following table lists the environmental components that were considered in the comprehensive study, as well as their scope and spatial boundaries.

³ Alternative means are other ways of completing the project (described in section 3.1). The proponent also provided an analysis of alternatives to meeting project objectives; the analysis is presented in section 3.2.

Table 1 – Environmental components considered in the comprehensive study, their scope and spatial boundaries

Physical components	Scope	Spatial boundaries
Aquifer characteristics	<ul style="list-style-type: none"> Hydraulic conductivity Transmissivity Storativity Direction of flow Natural boundary conditions of the aquifer 	Boundaries of the aquifers affected by the project
Groundwater quality	<ul style="list-style-type: none"> Physical, chemical and biological characteristics Comparative analysis of quality vs. drinking water criteria 	Boundaries of the aquifers affected by the project
Surface water	<ul style="list-style-type: none"> Hydrographic network, including rivers, streams, lakes and ponds 	Prospecting area of influence Groundwater drawdown and recharge area of influence Infrastructure construction area of influence
Surface water/groundwater exchange	<ul style="list-style-type: none"> Presence and characteristics of exchanges 	Prospecting area of influence Groundwater drawdown and recharge area of influence
Wildlife	<ul style="list-style-type: none"> Migratory birds and their habitat Fish and their habitat Terrestrial fauna and their habitat 	Prospecting area of influence Infrastructure construction area of influence
Plants	<ul style="list-style-type: none"> Woodlands targeted by work, and their characteristics Aquatic vegetation Wetlands Other plant environments of interest 	Prospecting area of influence Groundwater drawdown and recharge area of influence Infrastructure construction area of influence
Species at risk	<ul style="list-style-type: none"> Species of concern, including species at risk within the meaning of subsection 2(1) of the <i>Species at Risk Act</i> 	Prospecting area of influence Infrastructure construction area of influence
Surface water intakes and groundwater wells	<ul style="list-style-type: none"> Inventory and location of water intakes and groundwater wells (private and municipal) Operation and use 	Prospecting area of influence All zones likely to serve as groundwater recharge areas
Sources of contamination	<ul style="list-style-type: none"> Inventory of contaminated land Inventory of sanitary landfill sites Inventory of all potential sources of contamination 	Zones hydraulically upstream of capture point All zones likely to serve as groundwater recharge areas
Land use	<ul style="list-style-type: none"> Local neighbourhood and residents 	Prospecting area of influence All zones likely to serve as groundwater recharge areas Infrastructure construction area of influence
Aboriginal use of land and resources for traditional purposes	<ul style="list-style-type: none"> Traditional activities and resources affected by these activities 	Infrastructure construction area of influence
Heritage, historical, archaeological and paleontological resources		Infrastructure construction area of influence

The comprehensive study report also covers environmental changes that could affect the project. The following components are addressed:

- seismic activity;
- climate change ;

- influence of infiltration from surface water bodies, specifically the Neigette River, on groundwater quality; and
- potential sources of contamination (contaminated land, sanitary landfill sites, land use).

The comprehensive study report also covers potential adverse effects related to accidents or malfunctions, including spills of hazardous materials and other emergencies, as well as cumulative effects of the project on valued ecosystem components.

1.7 Temporal and spatial boundaries

1.7.1 Spatial boundaries

The geographic area covered by the environmental assessment of the project includes the areas described in Table 1 as well as the following elements:

- the land on which the infrastructures will be located;
- the access roads and adjacent parking lots;
- the surface and groundwater present at the time of the groundwater prospecting, at the work site and during operations, as well as their areas of influence;
- lands and watercourses adjacent to the site that could be directly or indirectly affected by the project components described; and
- sites of human activity that could be affected by the project.

1.7.2 Temporal boundaries

The period covered by the study begins with the reconnaissance work. Periods during which preparatory work was carried out, including water prospecting and construction activities, are also included, as is the operation and maintenance period for the site, and the demolition of facilities.

The time period is considered to be open-ended. It takes in the effects of the project in the future as a means of clearly identifying its long-term effects, up until the time when the environment that has been disturbed returns to its initial condition or achieves a new equilibrium. The predictable long-term effects are described, as are the cumulative effects.

The following are the proposed temporal boundaries for the project:

- The short-term temporal boundary of the project extends approximately six months and includes the construction and commissioning phases of the project. It includes the following activities: water prospecting, construction of an access road to the three wells, construction and commissioning of the new wells, construction of the service building, construction and commissioning of the pumping station, and construction and commissioning of the chlorine contact water main and its connection to the distribution system;
- The medium-term temporal boundary of the project is in the two- to three-year range and includes issues such as: the effectiveness of site restoration, possible accidents and malfunctions (for example, failure of the new on-site water mains, chemical spills, etc.) associated with the operation of the water system, and possible negative effects of groundwater withdrawal on environmental components;
- The long-term temporal boundary for the project would extend as long as the operational life of the project and includes the operation, maintenance and eventual decommissioning of the project as well as occurrences such as possible accidents and malfunctions (for example, failure of the new on-site water mains, chemical spills, etc.) associated with operation of the water system, and possible negative effects of groundwater withdrawal on environmental components.

2 Environmental assessment objectives, approach and methodology

2.1 Objectives and general approach

On the basis of what is learned about the environment through inventories, environmental components identified are linked to project components to identify effects of the project on the environment. The project components are related to the various stages of the project: construction, operation and maintenance of the infrastructures to be installed, closure and decommissioning of the wells at the end of the useful lifetime of the infrastructures.

The proponent has addressed the environmental effects of the project, including cumulative effects and mitigation measures. The federal authorities involved in the file have provided expert advice based on the information supplied by the proponent and their own expertise and analysis of the situation. DEC's conclusions on the environmental effects of the project are based on all of this information.

The general objective of the environmental assessment (EA) process is to minimize or prevent adverse environmental effects and incorporate environmental considerations into the decision-making process of the federal government. In order to achieve this objective and evaluate the effects of pumping the wells on the aquifer and the Neigette River, the following activities were carried out during the comprehensive study:

- identification of existing environmental conditions (baseline conditions, inventories) ;
- description of potential environmental effects;
- identification and evaluation of technically and economically feasible mitigation measures;
- identification of residual effects in light of implementation of the mitigation measures;
- prediction of the probability of significant adverse environmental effects in light of implementation of the mitigation measures.

The environmental effects of the project on the components are described and evaluated in sections 7 to 10 of this report. The choice of mitigation measures included an evaluation of environmental requirements that was based on three general approaches to mitigation: avoidance, minimization of adverse effects on environmental components and compensation.

Predicting residual effects involved an analysis of the impacts of the proposed work after implementation of mitigation measures. The assessment of the significance of an adverse environmental effect attributable to the project was based primarily on three parameters: the intensity of the effect (i.e., the interaction between the environmental value of the component and the degree of disturbance), its extent (scope or relative surface area where an effect is felt, i.e., site-specific, local or regional) and its duration (temporary to short term, temporary to medium term or permanent). The assessment of the environmental effect took into account the likelihood of its occurrence.

Finally, comments received during the public consultation process and consultations with the appropriate federal authorities were also taken into consideration during the assessment.

2.2 Related studies

A number of specific studies were carried out to assess the environmental effects of the proposed works on components of the environment. Their general scope is summarized below, and their conclusions described in detail in the following sections of the report.

2.2.1 Hydrogeology

Two groundwater prospecting activities were carried out as part of the project: the first in 2002, and the second in 2004. The purpose of the first was to determine whether the groundwater tapped by the

two existing wells in the Neigette River area could support an extraction rate of 32,700 m³/d, and the purpose of the second was to confirm the potential production capacity of the groundwater identified in the Neigette Dam area. The two studies were to be used to identify the boundaries of the protection area according to MDDEP requirements and to determine aquifer vulnerability. Another purpose of the groundwater prospecting activities was to ascertain whether the water complies with the quality standards set out in Quebec's *Regulation respecting the quality of drinking water* (BPR 2008; Jolicoeur 2002; Jolicoeur 2004).

2.2.2 Wildlife and plant species

To confirm the presence or absence of threatened, vulnerable or at risk animal and plant species, and the presence of wildlife habitats in the work area and its zone of influence, the proponent requested formal advice from the Quebec Department of Natural Resources and Wildlife (MRNF) and the Quebec Department of Sustainable Development, the Environment and Parks (MDDEP). A literature review was also conducted to determine the area's potential for bird life. No field inventory was carried out.

3 Evaluation of alternatives

In order to comply with Quebec's new *Regulation respecting the quality of drinking water*, the City of Rimouski had to evaluate new drinking water supply alternatives. Moreover, according to projections over a 10-year horizon, existing facilities will no longer meet future water requirements. Four alternatives were therefore evaluated by the City and are briefly described in this section.

3.1 Alternatives evaluated

3.1.1 Non-intervention

Existing water intakes in Lac à l'Anguille and Neigette Dam must be upgraded to comply with the new requirements of the *Regulation respecting the quality of drinking water*. The wells that currently rely on the Neigette River no longer have sufficient capacity to meet the current and future needs of the City: significant changes in the drinking water system must therefore be considered (BRP, 2008, p. 3), and non-intervention is no longer an acceptable alternative.

3.1.2 Increased use of the existing surface water source, Lac à l'Anguille, use of existing supply sources and addition of ultraviolet disinfection

Not filtering surface water is only an option if the water is of exceptional quality and the source watershed is free of potential sources of contamination. Because the poor quality of the lake water in the summer (sudden increases in phytoplankton levels) would necessitate costly pre-treatment, and because using a eutrophic lake as a water source is undesirable in the current context, Lac à l'Anguille was not included among the alternatives considered (BPR, 2008, p. 3).

A brief evaluation of potential sources of contamination shows a large number of farms where contamination is likely to be generated. This alternative would involve careful management of the watershed by the City, which would require additional inspectors and management of violators (BPR, 2008, p. 5).

3.1.3 Filtration of all water removed from the three existing sources

In addition to being the riskiest and most costly alternative, this approach will generate waste (aluminum sludge) that will have to be disposed of. It is the last alternative considered and was not selected.

3.1.4 Maximum use of the Neigette River aquifer and filtration of the surface water captured by the Neigette Dam

This alternative involves developing the Neigette River aquifer to its maximum capacity and supplementing water requirements by treating surface water impounded by the Neigette Dam. It means maintaining the maximum extraction capacity of the two existing wells (6,500 m³/d each) and installing a new well with an extraction capacity of 8,700 m³/d in the Neigette River aquifer. This would raise the total extraction capacity in this area to 21,900 m³/d. To supplement water requirements, surface water from the Neigette Dam would be treated by a physico-chemical process consisting primarily of direct filtration followed by UV disinfection.

3.2 Comparison of the alternatives considered

The following table compares the various alternatives as a function of compliance with the *Regulation respecting the quality of drinking water* (RQEP), risks, costs and environmental effects of each alternative considered. Scenarios leading to non-compliance with the RQEP were eliminated without further consideration.

Table 2 – Comparison of the various drinking water supply alternatives for the City of Rimouski

Scenarios	RQEP Compliant	Risks	Costs	Environmental Effects
Non-intervention	No	High	None	<i>Not assessed</i>
Increased use of the existing surface water source, Lac à l'Anguille, and addition of ultraviolet disinfection	No	High	Low	<i>Not assessed</i>
Filtration of water from all current sources	Yes	Low	High	Significant
Maximum exploitation of the Neigette River aquifer and filtration of surface water removed from the Neigette Dam	Yes	Low	High	Moderate
Use of groundwater sources and chlorine treatment	Yes	Low	Moderate	Minor

The events of 2000 in Walkerton, Ontario, prompted Quebec provincial authorities to strongly urge smaller municipalities to implement groundwater production projects. Such facilities require less rigorous monitoring, are generally safer than surface water treatment facilities, and limit bacteriological or viral contamination problems through the filtration of groundwater through natural soils.

In light of the new design principles being applied to surface water and of what has been learned about the aquifer available to the community, the representatives of the City of Rimouski opted for a groundwater source rather than continued use surface of water for either all or part of its supply. The groundwater alternative is also less costly, and its effects on the environment are less significant than those of the other alternatives considered. These effects are presented in detail in the following sections.

4 Comments from the public on the environmental aspects of the project

4.1 Public consultation on the scope of the project

The public consultation under subsection 21(1) of the CEAA sought public comments on the environmental assessment scoping document, to be followed by a change in the scope, if appropriate. A draft scoping document was prepared that included information on the purpose of the document, the environmental assessment process, opportunities for the public to make comments and other opportunities for public participation. The document was posted in English and French on the Internet site of the Canadian Environmental Assessment Registry (CEAR). A copy was also placed at the Lisette-Morin Library in Rimouski. Five newspapers, including one English-language newspaper, published a notice announcing the dates of the consultation period:

- *Le Progrès Écho*, October 8, 2006
- *Quebec Chronicle Herald*, October 11, 2006
- *Le Rimouskois*, October 12, 2006
- *Businest*, October 18, 2006
- *L'Avantage*, October 13, 2006

The public was invited to comment on the following specific points during the consultation period, which ran from October 6 to November 3, 2006:

- the scope of the project for purposes of environmental assessment, the factors to consider in the assessment, and the scope of the factors;
- whether the type of environmental assessment to be undertaken in this case, a comprehensive study, provides a sufficient and acceptable means for the public to set forth its concerns regarding the project to upgrade the drinking water system of the City of Rimouski.

CED received no comments on the scope of the environmental assessment through the public consultation. Under the Participant Funding Program, two organizations were funded by the Canadian Environmental Assessment Agency to participate in the comprehensive study on the project. The objective of the Program is to provide financial support for individuals and non-profit agencies interested in participating in environmental assessments.

4.2 Public participation in the environmental assessment

Under subsection 21(1) of the CEAA, CED is required to ensure that, in addition to the public consultations provided for under subsection 21(1) and section 22, the public has the opportunity to participate in the comprehensive study.

CED registered all documents related to the comprehensive study of the project in the CEAR. On September 5, 2008, CED posted a notice on the CEAR electronic site seeking public comment on the project. No comments or requests have been received to date.

During the course of the process, CED sent the proponent's impact study, the advice of expert federal departments and the preliminary list of mitigation measures to the Conseil régional de l'environnement du Bas St-Laurent [Lower St. Lawrence Regional Environmental Council] and to the Conseil de bassin de la rivière Rimouski [Rimouski River basin council]. These two groups received funding under the Participants Funding Program administered by the Canadian Environmental Assessment Agency. The groups reviewed the environmental assessment documentation, but have not yet issued any comments.

4.3 Public comment period for the comprehensive study report

Pursuant to section 22 of the CEAA, the public will have a third opportunity to comment on the project and the associated environmental assessment during a period that will be devoted to a review of this Report. During that time, the CEAA will facilitate public access to the Comprehensive Study Report and will administer a formal consultation period. All comments received from the public will be forwarded to CED and will become part of the public registry for the project.

4.4 Aboriginal consultations

Canada Economic Development has a legal obligation to consult and, where appropriate, to accommodate when it contemplates action that might adversely affect established or potential Aboriginal⁴ and Treaty⁵ rights⁶ protected by section 35 of the *Constitution Act, 1982*. CED therefore carried out an analysis to determine whether it was necessary to consult Aboriginal groups in the context of this project.

The Aboriginal communities that could be affected by the project are the Maliseet of Viger and the Micmacs, who consider their traditional territory to stretch from the Bay of Fundy to the area around Lévis, and hence to include the Rimouski area.

The Maliseet of Viger First Nation (MVFN) has two reserves, Cacouna and Withworth, located 102 and 133 km from Rimouski, respectively. Several Maliseet members live in the immediate area of the Cacouna Indian Reserve and in the neighbouring municipalities, but their history seems to indicate that most of the nation, which currently consists of 759 members, is scattered throughout Canada and the United States. Hunting, trapping and fishing are the traditional lifestyles followed by members of the Maliseet First Nation. Sectoral agreements have been concluded between the Government of Quebec and the Maliseet Nation to allow some hunting, fishing and trapping in certain agreed areas, specifically the Duchénier and Rimouski wildlife reserves.

There are three Micmac communities in Gaspé: Listuguj, which has 3,500 inhabitants and 1,875 Aboriginal residents, Gesgapegiag, where 530 of the 1,160 inhabitants are members of the Micmac Nation, and Gespeg, where 500 Micmac residents live in close relation with other citizens of the region. These three reserves are located 193, 290 and 365 km from Rimouski, respectively.

On the basis of the information provided in this section, and given the nature of the likely environmental effects of the project, CED considers that the project will have no adverse effects on Aboriginal rights or claims. Hence, a specific Aboriginal consultation was not considered necessary. Moreover, no comments on the project were received from Aboriginal groups either at the first consultation on the project scope or in response to the participation notice posted on the CEAR on September 5, 2008.

⁴ Practices, traditions and customs integral to the distinctive culture of the Aboriginal group claiming the right that existed prior to contact with the Europeans.

⁵ Rights that are defined by the terms of a historic treaty, rights set out in a modern land claims agreement or certain aspects of some self-government agreements.

⁶ Hunting, fishing, gathering and trapping rights, self-government rights, cultural rights (archaeological sites, cemeteries).

5 Project components and activities

This section describes in detail the components and activities of the project as presented by the proponent.

5.1 Project location

The work will be carried out at three different sites within the municipalities of Rimouski and Saint-Anaclet-de-Lessard. The first work site is located at the outlet of Lac à l'Anguille in the southwest sector of the City of Rimouski (Figure 2). The second site is located east of the Neigette Dam reservoir, and the third is near Neigette Falls (see Figure 3).

5.2 Project components

5.2.1 Groundwater prospecting activities

Two groundwater prospecting activities took place as part of the project to upgrade the drinking water supply system of the City of Rimouski: the first in 2002 and the second in 2004. The purpose of the first was to determine whether the groundwater supply for the two existing wells in the Neigette River area could support an extraction rate of 32,700 m³/d; the second was carried out in order to confirm the potential capacity of the groundwater identified in the area of the Neigette Dam. The two studies were also conducted to identify protection areas in accordance with MDDEP requirements and to determine the level of aquifer vulnerability. The final objective of the groundwater prospecting activities was to determine whether the water would meet regulatory quality requirements (Jolicoeur 2002, cpt. 9; Jolicoeur 2004, cpt. 6; BPR 2008, p. 22).

Groundwater prospecting involved the following phases:

- Verification of the existence of piezometers left in place after previous groundwater prospecting activities;
- Installation of new piezometers to determine the bedrock profile and the piezometric levels in the various areas studied;
- Verification of the condition of the test wells selected in order to determine whether they could be used for the high-discharge pumping test;
- Installation of new test wells (Neigette Dam area only), and;
- Completion of long-duration pumping tests to determine the maximum capacity of the wells.

Interpretation of the drilling and pumping-test data indicated that the area of the Neigette River well could support an extraction rate of 21,800 m³/d on a permanent basis. At the Neigette Dam site, the work led to the selection of a location that could also support a theoretical extraction rate of 21,800 m³/d, a capacity confirmed by the pumping tests. The results also show that the bacteriological and physico-chemical quality of the groundwater was excellent. Microscopy analysis indicated no influence from surface water.

5.2.2 Construction of permanent wells and related facilities – Neigette River area

At present, the Neigette River aquifer is tapped by two wells, with a unit capacity of 6,500 m³/d. The capacity of these wells would not change as a result of the proposed project. A new well with a capacity of 7,600 m³/d would be dug near the existing wells, bringing the total capacity to 20,700 m³/d.

The work would also include the following:

- Clearing and grubbing of an area of approximately 6,800 m² for the wells and the access road and an area of 500 m² for the water main;
- Construction of a 105-m² service building, and exterior landscaping;
- An access road approximately 50 m long and 15 m wide leading to the new well and the service building;
- Installation of an emergency power system in the service building, including muffler, double-walled fuel tank and concrete containment structure designed to hold any spills;
- A 450-mm diameter transmission main connecting the wells to the Neigette Dam and a 100-mm diameter drain line;
- Installation of the pumping mechanism; and
- Installation of a safety fence, approximately 2.2 m in height, to establish the protection area around the wells.

The work in the Neigette River area is illustrated in Figure 4.

5.2.3 Construction of permanent wells and related facilities – Neigette Dam area

Because 32,700 m³/d are required in the short term, 12,000 m³/d would have to be removed from the Neigette Dam to supplement water requirements. To this end, two new wells with a unit capacity of 6,000 m³/d would be installed near the Neigette Dam reservoir and connected to the Neigette pumping station (BPR, 2008).

The work in the Neigette Dam area would include the following:

- Clearing and grubbing of an area of approximately 3,200 m² for the wells;
- Construction of an access road approximately 600 m long and 15 m wide;
- Removal of two culverts and fill material and replacement by a one-lane bridge, 4.5 m in width and approximately 10 m in length, consisting of a substructure (two piers) and a deck structure;
- Construction of the main well, consisting of a permanent well and an emergency well, both housed in the service building;
- Construction of the secondary well;
- Construction of two complete service buildings, one housing the main well and the other housing the secondary well;
- Installation of the pumping mechanism for each well;
- Installation of the water supply lines and the power supply for the wells, including the use of a rockfill cofferdam to cross the Petite Neigette River;
- Modification of the pumping station in the Neigette Dam area by removal of the existing pumps and installation of the new water transmission main and programmable controller to manage the wells;
- Installation of a 1.8-m high safety fence around the protection area;
- Repairs to the existing reservoir, including replacement of the controls and telemetry, and;
- Decommissioning of the water intake in Lac à l'Anguille by closing the supply line valve with a plug.

The work in the Neigette Dam area is illustrated in Figure 5.

[Translation of terms in Figure 4 (some illegible):

Travaux non-exécutés – Work not performed

Poste de pompage – Pumping station

Puits secondaire – Secondary well

Conduite d'eau – Water line

Puits principal – Main well

Boisé – Forested area

Cloture de protection – Safety fence

(Voir détail F. # 11) – See detail F. #11

Drain – Drain

Aqueduc – Water line

Piézomètre exist. à conserver – Existing piezometer – to be retained

Vanne de vidange – Drain valve

Pont voir plans # 28 @ 32 – Bridge see plans # 28 @ 32

Enrochement à faire (voir feuille # 28) – Riprap

Barrière "Frost" – "Frost" fence

Clôture de protection – Safety fence

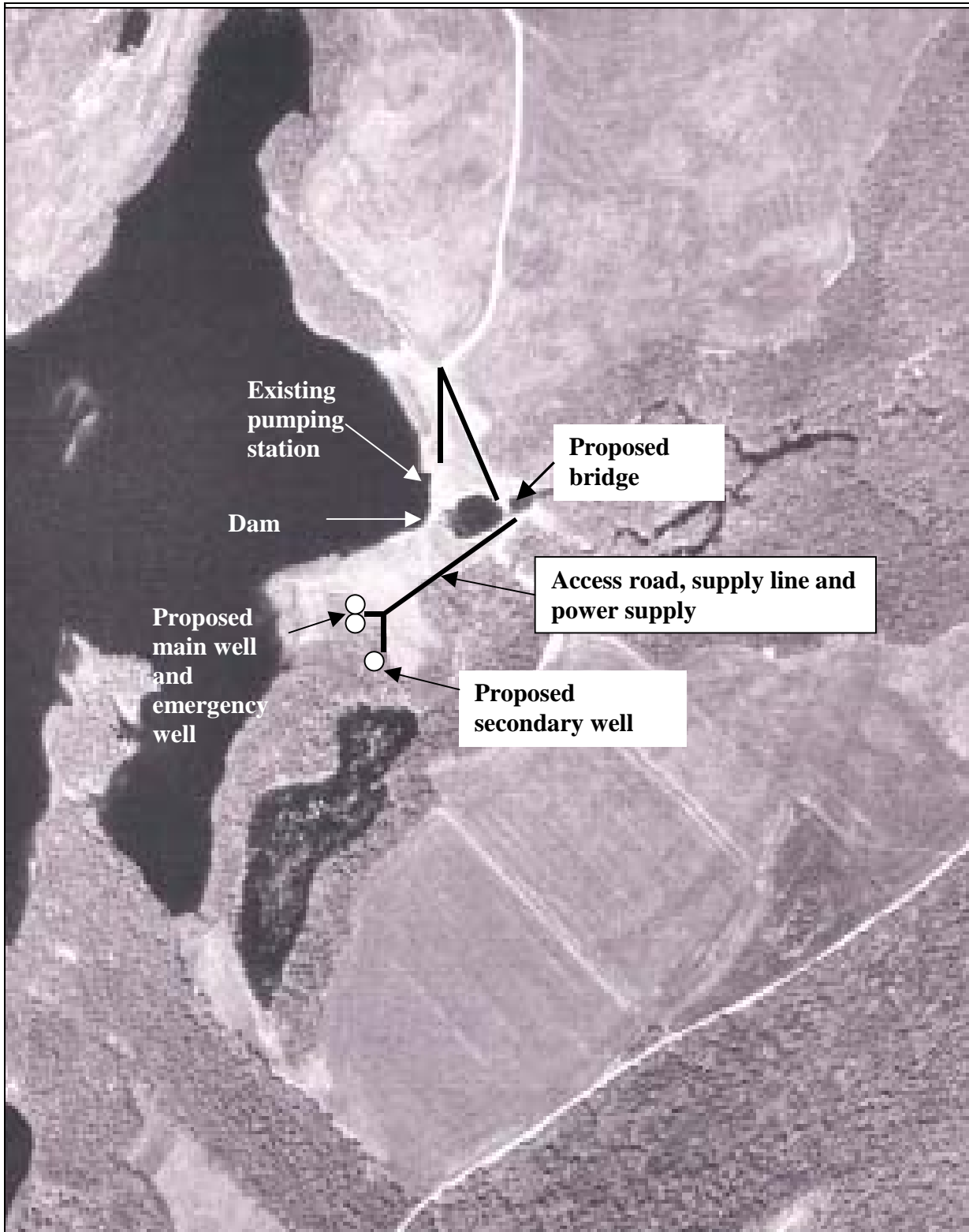
Pour clôture voir plan du nouveau chemin – For fence see plan for new road

Plan tel que construit – As-built plan

14 Mai 1987 – May 14, 1987

Révision générale – General revision]

Figure 5 – Work planned in the Neigette Dam area



From BPR, 2008.

5.2.4 Operation of the supply system

The following, relatively simple activities would be involved in the operation of this type of facility:

- daily inspections by the system operator to ensure the mechanics are functioning properly and that there is no contamination inside the immediate protection area;
- use, handling and storage of chlorine in the Neigette Dam building, which would have an unloading area and a storage area;
- groundwater extraction at the following daily maximum rates:

Current:	30,870 m ³ /d
10-year horizon:	32,530 m ³ /d
30-year horizon:	36,166 m ³ /d

5.2.5 Closure and decommissioning of the three wells at the end of their operational life

At the end of the operational life of the drinking water supply facilities (approximately 30 years), upgrading will probably be required to meet the standards in effect at that time. This type of facility is considered permanent and is unlikely to be decommissioned. However, should decommissioning be required, the wells whose continued existence might constitute a health hazard or allow a contaminant to enter the aquifer shall be filled and sealed using a method sufficient to prevent the vertical movement of water in the well (BPR, 2008).

6 Environmental setting of the project

6.1 Surface water

Lac à l'Anguille is at the head of the Germain-Roy River, which flows from southeast to northwest for a distance of approximately 12 km to empty into the St. Lawrence River Estuary at Rimouski-Est, near Pointe-au-Père.

The Neigette Dam area is located in the Petite Neigette River basin, which is part of the Neigette River watershed. There are two bodies of water in the Neigette Dam area: Lac du Barrage and Lac de la Coulée (an artificial lake).

The Neigette River area is located in the Neigette River watershed, which covers an area of approximately 560 km². The Petite Neigette River and the Neigette River are both tributaries of the Mitis River. The maximum, average and minimum flow rates of the Neigette River are 200,000, 9,400 and 210 L/s, respectively.

The proponent's documentation also notes the presence of an artificial pond in the Neigette Dam area, although the pond is not identified, nor does it appear on the maps provided by the proponent.

6.2 Hydraulic characteristics and quality of the aquifer

The following table summarizes the various characteristics of the Neigette Dam and Neigette River aquifers.

Table 3 – Hydraulic characteristics and quality of the Neigette Dam and Neigette River aquifers

Characteristics	Values	
	Neigette River	Neigette Dam
Watershed area		93 km ²
Minimum flow	210 L/s	
Hydraulic conductivity	0.01 (horizontal) and 0.012	0.004 (low slope)
Transmissivity	1,378 m ² /d (Neuman method for unconfined aquifers)	2,695 m ² /d, local value (time-drawdown method) 689 m²/d⁷ (time-drawdown method)
Storage coefficient		2.6 x 10 ⁻⁵ (no units, Cooper-Jacob method)
Direction of flow	North-northeastward	East-northeastward
Porosity	30%	30%
Permeability	36 m/d (Neuman method for unconfined aquifers)	49 m/d
Aquifer boundaries	A 500 m x 2 km SSW-NNW corridor East: Neigette escarpment	Southwest: drainage divide, 3.4 km from the wells North: Petite Neigette River South: Neigette Escarpment

⁷ Most realistic value, according to the hydrogeologist.

Characteristics	Values	
	Neigette River	Neigette Dam
Radius of influence of pumping	Between 250 m and 430 m hydraulically upgradient 228 m hydraulically downgradient	650 m hydraulically upgradient (safe) 200 and 150 m downstream (limited by the physical extent of the aquifer formation)
Groundwater quality	Excellent	Excellent
Aquifer vulnerability (DRASTIC)	Zone 1: 150 (vulnerable ⁸) Zone 2: 149 (vulnerable) Zone 3: 110 (not very vulnerable ⁷)	145 (moderately vulnerable ⁷)

- The **transmissivity** and **permeability** values are considered to be high and very high, respectively, in each of the two areas.
- According to the proponent, the **storage coefficient** confirms confined aquifer conditions in both areas, as anticipated on the basis of the local geological conditions and the quality of the groundwater.
- No **porosity** measurements were made. The values were provided by the hydrogeologist, Mr. Jolicoeur, who considers them realistic for the type of geological formation in place.

The following sections provide a more detailed description of each area in terms of the **vulnerability** index for the aquifer, according to the conclusions of the proponent and Natural Resources Canada (NRCan). The vulnerability index reflects the level of risk of groundwater contamination as a result of human activity. For this project, the proponent applied the DRASTIC⁹ method, a common approach used to identify risk.

6.2.1 Groundwater vulnerability in the Neigette River area

According to the proponent, the analytical results for the Neigette River aquifer indicate that the quality of the groundwater would be excellent and very stable, regardless of the season. In the Neigette River area, three distinct geological and hydrogeological zones were studied to determine their vulnerability.

Zone 1 – Hydraulically upgradient from the wells

In the area situated hydraulically upgradient from the wells, the water table is at a depth of 30 m, and there is no impermeable layer. According to the proponent, there is no source of bacteriological or virological contamination in the area. The proponent has established the vulnerability index for zone 1 at 116, i.e., relatively low.

However, according to NRCan experts, the vulnerability of zone 1 should be revised upward from the data supplied by the proponent. The stratigraphic cross-section provided and the boundaries of the permeable zones identified in Figure 6 indicate the likely presence of a highly permeable zone that could allow contaminant infiltration from the surface. Recharge in sand (even fine sand) would probably exceed 354 mm/a, and a rating of 10 should therefore be assigned for net recharge (R). NRCan considered that it was preferable to use a soil media (S) rating of 9, appropriate for a sand. These two changes would raise the vulnerability index to 150, or moderately high (NRCan, 2008).

⁸ Proponent's data revised upward by NRCan (NRCan, 2008B). CED decided to retain the NRCan value as a precaution.

⁹ DRASTIC: Depth to water table; R: Net recharge; A: Aquifer media; S: Soil media; T: Topography; I: Impact of the vadose zone vadose; C: Hudraulic conductivity.

Zone 2 – Vicinity of the wells and drillhole FE 8/79

This zone, located in the vicinity of the wells and drillhole FE 8/79, would have a moderately high vulnerability rating (149), indicating that it is more vulnerable than the previous zone and that human activities that could cause contamination should therefore be more closely controlled there. According to the proponent, although the zone has a higher vulnerability, there are no sources of bacteriological or virological contamination within it.

Zone 3 – Downgradient from the wells

According to the proponent, a clay layer in the zone located downgradient from the wells would provide significant groundwater protection. The proponent obtained a low vulnerability index of 74, which would indicate that the groundwater within this zone would be very well protected and would have little or no vulnerability to any source of contamination.

The NRCan experts felt that it was important to remain cautious when using averages to calculate the vulnerability index. The water table was at a depth of 4 m in drillhole 11/79 (see BPR, 2008), and hence the rating for the depth parameter (D) should be 7 rather than 1. Even if a thick layer of clay protects much of the zone, 1.5 m of clay was encountered in drillhole 11/79, indicating that the layer is probably discontinuous. In addition, sand is likely present at the surface in some places (see Figure 6), which could therefore raise the soil media (S) rating from 3 to 6 (NRCan, 2008). This would result in a vulnerability index of 110.

6.2.2 Groundwater vulnerability in the Neigette Dam area

According to the proponent, microscopy analyses show that the Neigette Dam aquifer does not appear to be affected by surface water. The water tested appears to be of excellent quality both bacteriologically and physico-chemically and, in the view of the proponent, could be distributed with no other treatment than preventive chlorination. The proponent also considered that its measurements of groundwater vulnerability show that the Neigette Dam aquifer would be very well protected against any form of surface contamination.

For its part, NRCan was of the opinion that the cross-sections provided by the proponent and Figure 6 showed that, on the contrary, the aquifer would not be well protected. The thick clay layer appears to be present only northeast and southwest of the wells. The aquifer is overlain by a layer of fine sand with a silt/clay matrix (till) that would provide better protection than sand, but would not offer the impermeable protection that clay would provide. Only drillhole Pz 2-03 (not shown in the cross-sections provided in annex 14 of BPR 2008 because it is too recent) indicates the presence of a clay layer between the depths of 24.4 m and 29.4 m. The ratings for parameters D (depth to water table of 6 m), S (6 for sandy loam) and I (6 for sand with significant amounts of silt and clay) should therefore be revised upward, giving a vulnerability index of approximately 145 (moderately high vulnerability) rather than 85.

6.3 Surface water-groundwater exchanges

6.3.1 Neigette River aquifer

On the basis of its investigations, the proponent was of the view that a direct link could exist between the river environment and the groundwater, despite the fact that the elevation difference between the river level and the groundwater would suggest no direct recharge from the river. The bed of the river would, however, be clogged by fine materials that would significantly reduce the infiltration rate (Jolicoeur, 2002).

On the basis of the minimum flow data for the river and the surface area of the watershed, NRCan experts considered that recharge would be sufficient to support pumping rates. The minimum flow rate can be used to approximate base flow (contribution from the aquifer to the river in dry periods) if the flow in the river (day-to-day) is only weakly controlled by the dam. The data indicate a recharge rate of 84 mm/a. Because hydrograph separation methods are known to overestimate recharge, often by 25% or more, a figure of 5% (of precipitation, approximately 50 mm/a) seems appropriate.

Much of the recharge likely comes from the schist, the surface of which is either altered (first 1-2 m) or covered with a thin layer of till; the remainder of the recharge would be from zones of coarse-grained surficial deposits and underlying materials, where infiltration of significant amounts of water (approximately 250 mm/a or more) is possible. The areas represented by these zones, determined by studying the surface geology shown on the provincial surficial geology map of the Rimouski – Trois-Pistoles area (Department of Energy and Resources, 1980), can be seen in Figure 6. Two types of zones were identified: a zone of coarse-grained (sand) surficial materials, and a zone of coarse-grained subsurface materials, where recharge is ample, but not as great as in the other zone (NRCan, 2008B).

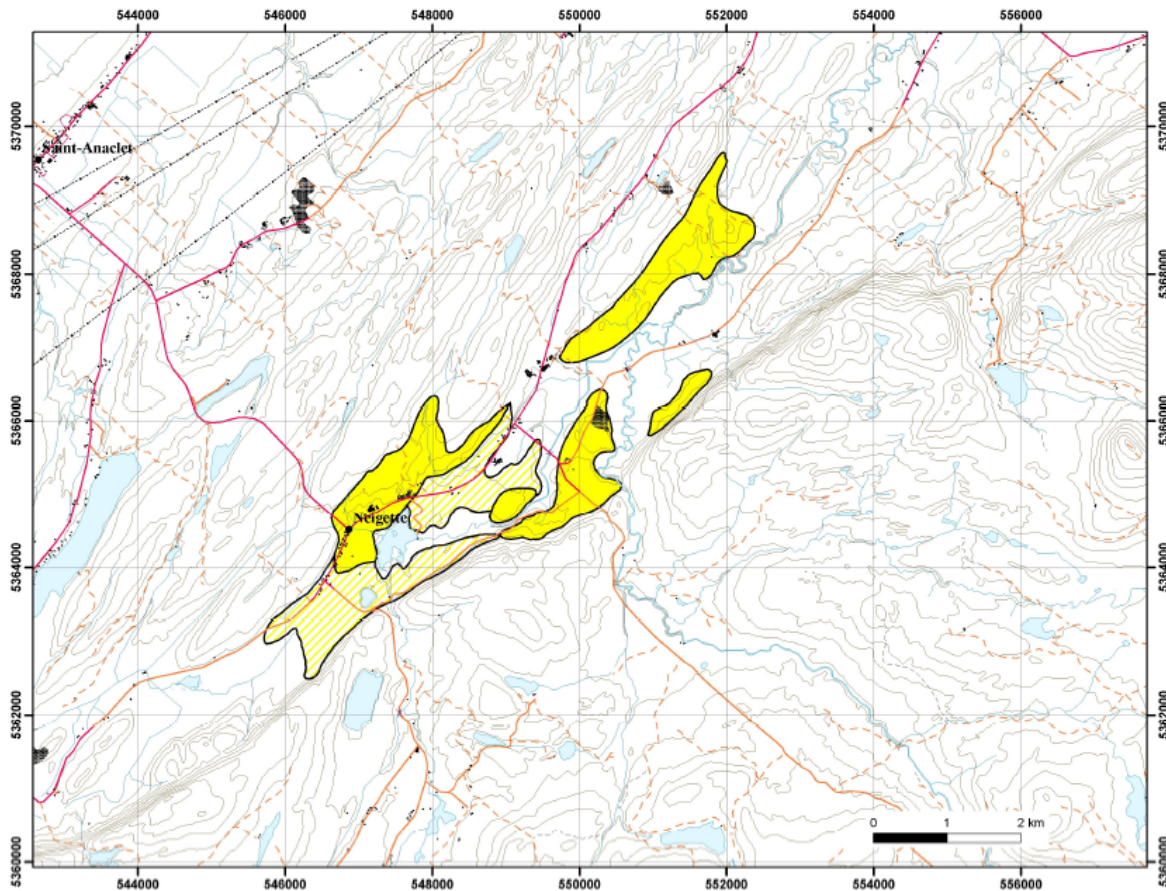
According to NRCan, however, the proximity of the wells to the river and the lack of a clay layer throughout much of this area is a problem. To try to resolve it, potential well yield was roughly estimated using the Thiem Equation (steady-state conditions in an infinite confined aquifer, because the north half has a good clay layer) for the observation wells located north of the pumping well and the values provided by Jolicoeur (Jolicoeur, 2002). The yield estimated by the NRCan scientists is approximately 19,000 to 16,070 m³/d, which is close to the City of Rimouski's target yield of 20,700 m³/d. These wells are located on the other side of the river, indicating that if surface water is extracted during pumping, the amount should in fact be limited (NRCan, 2008B).

6.3.2 Neigette Dam aquifer

The proponent considered that the difference in level between the groundwater and the two lakes (Lac du Barrage and the artificial pond) on either side of the intake point confirmed that the groundwater would not be in direct contact with the surface water (Jolicoeur, 2004). The bottom and dikes on each side of the Neigette Dam would also be impermeable. According to the proponent, the high transmissivity accompanying a direct link would have made it impossible to fill the reservoir. Given these conditions, the results of the pumping test and the quality of the water extracted from the wells, the proponent concluded that there would be no direct hydraulic link between the groundwater and the surface water.

According to NRCan, in a watershed of 93 km² or more, the fractured schist, with its altered first few metres, could provide the 10,900-m³/d yield desired by the City, particularly since the watershed includes a part of the valley where a number of highly permeable zones are located. The cross-section provided by the proponent (BPR, 2008, annex 14) seemed to show that the pumping wells would again be located in a clay-free zone, with a sandy till at the surface. Even if the walls at the base of the reservoir were sealed to make them impermeable, and the reservoir was successfully filled, NRCan considers it reasonable that pumping at a rate of 10,900 m³/d or 2,000 USGPM could create a hydraulic link because the wells are close to the reservoir (approximately 60 m) and impermeability is never absolute. The fact that the level of the artificial pond (which neither appears, nor is it identified on the maps supplied by the proponent) dropped 30 cm during the pumping test (Jolicoeur, 2004, p. 7) would indicate input of surface water through drainage. The report does not indicate whether the level of the reservoir was monitored during the test.

Figure 6 – Location of the more permeable areas of the valley in the vicinity of the pumping wells



[From NRCan, April 30, 2008]

6.4 Wildlife

Watercourses in the work area provide habitat for fish. Species that are likely to be found in the Neigette River and the Petite Neigette River would be the Atlantic salmon (*Salmo salar*), white sucker (*Catostomus commersoni*), brook trout (*Salvelinus fontinalis*), rainbow trout (*Salmo gairdneri*), American eel (*Anguilla rostrata*) and carp (*Cyprinus sp.*).

The study area is not believed to include any protected terrestrial wildlife habitats. The study area is a potential location for the establishment of the following terrestrial species: moose, white-tailed deer, black bear, snowshoe hare, eastern chipmunk, red squirrel, red-backed vole, groundhog, porcupine, red fox, beaver and raccoon. Within the study area, a total of 143 species of birds have been identified, with nesting confirmation for 78 species.

6.5 Plants

Most of the study area is located in farmland and has no trees or shrubs. However, the areas where the infrastructures (new wells and access roads) would be developed are forested. The vegetation on the south shore of Lac du Barrage (future site of the well in the Neigette Dam aquifer) consists of a mixed stand that includes species such as balsam fir, black spruce, white birch, trembling aspen and sugar maple. This forested area is at an intermediate stage of development. The vegetation along the banks of the Neigette River (future site of the Neigette River well and related facilities) consists of a mixed stand that includes species such as white birch, balsam fir, Canadian cedar and trembling aspen. This forested area is at an advanced stage of development (BPR, 2008).

6.6 Threatened, vulnerable or at-risk species

MDDEP has confirmed that no plant species covered by Quebec's *Act respecting threatened or vulnerable species* has been identified in the study area. Environment Canada's database related to the *Species at Risk Act* identified the potential presence of three at-risk species in the study area: the monarch butterfly (*Danaus plexippus*) (special concern), the peregrine falcon (*Falco peregrinus*) (threatened) and the Barrow's goldeneye (*Bucephala islandica*) (special concern). It is unlikely that the goldeneye is present on the work site, and, by its nature, the work planned is not a threat to the monarch butterfly. The cliff that overlooks the work site in the Neigette River Area is a preferred habitat for the peregrine falcon and, in 2007, the MRNF observed a peregrine falcon nest about 1.2 km from the work site (see Figure 7).

Figure 7 – Location of the peregrine falcon nest at the river site



From BPR, 2008

[Translation of text in Figure 7:

Zone des travaux: Work area

Nid de faucon pèlerine: Peregrine falcon nest]

Because of the behaviour of this species, the location of the nest may vary from year to year along the cliff. In public forests, peregrine falcon nests have special protection with respect to logging operations. The standards set could serve as a basis for defining the protective measures that would be desirable in the case of the work being planned. Falcon nests have the benefit of a 250-m intensive protection zone on each side over the full height of the rock wall, and a 50-m protection zone running from the slope break at the top and the base of the wall. No activity is permitted within this zone at any time. A second "buffer zone" of protection, consisting of an additional 100-m strip, surrounds the intensive protection zone. Activities are permitted within the buffer zone, but only between September 1 and the end of February.

6.7 Surface and groundwater usage

The Neigette Dam and Lac à l'Anguille water intakes are the only surface water intakes identified in the study area. In the Neigette Dam aquifer, no wells are located in the drawdown zone identified for the proposed wells. With the exception of a farm situated approximately 600 m from the wells, all the users in the Neigette River area are more than 1,000 away from the pumping wells.

The proponent's investigation did not reveal the presence of any soil deposit or industrial waste or contaminated land within the zones of influence of the wells. The only potential source of contamination within the protection perimeter of the two areas is the manure that is spread on fields located within the perimeter (see figures 4 and 5).

6.8 Land use

Farming is carried out within the far and close protection perimeters of the two areas studied (Neigette River and Neigette Dam). The immediate protection perimeters of the two areas are forested and are free from activities that pose a risk.

6.9 Aboriginal use of lands for traditional purposes

No Indian reserves are located near the study area. See section 4.4 for information on Aboriginal use of lands for traditional purposes.

6.10 Heritage, historical, archaeological and paleontological resources

According to the Department of Culture, Communication and the Status of Women (MCCCF), the remains of an ancient lime kiln are located a few kilometres from the proposed work sites (BPR, 2008), and there are also several sites of archaeological interest in the Rimouski-Neigette RCM, specifically in Parc du Bic and at Saint-Fabien-sur-Mer (Syndicat des producteurs de bois du Bas-Saint-Laurent, 1998). No sites have been identified within the study area itself.

7 Environmental effects analysis of the project

7.1 Approach

The environmental components were identified on the basis of a variety of information sources, including sector reports and expertise from expert departments and other authorities such as the Quebec Department of Sustainable Development, Environment and Parks (MDDEP). The environmental components selected are considered aspects of importance for the project in question and are listed in Table 4.

Table 4 – Summary of the environmental effects of the project

Environmental Component	Environmental Effects Analysis					Residual Effects	
	Potential Adverse Effects			Possibility of Full Mitigation		Significant Effects?	
	Yes	No	Uncertain	Yes	No	Yes	No
Physical and natural environments							
Groundwater quantity and quality	x			x			x
Surface water quantity and quality	x			x			x
Migratory birds and their habitat	x				x		x
Fish and their habitat	x			x			x
Terrestrial wildlife and habitat, woodlands, wetlands and plant environments of interest	x				x		x
Species of special concern, including species at risk within the meaning of subsection 2(1) of the <i>Species at Risk Act</i>	x			x			x
Capacity of renewable resources (aquifer)	x			x			x*
Human environment							
Land use	x			x			x
Aboriginal use of lands and resources		x					x
Heritage, cultural and historical resources		x					x
Environmental conditions							
Seismic activity		x					x
Climate change	x			x			x*
Potential sources of contamination (contaminated land, sanitary landfill sites, land use)	x			x			x**

Environmental Component	Environmental Effects Analysis					Residual Effects	
	Potential Adverse Effects			Possibility of Full Mitigation		Significant Effects?	
	Yes	No	Uncertain	Yes	No	Yes	No
Accidents, malfunctions and adverse conditions							
Spills and hazardous materials	x			x			x
Other emergencies	x			x			x

*Follow-up is recommended to complete data collection for purposes of adjusting operational yields to ensure sustainable use of the resource and address climate change.

** Follow-up is recommended to complete the analysis of the source of the water.

The following sections summarize the potential environmental effects of the project on the environmental components for which potential adverse effects have been identified. For each component, the effects analysis focuses on the following aspects:

- A description of the environmental effects of the project on the component
- Mitigation measures that will be implemented during the work
- Residual effects and their significance

7.2 Groundwater quality

The project could have an impact on groundwater quality because of potential hydraulic links between the river (Neigette River area and Neigette Dam area) and the aquifer, which could be magnified by well pumping operations. A hydraulic link could provide an entryway for viruses and bacteria. Moreover, planned uses in the areas of influence (groundwater recharge areas, river water quality) could have an impact on groundwater quality in the new wells to be constructed. Finally, at the end of the operational life of the facilities, poor sealing of the wells could allow contaminants to enter the aquifer and affect groundwater quality. The impacts for each of the areas studied are discussed in greater detail in the following sections, along with the mitigation measures that should be implemented to reduce the significance of the impacts to an acceptable level.

7.2.1 Groundwater quality in the Neigette River area

Despite the rationale presented by the proponent, the NRCan experts remain doubtful about the lack of a hydraulic link between the river and the wells in the Neigette River area. In fact, because the wells are close to the river (approximately 60 m) and the clay layer is thin or non-existent, it is difficult to conclude beyond any doubt that the pumping wells are not partially fed by the river. The water could be filtered over a certain distance, but this would probably not prevent bacteria and viruses from reaching the wells faster than MDDEP standards allow because of the very high transmissivity of the sand and gravel layer. Development of a numerical model could help to resolve the uncertainty, but assumptions would nevertheless be required and the process is time-consuming. This additional work would delay start-up of the new pumping wells and trigger additional costs.

Nevertheless, given that: 1) the existing well has been operating without a problem for 20 years, 2) according to Groupe BPR, the results of the microscopy analyses it carried out over the course of twelve weeks during the summer of 2001 were “encouraging,” and 3) the risk of contamination of the river is considered low given that the wells are located some distance away from major roads and industrial areas, NRCan indicated that it could recommend the use of the wells.

NRCan is also of the view, however, that the indices for the three areas are sufficiently high to prohibit certain high-risk activities in the aquifer zones of influence and that the City should introduce appropriate regulations. To follow the precautionary principle, CED is of the opinion that the vulnerability index that was revised upward by NRCan should be the value used for the environmental

analysis of the project. It was on the basis of this conclusion, therefore, that CED identified the mitigation measures to be implemented and determined the significance of the adverse environmental effects of the project on water quality in the Neigette River area.

7.2.2 Groundwater quality in the Neigette Dam area

As in the Neigette River area, NRCan remains cautious about the lack of a hydraulic link between surface water in the dam and groundwater and recommends that bacteriological analyses of the type conducted by Groupe BPR be carried out during the summer (June to August). Such analyses would not prove beyond any doubt that surface water is not being pumped, even if the results are negative, but they are not very costly and would provide additional reassurance for the authorities of the City of Rimouski.

The revised values produced by NRCan concerning groundwater vulnerability at the dam site indicate that agricultural activities carried out to the south of the site and within the watershed could have an effect on groundwater quality. Mitigation measures have been recommended to limit the significance of project impacts on groundwater quality.

7.2.3 Mitigation measures and conclusion on the significance of adverse environmental effects

In order to protect the aquifer throughout all phases of the project, the following mitigation measures will must be implemented:

- Certificates of authorization will be obtained from provincial authorities before any work related to installation of the wells and the water lines. The proponent will comply with all mitigation measures required in the certificates of authorization issued for the work. A copy of the certificates will be forwarded to the CED representative.
- Soils will be graded within the immediate protection area of the wells to prevent surface runoff toward the wells.
- Any activities, facilities or storage of materials or objects that could contaminate the groundwater will be prohibited, with the exception of the equipment required to construct the intake structures and the building housing them.
- An immediate protection area with a minimum radius of 30 m will be fenced in around each well.
- A sign will be posted on the site indicating the presence of a groundwater source that supplies water intended for human consumption.
- Any activities, facilities or storage of materials or objects that could contaminate the groundwater, will be prohibited, with the exception, once securely installed, of the equipment required to operate the intake structure. If an emergency generator (diesel) is planned, the generator and its tank will be installed on a clean base with a containment structure to confine spills and/or spatter that could occur during maintenance. The concrete containment structure will be designed to hold more than 100% of the tank's capacity.
- To protect the aquifer, a management plan will be obtained or developed for the farmlands located within the close protection perimeter in the **Neigette Dam** area, as defined by a migration time of 200 days.
- With regard to the **Neigette River** well, because the vulnerability indices in the three zones are high, the City will prohibit the use of fertilizers, pesticides and herbicides within the close and far perimeters.
- Groundwater quality (bacteriological analyses) will be monitored during the summer (June to August) in the **Neigette Dam** area (see section 10 of this report).
- At the end of its operational life, the main well will be sealed in accordance with the *Guide technique de captage des eaux souterraines et traitement des eaux usées des résidences isolées* [technical guide on groundwater collection and the treatment of wastewater from isolated

residences] published by the Quebec Department of Sustainable Development, Environment and Parks (MDDEP) or any other guide recognized by provincial authorities at the time of closure.

- The depth of cement-bentonite used to seal the wells will be increased to 3 m below the surface because the freeze-thaw zone can easily extend to 1.5-2 m in the Rimouski area.

CED considers that because of the mitigation measures to be implemented by the proponent, the project should not have any significant adverse effects on groundwater quality.

7.3 Groundwater quantity

The project could affect groundwater quantity, a) by extraction of groundwater at a rate that exceeds recharge (groundwater mining), and b) by water-table drawdown through pumping operations, which could affect domestic wells in the area of influence. These impacts are discussed in greater detail in the following sections.

7.3.1 Groundwater mining

This impact is also discussed in section 11 of this report, entitled “Sustainable use of the resource.”

According to the proponent, the hydrogeological study conducted in 1988 for the municipality of Pointe-au-Père showed that groundwater in the drilling area hydraulically upgradient from the Petite Neigette River could produce a permanent flow rate of 5,450 m³/d with a pumping rate exceeding the rate of flow of the river. In addition, the rate of flow of the river downstream of the dam, which at the time was recharged only through groundwater seepage, was 32,706 m³/d. This value would have been reached when there was no longer any water at the base of the dam: at that point, the City was using surface water.

According to NRCan, with a watershed of 93 km² in the Neigette Dam area, it is probable that the fractured schist (with its altered uppermost few metres) could supply the 10,900 m³/d desired by the City, particularly since the watershed includes a part of the valley where a number of highly permeable areas are located.

With regard to the Neigette River wells, NRCan considers that on the basis of the most recent data supplied by the proponent on the watershed surface areas, and the minimum-flow data for the river, it is reasonable to conclude that recharge could be sufficient to support pumping rates. Nevertheless, the proponent will implement measures to prevent groundwater mining. These measures will be clarified in the following section.

7.3.2 Water-table drawdown and impact on domestic wells

In the **Neigette River** area, with the exception of a farm located approximately 600 m from the wells, all users are more than 1,000 m from the pumping wells. In the piezometer near the farm, no drawdown was observed as a result of pumping. Moreover, the granular sand and gravel formation is absent in this area. Given the extent of the aquifer deposit, it is unlikely that pumping at a rate of 20,700 m³/d will affect the domestic wells in the area.

In the **Neigette Dam** area, the distance-drawdown curve was used by the proponent to establish the radius of influence for a pumping rate of 10,900 m³/d. Extrapolation of the distance-drawdown curve indicates that the cone of influence extends hydraulically upgradient for a distance of 650 m. There are no wells within the cone of influence. The proponent concludes, therefore, that pumping at a rate of 10,900 m³/d will have no effect on domestic wells in the area.

Nevertheless, to avoid any impact on groundwater quantity, the proponent proposes to implement the following measures:

- A system to control pumping levels and rates of water removal will be installed to ensure that groundwater capacity is not exceeded.
- At well facilities in the Neigette River area, operational pumping rates for the well will not exceed 7,620 m³/d.

- At well facilities in the Neigette Dam area, unit operational pumping rates for the two wells will not exceed 5,990 m³/d.

On the basis of the monitoring and control measures that will be implemented by the proponent, and NRCan's opinion concerning the recharge capacity of the aquifers, CED considers that the project is unlikely to adversely affect groundwater quality.

7.4 Surface water quantity and quality

7.4.1 Effects of the project on surface water quantity

Assuming that a hydraulic link exists between the Neigette River and the wells in the area, it is nevertheless impossible at present to determine the rate at which water would be indirectly removed by pumping the wells, although NRCan estimated that the effect would be limited. NRCan was initially surprised that during low-flow periods, no decrease was observed in the level of the river. They then theorized that this could be explained by the fact that water was being removed over a greater distance along the river—on the order of several hundreds of metres (NRCan, 2007B). The proponent subsequently revised its data on the surface area of the watershed for the river, making it possible to modify the recharge calculation and corroborate the recharge data as a function of the rate that water would be removed by the pumping of the wells.

Nevertheless, according to NRCan, it would be appropriate for the City to consider installing gauging stations in the Neigette River, upstream and downstream of the production wells, to verify the extraction rate and ascertain whether the addition of a third well removing 7,700 m³/d could lower the river level sufficiently to cause concern for plants and wildlife during low-flow periods.

7.4.2 Effects of the project on surface water quality

The project involves standard work that could adversely affect surface water through erosion of soils and fill materials, transport of suspended matter and destruction of the natural environment by the movement of machinery, particularly during construction of the bridge in the Neigette Dam area. Mitigation measures will make it possible to reduce the significance of the effects of the project on surface water quality. Additional measures are also listed in the section on fish habitat.

7.4.3 Mitigation measures and conclusion on the significance of adverse environmental effects

In order to protect surface water quality throughout all phases of the project, the following mitigation measures will be implemented:

- The work site will be equipped with all necessary waste recovery equipment (portable chemical toilets, waste receptacles, bins, etc.).
- A temporary storage area will be identified on the work site. The site will be cleaned and liquid and solid wastes routinely disposed of in accordance with regulations in effect.
- The contractor's work areas (trailers, machinery and equipment storage) will be located more than 60 m away from all watercourses.
- Burial of construction waste will be prohibited on the site.
- Fires and burning on or near the work site will be prohibited at all times.
- Construction waste and scrap (depending on their nature) will be disposed of in an area approved by provincial authorities. Hazardous waste (oil, grease, etc.) and other materials that pose a risk to the environment (creosote-treated wood, etc.) will be disposed of in a site that has been approved by provincial authorities to receive this type of waste. Copies of the delivery slips will be submitted to the CED representative.
- Work areas will be marked and movement of construction equipment restricted to those areas.

- Leaving soils bare will be avoided and, if necessary, suspended solids (SS) control measures (membranes, geotextiles, straw bales, settling ponds, filter berms, etc.) will be implemented to prevent SS input into surface water, drainage ditches or storm drains during the work. This measure will be applied at the end of every workday, e.g., a layer of straw will be spread on bare areas susceptible to erosion. This measure is particularly important for work conducted near watercourses.
- Working during heavy rains will be avoided.
- Excavated materials will be disposed of at a site approved for receiving such materials (depending on their quality) and in accordance with regulations in effect. Delivery slips for disposal of excavated materials at approved sites will be submitted to the CED representative.

Other applicable measures are listed in the section entitled "Fish and their habitat."

On the basis of the mitigation measures to be implemented during the construction work, CED considers that the project should have no significant adverse effects on surface water quality.

7.5 Migratory birds and their habitat

The structural diversity of the vegetation in the Neigette Dam area is not very highly developed and does not support a diverse bird community. The presence of farmland in this area encourages species that prefer open and edge habitats. In the Neigette River area, structural diversity is more highly developed and supports a diverse bird community. Leaving in place the forested buffer strip and the vegetation around the edge of the planned work area will make it possible to support a diverse bird community representative of the forest stands present in the area. The noise caused by vehicles, trucks and heavy machinery is likely to have an impact on birds (BPR, 2008).

In order to protect migratory birds and their nests throughout all the phases of the project, the following mitigation measures will be implemented:

- Cleared areas will be kept to a strict minimum.
- Mature trees within 5 m of the boundaries of the work area will be protected.
- Before the work is carried out, the location of the peregrine falcon nest will be verified. If the nest is within one of the areas protected against forestry operations, the previously defined standards shall be respected.
- During the water-prospecting phase, forest-clearing work was performed outside the nesting period, which runs from April 15 to August 15.
- The nesting period for certain migratory bird species can extend to August 15. Forest-clearing activities will take place outside the period from April 15 to August 15, in order to reduce the risk of impacts and comply with the *Migratory Birds Regulations*.

On the basis of the mitigation measures to be implemented during the work, CED considers that the project should have no significant adverse effects on this component.

7.6 Fish and their habitat

The project could disturb fish habitat because of the construction activities that would take place in or near the watercourse, particularly for the bridge across the Neigette River and for development of the site where the wells are to be installed in the area of the dam.

When the aquifers are being used, pumping of the water could cause leakage that would affect the water level in the river, which would have a negative effect on aquatic habitats, particularly during low-flow periods. However, this removal of surface water would be relatively minimal because, according to available data, groundwater recharge capacity appears to be sufficient to support the desired pumping rates.

In order to protect fish and their habitat throughout all phases of the project, the following mitigation measures must be implemented:

Watercourse crossings for the supply line (coffer dams and trench)

- Work related to these activities that is carried out in the watercourse will be performed in the dry. In order to protect fish habitat, work will therefore be performed between June 1 and September 15, outside periods of heavy rainfall.
- A supervisor will be present on the work site at all times during trenching in the streambed. A spare pump with sufficient capacity will be available.
- An effort will be made to ensure that the flow management system (pumping of water in the trench or work area) is not a source of suspended solids (SS) and does not cause erosion of the bed or bank.
- Water containing SS from the work area will be filtered before being discharged into the watercourse.
- In order to avoid disturbing the watercourse, machinery will not be operated below the natural high water mark (NHWM). For the watercourse crossing, only one machinery crossing will be authorized. The crossing will only be wide enough to allow one piece of equipment to cross at a time (one lane).
- The materials used to fill the trench for the watercourse crossing will be free of fine particles.
- Watercourse banks and crossing approaches disturbed by these activities will be stabilized immediately upon completion of the work.
- Once installation of the water line has been completed, the trench excavated in the watercourse will be partially filled with a base material. In order to restore the streambed to its initial condition, the upper part of the trench (15-20 cm) will be filled with materials matching the natural granulometry of the bed.
- The materials used to build the cofferdams will be free of fine particles (clean stone, sand bags, etc.). These materials will be fully recovered upon completion of the work.
- A geotextile membrane will be installed that has sufficient strength to maintain the original condition of the bed and bank.

Management of fish confined in the work area

- Fish will be removed before the work area is dewatered in order to prevent them from being killed.
- The end of the pump system suction pipe will be equipped with an appropriate apparatus to prevent fish from being drawn up or injured (see the Freshwater Intake End-of-Pipe Fish Screen Guideline at:
http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/water-eau/pipe/index_e.asp).

Work on stream banks

- Stripping the soil and grubbing on the banks (NHWM + 30 m) will be avoided in the work area near the watercourse. Only soil in areas required for the equipment crossing and water line installation will be stripped.
- Excavated materials will be disposed of more than 30 m above the NHWM of any watercourses. Non-contaminated materials (characterization conducted to verify quality) may be reused to restore the work areas following the natural slope profile and original granulometry.
- In order to avoid disturbing the watercourse, machinery will not be operated below the natural high water mark. Only one return trip in the river will be permitted for the machinery.

- Construction machinery will be washed, serviced, parked and refuelled, and fuel and other hazardous materials will be stored more than 30 m from the NHWM or at a greater distance that is sufficient to prevent any deleterious substances from entering the water.
- Machinery will be kept clean and free of leaks and maintained in this condition throughout the work period.
- Oil spill kits will be kept on the work site in case of emergencies.
- Personnel will know how to use emergency equipment in case of an accidental spill. In the event of an accidental spill of oil or any other harmful substance, the Environment Canada (1-866-283-2333) and MDDEP (1-866-694-5454) emergency contacts will be notified immediately.
- Contaminated substrates, used oil and recovered oil will be transported to a designated site.
- Appropriate sediment and erosion control measures will be maintained throughout the duration of the work and until the disturbed areas are restored.
- Transport of fine particles in streams outside work areas will be avoided.
- Debris accidentally introduced into the aquatic environment or onto the bank or flood plain will be removed as quickly as possible.
- Banks will be rehabilitated using recognized vegetation stabilization techniques that take into account the stability, sensitivity to erosion, slope and height of the bank. Revegetation will be carried out as quickly as possible after completion of the earthworks operations, preferably with indigenous species.

Groundwater use

- The well yield that can be provided by seepage of surface water from the Neigette River area must not exceed 15% of the stream discharge or 15% of the 7-day minimum flow with a 2-year recurrence interval (7Q2)¹⁰. For the Neigette Dam area, the 7Q2 flow at the outlet will be used. This flow will be adjusted in response to changes in criteria that will be introduced by MDDEP.

On the basis of the mitigation measures to be implemented by the proponent, CED considers that the project should have no significant adverse effects on this component.

7.7 Terrestrial wildlife and habitat

The impact of forest clearing and soil stripping will mean reduced ecological niches as a result of the loss of vegetation structure for the duration of the use of the sites (the Neigette Dam area and the Neigette River in particular). This impact will be unfavourable for most species located within the cleared and stripped areas. The disappearance of the soil and the herbaceous layer also means a loss of habitat, particularly for small mammals. The Neigette Dam area, however, is not a preferred habitat for terrestrial wildlife. Although a richer habitat for terrestrial wildlife, the Neigette River area is also not a unique habitat for terrestrial wildlife.

The impacts on terrestrial wildlife and habitat that can be foreseen as a result of the project to upgrade the drinking water supply system include reduced habitat surface area and therefore reduced productivity for the duration of the use of the site.

In order to protect terrestrial wildlife and habitat during all phases of the project, the following mitigation measures will be implemented:

- Certificates of authorization will be obtained from provincial authorities before any work related to the project is carried out. Copies of the certificates will be forwarded to the CED representative.
- The forest clearing boundaries will be clearly marked in the field.

¹⁰ Requirements set out in the *Guide de conception des installations de production d'eau potable* [design guide for drinking water facilities]. Volume 1. MDDEP. November 2007. Direction des politiques de l'eau [water policy branch]

- Forest clearing will be carried out in such a way as to protect all trees, shrubs and other vegetation outside the work area from damage or mutilation.
- Materials and debris produced by the removal of trees, cutting vegetation to the ground, clearing and grubbing will be disposed of properly. As much as possible, plant debris will be chipped and reused. No burning will be permitted on site.
- The movement of vehicles and machinery will be restricted to the proposed roadways, which must be clearly identified.

On the basis of the mitigation measures, DEC considers that the project should have no significant adverse effects on this component.

7.8 Species of special concern, including species at risk within the meaning of subsection 2(1) of the *Species at Risk Act*

The work could disturb a peregrine falcon that could be nesting on the cliff in the Neigette River area. The initial impression is that because of the distances between the nest and the work areas, no restriction would apply. This would depend, of course, on the location of the nest in the year the work is carried out (BPR, 2008).

In order to protect species of special concern during all phases of the project, the following mitigation measures will be implemented:

- The location of the peregrine falcon nest will be verified before the work is carried out. If the nest is actually located in the work area, the proponent will contact the appropriate authorities for instructions on how to protect the nest during the work. CED will be notified by the proponent of the steps taken and the requirements specified.

In view of the fact that the nesting site of the peregrine falcon is located at some distance from the work site in the Neigette River area, and in view of the mitigation measure to be implemented by the proponent during the work, CED can conclude that the project is unlikely to have any significant adverse impacts on the peregrine falcon.

7.9 Human environment

The project could adversely affect land use, recreational activities and the landscape.

7.9.1 Land use

The **Neigette River** area is already used as a source of water, and there are already two wells and two service buildings on the site. The planned works will be annexed to the existing facilities and will be in keeping with the current use of the site. No activity that poses a risk is carried out within the immediate protection perimeter; the area is used at present for recreation/tourism activities (fishing and swimming). Land within the close and far protection perimeters is used partly for agriculture and partly for forestry (BPR, 2008). As recommended by NRCan, because of the vulnerability index for the three areas identified by the proponent, they must be protected through controls on agricultural activities such as the use of fertilizers, pesticides and herbicides. This measure controls but does not compromise farming within the close and far protection perimeters. All access to the immediate perimeter will be prohibited except for purposes of operating and maintaining the wells.

At the **Neigette Dam** site, farming is an activity carried out within the close and far protection perimeters. The immediate protection perimeter is partially forested and free of activities that pose a risk. Given the theoretical production potential of the area, the City of Rimouski will control future activities within the recharge area. To this end, the City will acquire the land within a close protection perimeter corresponding to a groundwater migration time of 200 days. The City will ensure that no activities other than farming are carried out within the recharge area.

In order to reduce the impacts on land use in the areas targeted by the project, the proponent proposes to implement the following measures:

- Compensation will be agreed upon with farm operators affected by a loss of cropland area or a loss in yield.
- If necessary, authorization will be obtained from the Commission de protection du territoire agricole du Québec (CPTAQ) before any work related to the installation of water lines and other related works is undertaken in agricultural areas. The proponent will demonstrate compliance with all mitigation measures required by the CPTAQ.
- Residents of the area will be notified in advance of the start date and anticipated duration of the work. Activities will be restricted to normal hours of work, between 7:00 a.m. and 6:00 p.m.
- Appropriate measures will be taken to limit dust, e.g., placing tarpaulins over materials transported by trucks and applying dust suppressants more than 30 m from watercourses (dust suppressants must be suitable for agricultural environments).
- Upon completion of the work, unused materials, waste, scrap, cobbles, rubble and wood, stump or root debris will be removed from the work area. These materials will be disposed of in accordance with the regulations in effect.
- Burning will be prohibited in construction areas.
- Ditches obstructed or disturbed by the work will be restored.
- Fences and other essential structures that have been removed or damaged will be repaired or rebuilt.

The water supply project in the Neigette River area and the Neigette Dam area will have an impact on land use for agricultural purposes because of the implementation of controls. However, CED considers that the controls will ensure the quality of the groundwater used by the City for its drinking water supply. Given the mitigation and compensation measures proposed by the proponent, CED considers that the project is unlikely to have significant adverse effects on land use.

7.9.2 Recreational activities

The main tourism/recreation activities in the work areas are fishing and swimming. At present, the bridge that provides access to the areas where the existing infrastructures are located also provides access to Neigette Falls, a major attraction in the municipality of Saint-Anaclet-de-Lessard. The falls are located a few dozen metres from the bridge. Installation of the safety fence around the edge of the immediate protection perimeter will restrict access to the Neigette Falls site. In order to allow for access to the site, a footpath will be installed between the fence and the edge of the Neigette River (BPR, 2008).

Given the measure to be implemented by the proponent, CED considers that the project is unlikely to have significant adverse effects on this component.

7.9.3 Landscape

The first activity that is likely to affect the surrounding landscape is forest clearing. In the two areas studied, only small sections will have to be cleared. In the Neigette Dam area, the landscape consists mainly of fields interspersed with wooded sections. The impact of clearing will be barely noticeable from the road and from homes. In the Neigette Falls area, clearing will only be apparent to users of the Neigette Falls tourist site (BPR, 2008).

The second element that is likely to affect the surrounding landscape is the presence of new infrastructures (service buildings, safety fences, etc.). Because of the positioning of the infrastructures in each of the areas where work is to be carried out, they will be barely noticeable or not noticeable at all from the road and surrounding homes (BPR, 2008).

The proponent expects to implement the following mitigation measures:

- The surface areas of land cleared will be no larger than necessary.
- The materials chosen for the exterior cladding of the service buildings will be in keeping with the landscape.

Given the measures to be implemented by the proponent, CED considers that the project is unlikely to have significant adverse effects on this component.

8 Effects of the environment on the project

This section addresses the environmental changes that could have an impact on the project and presents the outcomes and risks of these impacts.

8.1 Climate change

The primary concerns related to the impacts of climate change on the project are the following:

- Heat waves will increase in frequency, intensity and duration. The total number of days in excess of 30 degrees Celsius will increase. On the other hand, the number of cold-weather days will decrease.
- The number of extreme weather events including storms, freezing rain and hot days will increase.
- Surface water levels will drop. Moreover, spring runoff will be reduced and occur earlier. This could affect the water balance of the groundwater recharge and, as a result, consumption rates.
- The effects of drought on water sources could lead to decreased water availability. Less rainfall could also increase the need for irrigation.

The hydrogeological study completed for the project demonstrates that the aquifer can meet long-term drinking water needs, provided water demand follows anticipated trends and groundwater recharge rates remain at current levels. If groundwater recharge rates were to decrease to levels that could no longer meet the Municipality's water needs, additional hydrogeological studies would be necessary to examine various solutions to the problem (improvements to the well system, identification of new water sources, implementation of rigorous water conservation measures, increased reservoir capacity, etc.).

Admittedly, determining the impact of climate conditions on the recharge capacity of the aquifer is very challenging because the conditions are not known and several parameters come into play. To date, the proponent's data have confirmed that the groundwater body in the Neigette Dam area can produce the flows required by the City of Rimouski on a permanent basis. For the Neigette River area, interpretation of the drilling and pumping data also indicates that the well area can support an extraction rate that matches with the flows required by the City of Rimouski and that a good margin exists between the extraction rate and the maximum production capacity of the aquifers (BPR, 2008). In the circumstances, the margin would likely make it possible to react, if necessary, to the effects of climate conditions without having to make changes to the project.

Therefore, CED considers that climate change is not likely to have significant adverse effects on the project.

9 Accidents and malfunctions

CED assessed the probability of malfunctions and accidents during construction, operation, modification, decommissioning, abandonment and all other work related to the project, as well as the potential adverse environmental effects of such malfunctions or accidents. Malfunctions and accidents are related to spills of hazardous materials or other situations associated with operation of the wells.

9.1 Accidental spills of hazardous materials

The release of contaminants can be linked to construction equipment and handling and storage of hazardous materials at all phases of the project and can result in soil, groundwater and surface water contamination.

In order to reduce the effects on the environment, the following measures must be implemented:

- The mitigation measures will be included in the construction specifications. A copy of the relevant sections of the specifications will be forwarded to the CED representative before the work begins.
- The contractor will be made aware of the mitigation measures to be implemented during the work. These measures will be presented to the contractor during the initial site meetings, for which an agenda item will be included to this effect. A copy of the site meeting agenda will be submitted to the CED representative.
- A manager responsible for verifying the implementation of the environmental mitigation measures will be present at all times while the work is being carried out. This work site manager will be in charge of writing a full monitoring report that describes the implementation of the mitigation and compensation measures. The report will be sent to the CED representative once the work is completed.
- The CED representative will immediately be notified of any problem that could cause environmental impacts.
- Faulty construction equipment and vehicles will be repaired as quickly as possible and at a distance of more than 30 metres from a watercourse.
- An emergency response kit will be kept on the work site at all times in case of an accidental spill.
- All handling of fuel, oil or other contaminants will be routinely supervised to prevent any spills.
- All necessary measures will be taken to stop an accidental spill and quickly confine the spilled product. The product will then be recovered, the waste disposed of and the area restored in accordance with existing regulations.
- A spill prevention and response plan will be established and the responsible individuals and authorities, as well as the procedure to follow in case of an environmental emergency will be clearly identified. A copy of the prevention plan will be submitted to the CED representative.
- Workers will be made aware of environmental emergency response and accidental spill prevention measures. This item will be included on a site meeting agenda or proof of certification of personnel in the implementation of emergency response measures will be provided.
- In the event of an oil spill or a spill of any other harmful substance, the Department of Sustainable Development, Environment and Parks will be notified immediately (1-866-694-5454).
- A retrospective analysis will be conducted to improve the prevention and response system in case of an accident.
- All hazardous materials will be transported safely and in accordance with existing regulations and standards.
- Construction machinery will be washed, serviced, parked and refuelled and fuel and other hazardous materials stored more than 30 metres from the NHWM or more than 30 metres from

the wells or at a greater distance that is sufficient to prevent any deleterious substances from entering the well protection areas.

- Machinery will be kept clean, free of leaks and maintained in this condition throughout the work period. A copy of the machinery inspection reports (most recent copy prior to start of work) will be submitted to the CED representative.
- Water containing suspended solids or harmful substances will not be pumped into the wastewater or drainage systems.
- All temporary fuel tanks will be installed and dismantled in accordance with the *Petroleum Products Regulation*.
- An immediate protection area with a minimum radius of 30 metres will be fenced in around each well.
- A sign indicating the presence of a groundwater source of drinking water intended for human consumption will be posted on the site.
- Any activities, facilities or storage of materials or objects that could contaminate the groundwater will be prohibited, with the exception, once securely installed of the equipment required to operate the intake system equipment. If an emergency generator (diesel motor) is planned, the generator and its tank will be installed on a clean base with a containment structure to confine spills and/or spatter that could occur during maintenance. The concrete containment structure will be designed to hold more than 100% of the tank's capacity.

CED considers that, provided these measures are properly implemented, they will ensure that the project does not have any major adverse environmental impacts.

9.2 Other emergency situations

Interruption of the drinking water supply is not covered clearly in the City of Rimouski's current emergency plan.

The City of Rimouski emergency plan must be improved to clarify the description of measures to be taken in the event of emergency situations or problems related to operation of the system. The well operator must follow the procedures described in the plan. A copy of the plan will be left in the well pumping station.

The emergency plan will establish the measures to be taken to mitigate adverse effects in the following general situations:

- supply and treatment problems (negative water quality analysis results, faulty chlorinator, etc.)
- distribution system problems (broken watermain, fire hydrant, etc.)
- problems involving the hazardous materials storage facility (leak, structural failure, etc.)
- exceptional circumstances (security breach, fire or explosion, etc.)

If a drinking water reservoir supply line were to break once the new systems are in operation, the reservoir would have to be filled from a tank in accordance with the *Regulation Respecting the Quality of Drinking Water*. The distribution of bottled water could also be arranged.

CED considers that because the emergency plan will include measures for dealing with malfunctions and accidents, the project should not have any significant adverse effects on the soil, groundwater or surface water.

10 Cumulative environmental effects

The potential environmental effects of the project to upgrade the drinking water supply system of the City of Rimouski are not considered significant. The effects involve the following environmental components: air quality, sound environment, soil quality, drainage and erosion, sediment quality, groundwater and surface water quantity and quality, wildlife and terrestrial, aquatic and bird habitats, soil use, recreation/tourism activities and landscapes. In most cases, the effects will be noticed over a short period of time and in a localized area. These effects could interact with one another or with past, present or future stressors. The spatial and temporal boundaries used in the cumulative effects assessment are described in sections 3.4 and 3.5 (BPR, 2008).

10.1 Identification of valued environmental components to be considered

The fundamental objective of the cumulative effects assessment is to determine whether the project itself will have an impact on a valued ecosystem component (VEC). In this case, the VECs considered in the analysis were selected according to their value. It should be noted that the environmental value of a component is a reference to its relative importance. This was determined, in part, by the intrinsic value accepted by specialists, which refers to the significance (function, representativeness, diversity, frequency of use and rarity-uniqueness) and quality of the component (harmony, vitality, potential), and, in part, by the social, cultural and aesthetic values accorded to the same component by the various social, legal and political interests involved in the protection and enhancement of the environment. Environmental components considered of high environmental value were included in the analysis of cumulative effects. The list of VECs can be found in Table 5 (BPR, 2008).

Table 5 – Valued ecosystem components

Physical components	Value
Groundwater quantity	High
Groundwater quality	High
Surface water quantity	High
Surface water quality	High
Biological components	Value
Aquatic wildlife and habitats	High
Human components	Value
Landscape	High

From BPR, 2008.

10.2 Identification of past, present and future projects and their impacts on valued environmental components

Research was conducted to determine whether the project is part of a group of similar past, present or future projects and/or activities whose impacts would be negligible on an individual basis, but significant collectively. Accordingly, the environmental assessment registries of municipal and provincial organizations were consulted (BPR, 2008). Other projects and activities that could potentially interact with the City of Rimouski water supply project are listed in Table 6.

Table 6 - List of other projects and activities that could interact with the Rimouski water supply project

Projects/Activities	Summary
Renaturalization of the Lac à l'Anguille Ecosystem	The purpose of the project is to stabilize and renaturalize 7,005 m ² of the Lac à Anguille shoreline owned by 13 landowners. Bioengineering techniques will be used and the organization will seek the participation of the shoreline landowners.
Dredging project, Rimouski-Est Harbour	The project consists of dredging the manoeuvring vicinity zone, commercial docking station numbers 3, 4, and 5 along the eastern wharf and the approach channel. This dredging project is to comply with the depth conditions prevailing before 1995, 5.2 m for the manoeuvring vicinity zone and the approach channel and 7.3 m for the docking station. Approximately 94,000 cubic meters of sediment will be removed according to the May 2006 bathymetric record.
Keeping livestock away from waterways at St-Anaclet and Rimouski	Fence and drinking trough installation near watercourses.
Construction of an electric power transmission line (Rimouski and Saint-Anaclet)	Construction of a 63-kilometre, 230-kilovolt power transmission line. Hydro-Québec plans to begin the work in November and complete it in July 2009.
Asphalting of Route 232	Asphalting of Route 232, Rimouski.
Rehabilitation of Route 132 - Rimouski	Rehabilitation of retaining wall drains.

Tiré de BPR, 2008.

10.3 Identification of potential cumulative impacts

For cumulative effect assessment purposes, it is necessary to establish whether other projects and activities have the potential to act cumulatively with the effects of the City of Rimouski drinking water supply project. Accordingly, the proponent analyzed the effects of the project to determine whether or not they were similar to those likely to result from the other projects and activities and whether or not they were expected to occur during the same time and in the same geographic area (i.e. space) as the effects of the other projects and activities. In terms of the spatial overlap, the effects of the project and the effects of other projects and activities must occur at the location of a VEC.

10.3.1 Cumulative effects of the overlapping of area well drawdown cones on groundwater quantity

There are no risks associated with overlapping of the wells' drawdown cones with those of domestic wells present in the area of influence of the wells.

The proponent plans to build an extra well at the Neigette Dam. Therefore, both wells will tap the same aquifer, but they will not operate simultaneously. The recommended operational flow is 1,337m³/min, regardless of which well is used.

The operation of one or several high-capacity municipal wells could have negative impacts on municipal and private wells in the project area (increased drawdown, mutual interference effects, etc.). Any decision to increase total supply capacity must be supported by new hydrogeological studies showing that the construction of new municipal wells and/or the improvement of existing municipal wells would not have any adverse effects on the aquifer. Given the City of Rimouski's relatively low demographic

growth and limited future needs in terms of increased water consumption, CED considers that the project is not likely to have significant cumulative effects on groundwater quantity.

10.3.2 Cumulative effects on other valued environmental components

On a temporal level, the proponent believes that all of the projects combined could produce environmental effects that overlap with the effects of the City of Rimouski water supply project. On a spatial level, the proponent believes that no other projects or activities will be conducted within the boundaries of the anticipated effects of the project to upgrade the drinking water supply system of the City of Rimouski. Finally, the proponent believes that, although there is temporal overlap with the other projects and activities, no overlap of the effects was identified. In all cases, the effects of the other projects and activities will have no impact on the VECs considered in the analysis of cumulative effects.

In light of the information collected, the proponent has determined that no similar project and/or activity is likely to produce environmental effects that could interact with those identified within the framework of the project to upgrade the drinking water supply system in the City of Rimouski. No cumulative environmental effects are anticipated and no monitoring program specific to the cumulative effects is required. CED is in agreement with the proponent's conclusions.

11 Sustainable use of the resource

The environmental assessment takes into account the renewable resources that could be significantly affected by the project. CED's analysis places particular emphasis on sustainable use of the groundwater.

As indicated in sections 6.2 and 7.3, the hydrogeological studies conducted by the proponent and the analysis carried out by NRCan show that the two aquifers (Neigette Dam and Neigette River) would currently be capable of supporting the pumping flows required by the City of Rimouski over a 30-year horizon.

NRCan also expressed some doubts concerning the source of the groundwater, some of which could be supplied by surface water from the Neigette River and possibly the Neigette Dam. There is still uncertainty about how the aquifer would behave during severe low-water periods in the river if the river contributes to aquifer recharge.

In an attempt to respond to these uncertainties, NRCan recommended installing gauging stations upstream and downstream from the production wells in the Neigette River in order to determine the flow being pumped and whether the addition of the third well could cause the water in the river to drop to levels that would be problematic for wildlife and plants during low-water periods. The City also proposed measures to limit extraction to ensure that groundwater use does not exceed recharge capacity.

After examining the existing environmental context and considering the proponent's commitment to take into account well water level monitoring results in adjusting operational flow to recharge, CED has concluded that the project to upgrade the system should not have any significant adverse effects on the capacity of the groundwater to meet present and future needs.

12 Monitoring and follow-up program

12.1 Monitoring program

Monitoring of the implementation of mitigation measures will be ensured as long as the work site is in operation.

A monitoring report will be produced by the proponent upon completion of the work. The report will address the various activities involved in the monitoring of the implementation of the mitigation measures and the results obtained. A photographic report will be submitted with the monitoring report and will include photographs taken before, during and after the work, as well as photographs of some of the mitigation measures implemented (for example, suspended solids control measures, etc.). A copy of the monitoring report will be forwarded to Canada Economic Development upon completion of the work. Quebec's Department of Municipal Affairs and Regions (MAMR) will also check with CED to ensure that the proponent has complied with the elements related to environmental monitoring.

12.2 Follow-up program

The proponent established a groundwater quantity and quality follow-up program in accordance with applicable legislative requirements. The follow-up program will make it possible to establish and implement adaptive management measures to minimize the project's impacts.

The follow-up program will include the following activities:

- long-term groundwater monitoring to observe decreases in the groundwater level in the program years to come. Operational flows must be adjusted according to the findings of the monitoring to ensure sustainability of the resource;
- monitoring of water quality through regular sampling to identify changes over time. Analyses will mainly test for *Giardia* cysts and *Cryptosporidium* oocysts, as well as arsenic, to ensure concentrations respect existing standards.
 - monitoring of groundwater quality (bacteriological analyses) during the summer (June to August) in the Neigette Dam area.
- monitoring, during operation, of water levels in the Neigette River and Neigette Dam to determine whether hydraulic connections exist between the aquifer and the surface water in order to maintain a maximum 15% use of stream discharge or 15% of the 7Q2 flow.

13 Conclusions and recommendations

The assessment of the project's impacts on the environment included the effects on the environment of accidents and malfunctions, the effects of the environment on the project, the alternatives, the capacity of the renewable resources and the cumulative effects.

CED has concluded that, to the extent that the proponent commits to the implementation of the mitigation measures specified in this report, the construction, operation and decommissioning activities related to the upgrading of the drinking water supply systems are unlikely to have any significant adverse effects on the environment. CED has also established a surveillance and monitoring program to ensure the accuracy of this conclusion.

14 References

Documents

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- BPR, 2007. *Questions et réponses* [questions and answers]. Report prepared for the City of Rimouski, August 22, 2007.
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- Quebec Department of Energy and Resources, 1980. *Dépôts meubles de la région Rimouski – Trois-Pistoles*, [surficial deposits in the Rimouski – Trois-Pistoles region], Direction générale de la recherche géologique et minérale [geological and mineralogical research directorate], Direction des levés géoscientifiques – Division du Quaternaire [geoscience survey branch – Quaternary division], DPV-717, 10 p. + map

Expert advice

- NRCan, 2008. April 30, 2008. Expert advice provided to Dominique Lagueux (CEAR) by Yanick Matteau on the project to upgrade the drinking water supply system in the City of Rimouski 7 p.
- NRCan, 2007B. Expert advice provided to Dominique Lagueux (CEAR) by Yanick Matteau on the project to upgrade the drinking water supply system in the City of Rimouski 8 p. Dated September 26, 2007.
- NRCan, 2007A. Expert advice provided to Dominique Lagueux (CEAR) by Yanick Matteau on the project to upgrade the drinking water supply system in the City of Rimouski 6 p. Dated May 1, 2007
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- Fisheries and Oceans Canada, 2006. Expert advice sent to Dominique Lagueux (CEAR) by Maryse Lemire on the response required pursuant to the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements – Expert advice on the project to upgrade the drinking water supply system, Rimouski* 3 p. and annex, Dated May 4, 2006.

**Annex 1 – Document of consultation on the Scope of the Comprehensive Study Under the
Canadian Environmental Assessment Act (CEAA)**