Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Replacement Class Screening Report

For

Water Well Construction and Decommissioning

Initial Declaration: October, 2005
Re-Declaration: May, 2011

Agriculture and Agri-Food Canada

Canada

Acknowledgements

Initial Declaration – 2005

The development of national Class Screening Reports requires a concerted effort by a large team of people. It is my pleasure to recognize the contributions made, not only by my AAFC colleagues, but also by our partners in other federal agencies, provincial agencies, and non-government agricultural organizations. In addition to the following Replacement Class Screening Report for Water Well Construction and Decommissioning Projects, AAFC has undertaken to prepare three other Class Screening Reports:

- Soil Conservation/Erosion Control Model Class Screening Report;
- Farm Water Supply Infrastructure Model Class Screening Report;
- Small Scale Farm Infrastructure Replacement Class Screening Report.

First among those to be acknowledged for his role as lead author is Darren Thomas, Environmental Analyst, AAFC-PFRA, Prairies East. As lead author, Darren has shouldered the primary responsibility for report research and writing. In carrying out his role, Darren has demonstrated dedication and perseverance. Darren, along with the lead authors for the other three AAFC Class Screening Reports, have worked as a cohesive team to ensure that AAFC exercises a consistent and high quality national approach to the assessment of water well construction and decommissioning projects and other environmentally sustainable agricultural projects supported by AAFC. Daryl Jaques, Environmental Specialist, AAFC-PFRA, Prairies Central, assisted Darren Thomas in an advisory capacity.

From the conceptual stage through to declaration and implementation, Robyn-Lynne Virtue, Class Screening Advisor, Canadian Environmental Assessment Agency has been our constant advisor, supporter, and companion. She has indeed set the standard for client service. As a result of her years of experience with the Agency and knowledge acquired through working with other Responsible Authorities in the development of their Class Screenings, Robyn very capably guided us through the process and contributed greatly to the organization of the Class Screening Reports. AAFC is grateful to the Agency for the substantial financial support which was provided to assist in covering incremental costs of producing the class screening reports.

Regional factors and differences which are inherent within Canadian agriculture have been considered by AAFC in the development of this and other national class screening reports. To ensure that the report reflects technical aspects of farm water supply infrastructure projects across our country, a Technical Review Team was established to review and comment on the draft report. AAFC acknowledges and thanks Team members, as listed below, for broadening our

geographic perspectives from the prairies to include other regions of Canada. The review process was facilitated by Ryerson Christie, XIE & Associates Ltd.

- Brett Henschel, AAFC-PFRA, Dawson Creek, BC
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In addition to the lead authors and members of the Technical Review Team, numerous other AAFC staff have contributed to the development of the Class Screenings. I am particularly grateful to Jennifer Edwards for her leadership in developing the proposals and laying the foundation for work to follow and for coordinating translation.

A final acknowledgement goes to all members of the national AAFC –PFRA Environmental Planning Unit for helping to ensure that the report is relevant and applicable to the provinces/region for which they are responsible.

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Re-Declaration - 2011

AAFC has declared two Replacement Class Screening Reports (RCSRs) to date: the Small Scale Farm Infrastructure Replacement Class Screening Report and the Water Well Construction and Decommissioning Replacement Class Screening Report. The Model Class Screening Reports initiated at the time of these RCSRs were never finalized or declared.

Since 2005, the Branch of AAFC responsible for the development of the class screenings has undergone some structural changes and the PFRA has been transformed into the Agri-Environment Services Branch (AESB). Programming at AAFC has also evolved to target a broader audience. Programs are still available to small scale producers, but also to agri-businesses involved in processing and value-added agricultural activity.

This RCSR will continue to be used for the next five years, for AAFC supported projects that fit the classes defined.

I would like to acknowledge the work of Marie-Hélène Beauchemin and Tamara Horechko, as well as the other technical staff in the Environmental Services Unit of AAFC-AESB, for reviewing the continued relevance of this Replacement Class Screening Report and liaising with the Agency through the process related to re-declaration of the report.

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1.0 INTRODUCTION

Agriculture and Agri-Food Canada (AAFC), has long been involved in water well construction and decommissioning projects, either by providing funding, acting as the proponent, or by providing an interest in land. Water well construction and decommissioning projects could involve the construction, operation, modification, decommissioning or abandonment of physical works including construction of new water wells and the decommissioning of existing water wells. The majority of water well construction and decommissioning projects are routine, repetitive projects with predictable and mitigable environmental effects. For these projects, AAFC is a responsible authority (RA) under the *Canadian Environmental Assessment Act* (the Act), and is required to undertake an environmental assessment as early as practicable in the planning stages of the project and before irrevocable decisions are made.

Use of this Replacement Class Screening Report (RCSR) will enable AAFC to streamline the environmental assessment process while maintaining a uniform high quality approach and ensuring compliance with relevant federal and provincial acts and regulations. It will also allow environmental practitioners to direct resources towards projects likely to have more substantive environmental effects. Agriculture and Agri-Food Canada will be responsible for all reporting and federal coordination requirements under the Act and this RCSR.

1.1 Development of the Class Screening

Prior to beginning the Class Screening development process in July 2005, AAFC estimated the number and type of environmental assessments that might be required under the Agriculture Policy Framework (APF) funding programs. Based on this information, the types of projects best suited for assessment using a class screening were determined. Water well construction and decommissioning projects were found to be an ideal candidate for use of a class screening in that they are routine, repetitive projects with predictable and mitigable environmental effects, and will result in a positive net environmental effect.

AAFC sees value in the re-declaration of this RCSR to streamline the environmental assessment process of water well construction and decommissioning projects under current and future funding programs.

1.2 Class Screening and the Canadian Environmental Assessment Act

The Act and its regulations set out the legislative basis for federal environmental assessments. The legislation ensures that the environmental effects of projects involving the federal government are carefully considered early in project planning. The Act applies to projects which require a federal authority (FA) to make a decision or take an action, whether as a proponent, land administrator, source of funding or regulator (issuance of a permit or license). The FA then becomes an RA and is required to ensure that an environmental assessment of the project is carried out prior to making its decision or taking action.

Most projects are assessed under a screening type of assessment. A screening systematically documents the anticipated environmental effects of a proposed project, and determines the need to modify the project plan or recommend further mitigation to eliminate adverse environmental effects or minimize the significance of these effects.

The screening of some repetitive projects may be streamlined through the use of a class screening report. This kind of report presents the accumulated knowledge of the environmental effects of a given type of project and identifies measures that are known to reduce or eliminate any significant adverse environmental effects. The Agency may declare such a report appropriate for use as a class screening after taking into account comments received during a period of public consultation.

A replacement class screening consists of a single report that defines the class of projects and describes the associated environmental effects, design standards and mitigation measures for projects assessed within the report. It includes a determination regarding significance of environmental effects for all projects assessed by the replacement class screening. Once the Agency declares an RCSR and where an RA is satisfied that a project falls within the class described in the RCSR, no further action is required under sections 18 or 20 of the Act with respect to the project, as long as the RA ensures that design standards and mitigation measures described in the RCSR are implemented.

1.3 Rationale for Replacement Class Screening Report

The applicability of the RCSR to these projects is based upon the following six criteria:

1. *Well Defined Class of Projects*
   Water well construction and decommissioning projects involves a number of common physical works and activities. They are well defined in terms of the design function and purpose, equipment used, how the activities are undertaken and regulated, how and where the works are undertaken, and the likely constraint on their implementation, such as seasonal timing restrictions. They have predictable and mitigable environmental impacts.

2. *Well Understood Environmental Setting*
   All water well construction and decommissioning projects are undertaken on or adjacent to land that has been previously disturbed, and currently supports the agricultural sector. Land that supports the agricultural sector will range, and may include general farm land (e.g. cultivated fields, greenhouse operations, and farm yards) and rural or municipal land occupied by facilities that processes agricultural products (secondary agricultural processing facilities such as grain processing facilities, meat processing facilities, juice extraction facilities, fruit and vegetable packaging facilities). Farm machinery is routinely used in or around this land throughout the year. The typical environmental settings and interactions among valued ecosystem components are well understood and not likely to vary between projects.

3. *Unlikely to Cause Significant Adverse Effects, Taking into Account Mitigation*
   The projects assessed in this RCSR are similar to numerous other projects that have been previously assessed in accordance with the Act by AAFC as individual

screenings. Based on previous experience with the projects, adverse environmental effects likely to result are known, predictable and unlikely to be significantly adverse. The implementation of best construction and management practices that include standard designs, proven mitigation measures, and compliance with provincial guidelines and regulations also help to ensure the unlikelihood of these projects to cause significant adverse environmental effects.

4. *No Project Specific Follow-Up Measures Required:*
   Water well construction and decommissioning projects fall within the category of standard agricultural practices. They are tried and tested solutions to water supply needs; they do not involve new or unproven technology. No project specific follow-up programs are required as there are no expected variations in predictions or effects to be monitored.

5. *Effective and Efficient Planning and Decision Making Process:*
   The physical works and activities associated with water well construction and decommissioning projects to be assessed using this RCSR are straightforward and routine in nature. AAFC is usually the only RA involved in these assessments. Project engineers and technicians are specialized and highly experienced in the design and construction of such projects, therefore the planning and decision making processes are straightforward. From AAFC's experience in preparing individual project screenings, it is anticipated that greater efficiency, consistency, and certainty of the environmental assessment process can be achieved through the use of the RCSR.

6. *Public Concern is Unlikely*
   For numerous years, AAFC together with provincial departments responsible for groundwater have assessed and supported projects similar to those assessed in this class of projects. To date, there have been no, or very few, public concerns regarding these projects. It is, therefore, reasonable to expect that projects covered by this RCSR are unlikely to result in public concerns.

As the project class meets the necessary six criteria, the RCSR is applicable. The RCSR streamlines the environmental assessment process based on the commonalities shared by the projects subject to the RCSR and satisfies the requirements of the Act.

1.4 Consultation

During the development of this RCSR, consultation was undertaken with representatives from AAFC's seven regional offices, key funding programs, the various departmental teams, and the department's Agri-Environmental Policy Bureau to ensure the RCSR would meet the needs of the department, programs and requirements of the Act.

Through the establishment of a Technical Review Team comprised of representatives from AAFC, provincial partners, and the agricultural sector, environmental issues associated with the construction, operation, modification, or decommissioning or farm water well projects were identified. The Technical Review Team also provided input which ensured that all the required mitigation measures, best management practices, and design standards were captured in the RCSR. Members of the Technical Review Team are identified in the Acknowledgements.

Following its submission, the Agency conducted a 30 day public consultation on the RCSR. All comments received were taken into consideration and incorporated into the RCSR as appropriate before its declaration.

1.5 Canadian Environmental Assessment Registry

The purpose of the Canadian Environmental Assessment Registry (the Registry) is to facilitate public access to records relating to environmental assessments, and to provide notice in a timely manner. The Registry consists of two components – an Internet site and a project file.

The Registry project file must include a copy of the RCSR. The RA maintains the file, ensures convenient public access, and responds to information requests in a timely manner.

The Registry Internet site is administered by the Agency. The RA and the Agency are required to post specific records to the Internet site in relation to the RCSR.

Upon declaration of the RCSR, the Act requires RAs to post on the Internet site of the Registry, at least every three months, statements of projects for which an RCSR was used. Each statement should be in the form of a list of projects, and should include:

- the title of each project for which the RCSR was used;
- the location of each project;
- RA contact information (name, phone number, address, email); and
- the date when it was determined that the project falls within the class of projects covered by the report.

Note: The schedule for posting statements is:

- no later than July 15 (for projects assessed from April 1 to June 30)
- no later than October 15 (for projects assessed from July 1 to September 30)
- no later than January 15 (for projects assessed from October 1 to December 31)
- no later than April 15 (for projects assessed from January 1 to March 31)

2.0 Projects Subject to Class Screening

The candidate class for this RCSR is water well projects that could involve the construction, operation, modification or decommissioning of large or small diameter wells, piezometers and monitoring wells, including their associated fencing, well head protection, pump enclosures, well casing, intake screen, pumps and piping.

For application of the RCSR, projects must be undertaken on land that has been previously disturbed, and currently supports the agricultural sector (e.g. cultivated fields, greenhouse operations, and farm yards, agricultural processing facilities). Farm machinery is routinely used in or around this land throughout the year. The construction of new works will not be carried out within a water body or contribute to the direct deposit of materials, sediments, or water into them. All provincial and local set back distances prescribed in regulations and guidelines must be observed, where they exist.

Construction of water wells can occur year round, however, in many parts of Canada construction typically occurs between the spring and fall when the ground is not frozen. Construction, installation and decommissioning of the water wells will be undertaken in accordance with provincial groundwater regulations and guidelines, where they exist. Operation of the well will comply with water allocations outlined in provincial licences, permits, and guidelines. The end result is a safe secure water supply with little possibility of pollutants contaminating the water source or any general adverse affects on the aquifer, water bodies or vegetation. A combination of mobile water well drilling and earth moving machinery (drilling rigs, water trucks, service trucks, backhoes) and hand machinery/tools, may be involved in the construction and or installation of the project.

Water well construction and decommissioning projects are carried out by the project proponent or a contractor working on their behalf. The proponent is responsible for the routine inspection and maintenance of the project.

2.1 Projects Subject to the CEAA

Water well construction and decommissioning projects are a project under the Act because they are undertakings in relation to a physical work. AAFC would “trigger” or initiate the need for an environmental assessment before it could exercise any duties, powers, or functions in relation to a project, as defined by the Act, under Section 5(1)a the proponent of a project, 5(1)b the provision of financial assistance to a project, or 5(1)c the administration of federal lands.

2.2 Projects Subject to Replacement Class Screening Report

The projects subject to the RCSR include those projects that are defined as projects under the Act because they are undertakings in relation to a physical work and do not fall under the *Exclusion List Regulations*. Two sub-classes of water well construction and decommissioning projects are identified and described in Table 2.1. The full scope of the project has been assessed within each sub-class.

Table 2.1: Description of Projects Subject to the Replacement Class Screening Report

Name of Sub-Class	Description of Sub-Class Project Components
Large Diameter Well (includes bored wells/dug holes and drilled wells)	Construction, installation, expansion, operation, modification or decommissioning of large diameter or bored wells, including their associated fencing, well head protection, pump enclosures, well casing, intake screen, pumps and piping. The depth of the well is dependent on the desired completion aquifer. The project typically takes from one to several days, leaves little to no significant disturbance and vegetation is usually re-established within one growing season.
Small Diameter Well (includes drilled wells, driven wells, piezometers and monitoring wells)	Construction, installation, expansion, operation, modification or decommissioning of small diameter or drilled wells, along with monitoring wells and piezometers, including their associated fencing, well head protection, pump enclosures, well casing, intake screen, pumps and piping. The depth of the well is dependent on the desired completion aquifer. The project typically takes from one to several days and leaves little to no significant disturbance and vegetation is usually re-established within one growing season.

2.3 Projects Not Subject to the Replacement Class Screening Report

The projects not subject to the RCSR include those projects that:

- Are not covered by the projects described in *Section 2.0: Projects Subject to this Class Screening* or *Section 3.0: Sub-Class Descriptions*;
- Are listed in Table 2.1 but will not implement the relevant mitigation stated in this RCSR, as required by AAFC;
- Require a permit, approval or authorization from another federal department (i.e. RA other than AAFC);
- Require assessment because they are captured in the *Comprehensive Study List Regulations*;
- Require an assessment under provincial environmental assessment legislation;
- Are constructed within a water body;
- Are constructed in an environmentally sensitive area;
- Will result in the loss, displacement, destruction, or degradation of any wetlands;
- Are carried out within a National Park, Migratory Bird Sanctuary, National Wildlife Area, provincially designated site of special concern, or on First Nation lands;
- Are infrastructure intended for a group or community;
- Are likely to have an adverse effect on species at risk, either directly or indirectly, such as by adversely affecting their habitat*, and/or that would require a permit under the *Species at Risk Act (*SARA). For the purposes of this document species at risk include:
    - species that have been recognized as “at risk” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by provincial or territorial authorities;
    - species identified on the List of Wildlife Species at Risk set out in Schedule 1 of SARA, and including the critical habitat or the

residences of individuals of that species, as those terms are defined in subsection 2(1) of SARA;

* if, after reviewing the project description using the class screening report, it becomes known or reasonably suspected that species at risk could be adversely affected by the proposed project, do not use the replacement class screening report. The project requires an individual environmental assessment under the Act. Note, that the contents of the replacement class screening report may be used in the preparation of the individual screening report to the extent appropriate.

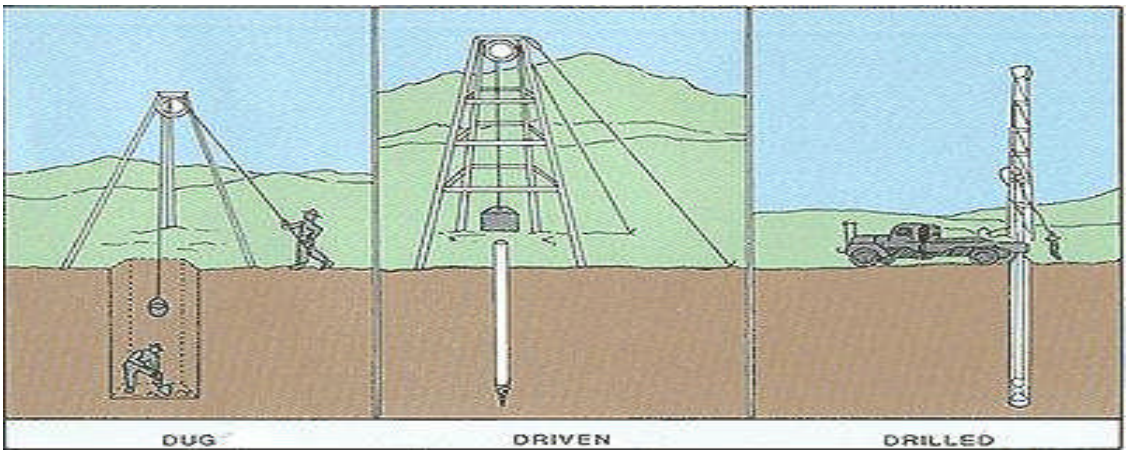
Water well construction and decommissioning projects that meet any of the above criteria are not addressed by this RCSR, and therefore require individual environmental assessments.

3.0 Project Descriptions

Class Description

Water wells are stable or cased holes into an underlying aquifer which produces a volume of water suitable for a variety of uses. Water wells can be located wherever an adequate supply of groundwater exists; there is no common location for the installation of water wells. Groundwater is the preferred water supply source in most rural areas of Canada because of its widespread availability and marked degree of drought tolerance.

Figure 1: Various Types of Wells



The situation surrounding wells often changes. For various reasons, many wells are abandoned and left unused, or dormant, for years. Often, these wells are still viable sources of water. Abandoned, or poorly managed, wells can act as a conduit for entry of surface pollution into the well and contaminate the entire aquifer. Proper decommissioning procedures can prevent contamination from occurring.

Decommissioning of wells generally includes the removal of pumping equipment, disinfection of the borehole or well casing, infilling of the bore hole or well casing with cement grout or bentonitic clay material to prevent the vertical movement of water,

removal of the upper casing section if practical, and covering, mounding and re-vegetating the well site.

This RCSR applies to water well projects which do not meet the exclusion requirements of the *Exclusion List Regulations*. Projects in this RCSR include:

- The construction and decommissioning of scientific data collection instruments (permanent piezometers)
- the construction and decommissioning of newly constructed water wells; and
- the decommissioning of previously existing wells.

The procedures and activities associated with the construction, operation, maintenance, and decommissioning of water wells are routine activities which are usually covered under provincial or territorial jurisdiction and have predictable environmental impacts that can be addressed with standard mitigation.

Two sub-classes and components, distinguished by their diameter, are described in this section: Large Diameter Wells and Small Diameter Wells.

Table 3.1: Potential Physical Activities for the Associated Physical Works of Large and Small Diameter Wells

Project Phase	Physical Works and Activities	Sub-class A – Large Diameter Well	Sub-class B – Small Diameter Well
Construction	Site planning and Selection	•	•
	Site Access	•	•
	Vegetation Clearing and Grubbing	•	•
	Operation of Hand Machinery	•	•
	Operation of Heavy Equipment, Vehicles	•	•
	Construction of Well Components	•	•
	Disinfection	•	•
	Earthworks	•	•
	Seeding/Planting	•	•
Operation and Maintenance	Operation of Hand Machinery	•	•
	Operation of Heavy Machinery	•	•
	Operation of Well components	•	•

	Disinfection	•	•
Decommissioning	**Operation of Heavy Equipment, Vehicles**	•	•
	Removal of Well Components	•	•
	Disinfection	•	•
	Earthworks	•	•
	Seeding/Planting	•	•

Sub-class A – Large Diameter Well

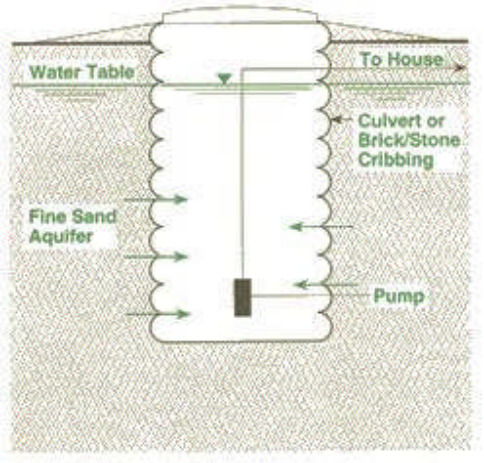


Figure 2: Example of Large Diameter Well

This sub-class applies to the construction, installation, expansion, operation, modification or decommissioning of large diameter wells and their associated fencing, well head protection, pump enclosures, well casing, intake screen, pumps and piping. Large diameter wells are large in diameter and relatively shallow. The depth of the well is dependent on the desired completion aquifer and is limited by the methods of construction, equipment used, and practical considerations for structural integrity and depth. The types of wells that can be included in this subclass are dug, excavated or bored wells.

These projects typically require from one to several days to complete, and leave little to no significant disturbance on the area around the well site. The vegetation and soil integrity is usually re-established within one growing season.

Sub-class B – Small Diameter Well

This sub-class applies to the construction, installation, expansion, operation, modification or decommissioning of small diameter wells, piezometers and monitoring wells, and their associated fencing, well head protection, pump enclosures, well casing, intake screen, pumps and piping. Small diameter wells are those wells that are significantly smaller in diameter and usually deeper than the large diameter wells. The depth of the well is dependent on the desired completion aquifer and is a more feasible option in areas of deep aquifers. Types of wells that can be included in this sub-class are drilled

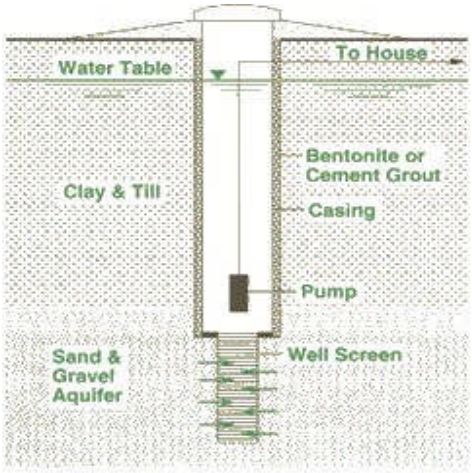


Figure 3: Example of Small Diameter Well

(including mud rotary, air rotary and air hammer drills), small bored, cable-tool (percussion), driven-point or jetted wells.

These projects typically require from one to several days to complete and leave little to no significant disturbance on the area around the well site. The vegetation and soil integrity is usually re-established within one growing season.

3.1 Seasonal Scheduling and Duration of Project

Wells can be installed at any time of the year, but due to machinery operations and effectiveness, and worker considerations, water wells are usually installed when extreme weather conditions are least likely to occur and soil moisture conditions permit access and movement of heavy equipment.

Site preparation and construction activities may typically last from less than one day to a few days, depending on the scale of the project. Modification, maintenance, or repair activities are generally shorter in duration unless a major change is required. In the latter case, the project may take as long as the original construction to complete. Decommissioning and abandonment activities may take as long as the original construction to complete.

3.2 Effects of the Environment on the Project

Under the Act, an environmental assessment must consider potential effects which the environment may have on the project. Activities relevant to water well construction and decommissioning are vulnerable to a variety of environmental effects such as:

- extreme weather events (such as temperatures and precipitation) that may cause problems for machinery operation and drill crews during construction or decommissioning;
- formation drilling that may require more drilling fluid materials;
- rainfall and flood events that may introduce foreign material into a well and adversely affect water quality; or
- rainfall and flood events that may erode site structures.

The effects identified are considered mitigable and avoidable through design and siting, the use of best construction practices, as accepted by industry and the use of standards for operating, maintenance and repair procedures. These specific mitigations are covered in Section 4.0 of this RCSR.

3.3 Description of Project Activities

The proposed construction, installation, operation, maintenance and decommissioning of water well projects involve a number of common physical works and activities, as described below. They represent the manner in which water wells are typically implemented throughout each phase of development. Mitigation measures, as described

in *Section 4: Environmental Review*, may be required to ensure no significant adverse environmental effects occur.

The primary difference between activities associated with Large Diameter and Small Diameter wells lies in the methods used to construct the well components. Unless otherwise stated, the following project activities are undertaken for both types of well projects.

3.3.1 *Construction*

Site Planning and Site Selection
Project planning involves identifying relevant local, provincial, and federal regulations that must be complied with as well as guidelines and best construction practices for siting and construction of projects; attaining necessary approvals and authorizations of relevant local, provincial/territorial, and federal regulations; consulting with technical experts where appropriate; obtaining engineering advice where appropriate; selecting the project site; project design; determining the work schedule; and completing the environmental assessment, when required.

The site selected for water well should be located away from potentially polluting influences, with ground sloping away from the well site, and in an area not prone to flooding events. The well will be located in an area with high potential for adequate water supply, considering aquifer re-charge and annual yield. Site selection will also take into consideration previous and existing well sites and groundwater depths. Projects will not challenge the sustainability of the aquifer. Provincial/territorial and local legislation and guidelines, as well as local professionals/specialists should be consulted to determine obligations required for site selection.

Site Access
In some areas a temporary access may be required to allow site access by drilling equipment, a water truck, and auxiliary equipment trailers. Modifications are rarely made to the landscape for temporary access and vegetation clearing is minimal. A temporary access is used only for the purpose of the water well construction and will not be a permanent landscape feature. Where possible, project site access will be confined to, or near, existing roads and rights-of-way. Site access will utilize natural clearings be located on or adjacent to land that has been previously disturbed, and currently supports undertaken on land that has been previously disturbed, and currently supports the agricultural sector (e.g. cultivated fields, greenhouse operations, and farm yards, agricultural processing facilities).

Vegetation Clearing and Grubbing
Depending on the condition of the project site, some vegetation removal may be required to provide sufficient open space to construct the project and/or provide access to the project site. This may involve cutting, clearing, and grubbing of the area using heavy or hand equipment, depending on the vegetation type and size, and site accessibility.

Operation of Hand Machinery/Tools
Hand machinery/tools may be used during a project. Hand machinery/tools may include items such as weed whips, chain saws, shovels, cement mixers, power tools, seeding

and spraying equipment. Fuel is used by certain hand machinery. Re-fuelling and storage of fuel may be required at or near the project site.

Operation of Heavy Equipment and Vehicles

A variety of heavy equipment/machinery may be used during a project. The drilling process involves the use of heavy machinery (drilling rig or back hoe, water truck) and other vehicles and equipment that may be related to the drilling and completion process (equipment trailer, light and heavy duty trucks). A variety of vehicles, such as light-duty trucks, trailers, and ATV's, may be used to access the project site. Re-fuelling and storage of fuel may be required at, or near, the project site.

Construction of Well Components

The major components involved in a typical well installation tend to be similar from one project to another, although there may be some variation in diameter and length of some components.

The following project descriptions will separate work activities associated with the individual components of each project, rather than describing each type of system.

Sub-class A – Large Diameter Well

Drilling

Large diameter wells can be excavated or dug by hand or by heavy machinery, such as a backhoe. The hand dug method is not widely used today, however, in the past these types of wells were common place. The holes were dug in the hope of encountering a shallow aquifer. The holes were then stabilized using a variety of materials such as wood, stones, bricks, tile or concrete. The well was then covered using wood, stone or concrete covers. Equipment such as backhoes can be used to excavate a large diameter well, but these too are restricted to a certain depth.

Bored wells can be dug using a rotating earth auger, or more commonly a bucket-type excavator. The auger or bucket is rotated by hydraulic power, and bores the hole to the required depth. The auger bit carries the earth to the surface, while the bucket picks up the excavated materials which are then raised from the hole. The excavated materials are then deposited on the surface. Bored wells are smaller in diameter and are completed to greater depths compared with excavated or dug wells.

Casing

A casing is inserted into the shaft in order to improve the stability of the shaft. The casing is made from a variety of materials, including but not limited to, corrugated steel, PVC, fibreglass or concrete. In some older wells, bricks, stones, wood or tiles may have been used to stabilize the shaft. Materials used for casings will be determined by provincial/territorial or local legislation, regulations, guidelines, or policies or by site conditions. The height of casing above ground will also vary, based on circumstance and provincial requirements.

Screen

A screen is placed at a location on the casing that is adjacent to the desired aquifer zone. The screen allows the water to seep into the pipe. The screening can consist of or be manufactured in a variety of ways including, but not limited to, manufactured steel around the casing or machine cut openings into the casing itself. The casing is then installed in the drilled shaft, with either a manufactured or custom well screen set at a

predetermined interval in the well casing to accommodate water flow into the well. Methods used for screening and screen heights will be determined by provincial/territorial or local legislation, regulations, guidelines, or policies or by site conditions.

Well Development
Construction of well components may also involve well development, pump installation, connection to the water system, test holes, pump testing, disposal of pump test water, and disposal of contaminated water. These activities should be followed as prescribed in the provincial/territorial or local legislation, regulations, guidelines or policies and/or by site conditions.

Backfill
The annular space between the screened well casing and drilled hole is usually backfilled with pervious material to within a few metres above the screen, then backfilled to the surface with impermeable materials to form an impermeable seal. Methods and materials used for backfill and sealing may be determined by provincial/territorial or local legislation, regulations, guidelines, or policies or by site conditions.

Sub-class B – Small Diameter Well
Drilling
Types of wells that can be included in this sub-class are drilled (including mud rotary, air rotary and air hammer drills), small bored, cable-tool (percussion), driven-point or jetted wells. Piezometers and monitoring wells constructed using similar methods are also included in this sub-class.

Most modern wells are drilled using some kind of rotary method, which requires a drill rig mounted on heavy truck platforms. They utilize rotary drill bits that penetrate subsurface materials, or percussion bits that pulverize the materials encountered. If the ground is soft, or the target aquifer is shallow, small diameter auger bits may be used.

Driven wells are constructed by driving a small-diameter pipe into shallow water-bearing sand or gravel. Usually a screened well point is attached to the bottom of the casing before driving. These wells are relatively simple and economical to construct, but they have limited applicability with respect to depth and materials that can be penetrated. These types of wells can be easily contaminated from nearby surface sources because a significant annular space is not created during the driving process, and therefore sealing material such as grout can not be used to seal the well.

Jetted wells use a high velocity stream of water to excavate the hole and to carry the material out of the hole. This method requires a supply of water and a high pressure pump. This method depends on the erosive action of water; therefore it is only suitable for limited drilling mediums. Extremely hard materials cannot be penetrated; semi-hard materials may be penetrated by a combination of hydraulic and percussion effects, while coarse materials such as gravel require a greater water velocity to move the cuttings vertically out of the hole than do finer materials. Very fine, hard packed materials, such as clay, require a high water velocity to dislodge the material.

Casing
A casing is inserted into the bore hole to improve the stability of the bore hole. The casings can be made from a variety of materials, including but not limited to steel, black iron, PVC, fibreglass or plastic. Materials used for casings will be determined by federal, provincial/territorial or local legislation, regulations, guidelines, policies or by site conditions. The height of casing above ground will also vary, based on circumstance and provincial requirements.

Screen
A screen is usually attached to the bottom of the casing in most cases (exceptions can include some bedrock wells). The screen allows the water to seep into the casing. The screen can consist of a variety of materials including steel or plastic. The casing is then installed in the bore hole, with the screen set at a predetermined interval to accommodate water flow into the well. Methods used for screening and screen heights will be determined by provincial/territorial or local legislation, regulations, guidelines, or policies or by site conditions.

Well Development
Construction of well components may also involve well development, pump installation, connection to the water system, pump testing, disposal of pump test water, and disposal of contaminated water. These activities should be followed as prescribed in the local legislation, regulation, guidelines or policies, or by site conditions.

Backfill
The annular space between the screened well casing and drilled hole is usually backfilled with pervious material to within a few metres above the screen, then backfilled to the surface with impermeable materials to form an impermeable seal. Methods and materials used for backfill and sealing may be determined by provincial/territorial or local legislation, regulations, guidelines, or policies or by site conditions.

Disinfection
Drilling of a well, or the addition of the casing or the sealing materials, may introduce bacteria into the well and surrounding aquifer. Wells should be disinfected by shock chlorination, or other approved/acceptable means of disinfection, prior to capping. Provincial/Territorial or local legislation, regulations, guidelines or policies should be consulted, where they exist, as to proper disinfection techniques. Where such are not in place, industry accepted best practices should be followed for disinfection procedures.

Earthworks
Earthwork activities, such as stockpiling, removal and handling of soil and cuttings, and sloping may need to be undertaken as part of a project, with the site sloped to allow precipitation or surface water to flow away from the well site. Operation of a combination of heavy equipment, vehicles, and hand machinery/tools may be required.

Seeding and Planting
Re-vegetation of disturbed areas involves the use of pre-existing or other suitable vegetation, and may include final site sloping, direct or broadcast seeding, sodding, transplanting, fertilizing, establishment control, and site monitoring. In many cases, the footprint of the site is small and therefore the site is left to re-vegetate naturally.

3.3.2 *Operation and Maintenance*

Operation of Well Components
Once the construction of the water well is complete and the piping and pump are in place, the water is utilized for purposes which are generally located away from the well system. Much of the operation, or usage of the water, does not directly interact with the well site. An important factor to consider when operating a well is the withdrawal limits which may be set as per provincial/territorial licence, permits, guidelines, agreements or through technical data. If the limits of the well are exceeded, problems related to water quality or quantity in and around the project area may arise.

Once the well has been constructed, sealed and capped, the well needs little attention except for periodic maintenance and checking. Well head protection (steel posts, fence) may be used and the area around the well head may be modified to ensure that surface water runs away from the well head. The power supply may be either by a connection to a nearby pole, underground lines or possibly, solar panels. Water is pumped to discharge points through buried pipelines. Hydrants may be connected to the line at various points of convenience.

Operation of Hand Machinery
Hand machinery, such as brush saws, power tools and hand tools, may be used to maintain the access.

Operation of Heavy Machinery
Heavy machinery may be used to repair the well and associated piping if malfunctions occur. Heavy machinery can include drilling rigs, water trucks and cranes.

Disinfection
The well may require periodic disinfection for a variety of reasons. Bacteria may be introduced into the subsurface from a variety of sources such as repairs or maintenance of the well or other wells or activities in the area. Shock chlorination of the well can be used to help reduce the impact of these occurrences.

3.3.3 *Decommissioning*

This RCSR applies to the decommissioning of new wells constructed under this RCSR as well as those constructed and abandoned prior to this RCSR.

An abandoned well is defined as a well for which use has been permanently discontinued or is in an advanced state of disrepair, and can not be used for its intended purpose. The many abandoned wells in Canada pose a threat to both human safety and groundwater quality as they act as a conduit for the movement of near-surface contaminants, such as farm wastes, pesticides, fuel and other chemicals from leaking storage tanks, septic system wastes, and storm water run-off, into the underlying aquifer. Larger diameter, open, unused wells also present a physical hazard for animals and humans.

Activities involved in decommissioning a well may vary considerably depending on the type of well casing and the well depth and diameter. Examples of such activities include removal of the well casing, removal of pumping equipment, disinfection of the well, filling of the borehole with an impervious substance, backfilling the area with clay and adding topsoil at the surface. Re-vegetation occurs naturally or through seeding.

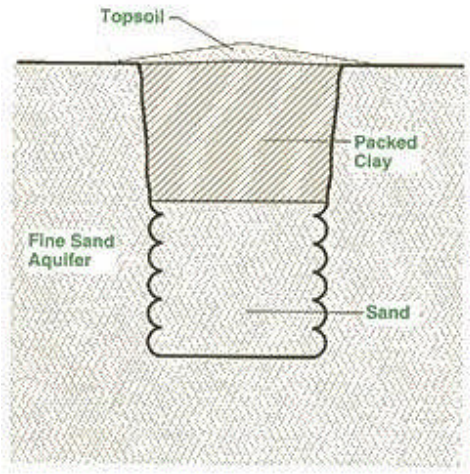


Figure 4: Example of Decommissioned Large Diameter Well

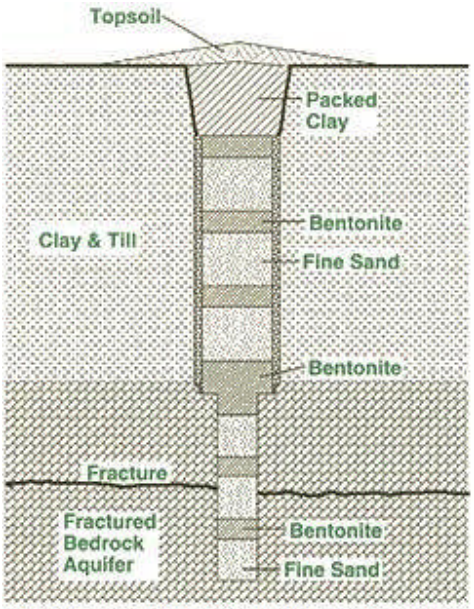


Figure 5: Example of Decommissioned Small Diameter Well

Efforts are rarely made to properly decommission water well. Methods and proper procedures for decommissioning a well are determined by provincial/territorial guidelines or regulations, where they exist. In some provinces, well decommissioning is highly regulated while, in others, decommissioning is broadly defined.

Site Access

In some areas a temporary access may be required to allow site access by drilling equipment, a water truck, and auxiliary equipment trailers. Modifications are rarely made to the landscape for temporary access and vegetation clearing is minimal. A temporary access is used only for the purpose of the water well decommissioning and will not be a permanent landscape feature. Where possible, project site access will be confined to, or near, existing roads and rights-of-way. The site access will utilize natural clearings and be located on or adjacent to land that has been previously disturbed, and currently supports undertaken on land that has been previously disturbed, and currently supports the agricultural sector (e.g. cultivated fields, greenhouse operations, and farm yards, agricultural processing facilities).

Operation of Heavy Equipment

The decommissioning process involves the use of heavy machinery (such as back hoe, cat, grader, drilling rig) and other vehicles and equipment (such as equipment trailer, ATVs, shelter). A variety of vehicles, such as light-duty trucks and trailers, may be used during a project, particularly to access the project site and possibly to complete the project. Re-fuelling and storage of fuel may be required at or near the project site.

Closure of a Well
Removal of the pump and related infrastructure, if necessary, is a logical first step in the well decommissioning process. The next step may involve removal of the upper portion of the casing, depending on the provincial/territorial or local requirements. Once the casing is removed, the area should be backfilled with an impervious material, graded to slope away from the former well, covered with topsoil and seeded. If the well casing cannot be removed, then it should be cut off below ground after it has been filled.

The selection of the material type used to seal the well is very important. The sealing procedures can often be found in provincial/territorial or local regulations or guidelines, where they exist. The type of material used to seal the well will help determine how effective the capping will be in preventing contamination.

Aside from choosing the appropriate plugging material, the method of placing material into the well is critical. Regulations and guidelines, where applicable, may require that the plugging material be introduced in a manner as to fill the well shaft from the bottom of the well and progressively upward to ground surface.

As a final step the excavation is backfilled with an impervious material, graded to slope away from the former well, covered with topsoil and seeded.

Provincial/territorial or local legislation, regulations, guidelines or policies should be consulted as to proper closure techniques as some jurisdictions may have additional requirements for decommissioning.

Disinfection
Sealing a well may cause a temporary silty or cloudy appearance to the water in nearby wells, particularly in areas where wells are constructed in fractured bedrock aquifers, such as limestone. Bacteria may also be introduced into the subsurface when adding sealing materials. Wells should be shock chlorinated. Wells may be shock chlorinated by adding one gallon of household bleach for every 50 gallons of water in the well. Provincial/territorial or local legislation, regulations, guidelines or policies, where available, should be consulted as to proper disinfection techniques.

Earthworks
After the well has been filled and sealed, it must be capped. A variety of methods can be used to cap a well, depending on the method used to seal the shaft. Local regulations and guidelines may indicate the appropriate method of capping the well. If top soil is used to cover the well, it should be mounded so that surface water will always drain away from the well. The well should also be mounded to allow for settling in the immediate area of the well.

Seeding and Planting
Well sites are usually left to re-grow naturally but may be replanted to help the site re-vegetate.

3.4 Accidents and Malfunction

The drilling and decommissioning processes involve the use of heavy machinery and other vehicles and equipment (equipment trailer, light and heavy duty trucks). As such, there is potential for accidental leaks of hydrocarbons, lubricants, or cooling fluids from the vehicles, either during their normal operation or during re-fuelling and maintenance procedures.

Geological factors may contribute to an accident or malfunction. There is the potential for drilling fluids to leave the confinement of the construction area and enter the surrounding environment through formation fractures in the bore hole. This is of particular concern when the well is located near a water body or close to other well sites.

Problems may arise due to erosion, water logging, declining water levels, or flooding from pump testing or to natural environmental factors, such as extreme precipitation events. These problems are difficult to forecast, however, they should be recognized as possible occurrences.

In some drilling techniques, various liquids are used, such as chlorinated water for disinfection, or drilling fluids used in drilling. These liquids can escape and damage the local flora and fauna, or may contaminate local water bodies or sources.

In drilling a well, unexpected risks such as flowing wells or entrained gas may be encountered. Flowing wells pose a risk of contamination of a nearby water source, while encountering gas can pose a health risk or risk from fire and explosions.

There is always a possibility of equipment malfunction or human error. In the case of malfunctions, equipment may not perform to expectation or break down unexpectedly. Human error may cause for unplanned events to occur. In either case a variety of occurrences could happen that might have an effect on the environment. These problems are difficult to forecast, however, they should be recognized as possible occurrences.

When working in the natural environment, there is always the potential for fires to occur. Whether the fire was created by natural causes or by project related activities, it still has the potential to affect the environment. Fire can also pose a risk to health and safety

4.0 ENVIRONMENTAL REVIEW

This section outlines the methodology used to ensure that the effects of project activities on the environment are consistently addressed from project to project regardless of location. To accomplish this, Valued Ecosystem Components (VECs) have been identified. VECs are those ecosystem components most likely to be affected by a project, and those features thought to be most important, thereby warranting further analysis. Potential environmental effects on selected VECs, which include cumulative and residual effects, are identified and the rationale for their analysis is explained. Accidents and malfunctions, including the effects of the environment on the project, are also considered. The process for selecting mitigation measures to address and alleviate

these effects on each VEC is discussed. A rating system is applied to establish the significance of residual environmental effects (i.e., effects remaining after the application of mitigation measures), based on the magnitude, geographic extent, duration, frequency, and permanence of the effect.

4.1 Environmental Assessment Boundaries

An important aspect of the environmental assessment process is the determination of the study boundaries. Study boundaries serve to focus the scope of the work such that a meaningful analysis of potential effects arising from the proposed project can be made. Study boundaries may be influenced by restrictions imposed by project scheduling and the varying degree to which environmental effects can be quantified and objectively evaluated (i.e., the point at which an environmental effect can no longer be measured, noticed or observed).

A boundary is a function of the extent and duration of potential interaction between a proposed project and VECs. Generally, these boundaries are defined by the temporal and spatial characteristics encompassing those periods and areas, during and within which, the VECs are likely to interact with, or be influenced by, the project. The environmental assessment boundary for water well construction and decommissioning projects is defined by the spatial and temporal extent of the similar physical characteristics of the project location. The projects covered under this RCSR are regularly conducted, routine projects. Project boundaries may vary slightly for individual project sub-classes.

Temporal boundaries include all project phases; from site preparation through to decommissioning. Project activities for water well construction and decommissioning projects continue on a year round basis, however, most are initiated in spring, summer, or fall seasons. They can last from less than one day to several days, depending on work specifics. The temporal boundaries are dependent on the particular project phase and time of year it is undertaken. This has been considered in the assessment and addressed for each VEC; specific details are provided in *Section 4.3: Issues Scoping and Valued Ecosystem Components.*

The spatial boundary encompassing the potential effects of a project is generally expected to be limited to the immediate project area. The majority of potential effects are not expected to occur beyond this spatial extent; however some effects may extend beyond the limits of the project area for certain VECs. Spatial boundaries have been considered in the assessment and addressed for each VEC. Specific details are provided in *Section 4.3: Issues Scoping and Valued Ecosystem Components.*

Administrative boundaries have also been considered during the development of the replacement class screening report. Both federal and provincial/territorial requirements have been considered and addressed.

In assessing and comparing the nature and limited affected areas of proposed projects, versus the defining scales of ecological and socioeconomic boundaries, it is felt that temporal, spatial and administrative boundaries alone properly identify potential environmental effects of defined projects. Accordingly, ecological and socioeconomic

boundaries were not considered further, as this would not add to the quality of the replacement class screening and would only replicate previously identified effects.

As project use of new technology or technology with uncertain effects is unlikely, technical boundaries were not considered.

4.2 Environmental Setting

Since the projects subject to this RCSR are well defined, mitigation measures are well established, and potential environmental effects are well understood, detailed descriptions of environmental settings for projects subject to the RCSR have not been provided. However, general descriptions of environmental settings are provided in *Section 3.0: Project Class Descriptions*.

For application of the RCSR, projects must be undertaken on or adjacent to land that has been previously disturbed, and currently supports undertaken on land that has been previously disturbed, and currently supports the agricultural sector (e.g. cultivated fields, greenhouse operations, and farm yards, agricultural processing facilities). Farm machinery is routinely used in or around this land throughout the year. The construction of new works will not be carried out within a water body or contribute to the direct deposit of materials, sediments, or water into them. Farm machinery is routinely used on or around this land, often throughout the year. Given this present land use, wildlife present in the area will be accustomed to normal agricultural activities, including the sounds and movement of farm machinery present in such a setting. It is, therefore, unlikely that wildlife will be adversely affected by proposed projects under this RCSR.

4.3 Issues Scoping and Valued Ecosystem Components

Using their experience in project assessment, planning and implementation, AAFC conducted an issues scoping process to:

- Identify all project activities associated with each water well construction and decommissioning sub-class;
- Identify VECs for water well construction and decommissioning projects; and
- Establish a matrix of potential interactions between identified project activities and VECs.

Various expert authorities were also consulted as part of this process. These authorities included: internal colleagues; the Saskatchewan Watershed Authority; the Ontario Ministry of Agriculture and Food; Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec; Nova Scotia Department of Agriculture and Fisheries; New Brunswick Agriculture, Fisheries, and Aquaculture; and the Prince Edward Island Department of Agriculture, Fisheries and Aquaculture. The Canadian Environmental Assessment Agency was also consulted.

The matrix describing potential interactions between project activities and VECs is shown in Table 4.1.

Table 4.1: Potential Interactions between Project Activities and Valued Ecosystem Components (VECs)

Project Phase	Physical Works and Project Activities	VECs[1]											
		Air Quality	Terrain and Topography	Soils	Surface Water Hydrology	Surface Water Quality	Groundwater Quantity	Groundwater Quality	Aquatic Habitat and Species	Terrestrial Habitat and Species	Land and Resource Use	Socio-Economic Conditions	Cultural and Heritage Resources
Construction	**Site planning and Selection**					•							
	Site Access			•		•				•			•
	Vegetation Clearing and Grubbing			•		•				•			
	Operation of Hand Machinery/Tools			•						•			
	Operation of Heavy Equipment, Vehicles			•				•		•			•
	Construction of Well Components			•	•	•	•	•					•
	Disinfection							•					
	Earthworks			•		•				•			•
	Seeding/Planting			•						•			
Operation and Maintenance	**Operation of Hand Machinery/Tools**			•						•			
	Operation of Heavy Equipment, Vehicles			•		•		•		•			•
	Operation of Well Components				•		•	•					
	Disinfection					•		•					
Decommis-sioning	**Operation of Heavy Equipment, Vehicles**			•						•			•
	Closure of Well Components					•	•	•		•			
	Disinfection					•		•					
	Earthworks			•		•				•			•
	Seeding/Planting			•						•			

[1] A – Applies to Subclass A (Large Diameter Wells), B – Applies to Subclass B (Small Diameter Wells), • – Applies to all classes

It has been determined that no measurable adverse environmental effects will occur on the following VECs, based on the limited duration, frequency and spatial extent of the potential interactions outlined in Table 4.1, with routine water well construction and decommissioning:

- Air Quality
- Terrain and Topography
- Surface Water Hydrology
- Aquatic Habitat and Species
- Land and Resource Use
- Socio-Economic Conditions

These components will not be carried forward through the RCSR for further detailed analysis. In the unlikely events that these VECs could be indirectly affected, it is presumed that the mitigation developed for the RCSR will serve to address any potential affects on the unconsidered VECs.

4.3.1 *Description of Valued Ecosystem Components*

The following VECs have been identified as potentially susceptible to significant adverse environmental effects due to project activities. The value of each VEC, and possible interactions with project activities, is also described.

Soils
Soils are important as they are directly connected to agricultural productivity and economic sustainability of the industry. Healthy soils support biological diversity and promote agricultural quality. Well-managed soils have high moisture-absorbing capacities, which can reduce the intensity of runoff and thus reduce potential erosion and loss of soil resources. Project activities, could result in a number of environmental effects, including: erosion or slope instability due to increased soil exposure and reduced soil capability through soil compaction and mixing and soil contamination through unsafe handling, storage or the accidental spills of fuels, hazardous material or wastes.

The spatial boundary for this VEC is set to the project site. The effects of the project activities will be felt for the length of time required to complete all project activities and, in some cases, the length of time that the project is in operation. In certain instances, effects will be felt for the length of time it takes for the project site to be restored to preconstruction conditions, as disturbed areas will continue to be affected until appropriate restoration takes place. The generally minor effects felt by the introduction of contaminants are likely to be rare and small in magnitude. If they occur, they will affect only the immediate surface area, and will be appropriately removed and disposed of in an appropriate manner.

Surface Water Quality
Surface water quality is valued as it influences the health of humans, fish and wildlife, livestock, and the environment as a whole. It is frequently relied upon as a water source, often satisfying water requirements during operation. Surface water quality has the potential to be reduced by project activities, through an increase in sediment loads which may occur through poorly planned or implemented excavation activities, or by the accidental introduction of contaminants such as oil, grease or fuel spills from construction vehicles or equipment, directly or indirectly into surface water bodies.

The spatial boundary for this VEC is set to the project site and any receiving water bodies. Effects to surface water quality will not extend past the length of time it takes to restore the project site to pre-construction conditions. The generally minor effects felt by the introduction of sediments will be limited to the length of time and reach it takes for introduced sediments to fall out of suspension.

Groundwater Quantity

Water is critical to the success of an agricultural operation. Groundwater is a valued source of water and is frequently relied upon as a source of drinking water and often used to satisfy water requirements during agricultural operations. Groundwater aquifers are not always isolated entities; shallow aquifers can be linked with other surface water sources such as lakes, rivers and streams through discharging and recharging areas. This interaction between shallow aquifers and surface water is often integral to the survival of either system. Projects could negatively affect groundwater quantity through water withdrawal during project activities. Withdrawal could result in changes to groundwater flow patterns, groundwater levels and subsequently, well yields.

The spatial boundary for this VEC is set to the project site and the area of influence within the associated aquifer. Direct effects of project activities on groundwater quantity will rarely be felt indefinitely; however, aquifer depletion could result from extended drought conditions, or if sustainable yields are exceeded for long periods of time. In most cases, the effects of groundwater withdrawal will be felt temporarily until proper withdrawal rates and sustainable yields are determined.

Groundwater Quality

Water is critical to the success of the agricultural sector. Groundwater is a valued source of water and is frequently relied upon as a source of drinking water and often used to satisfy water requirements during agricultural operations. Groundwater aquifers are not always isolated entities, shallow aquifers can be linked with other surface water sources such as lakes, rivers and streams through discharging and recharging areas. Groundwater quality is valued as it influences the quality of linked water sources and the health of humans, fish and wildlife, livestock, and the environment as a whole. Through proper well siting and decommissioning, groundwater quality is protected by eliminating potential pathways for contaminants to reach aquifers. Projects could, however, negatively affect groundwater quality through the accidental introduction of contaminants to the associated aquifer. Groundwater quality can also be influenced by the pumping of groundwater, which has the potential to draw in water from any poor quality sources in the immediate area (e.g. surface water, saline groundwater).

The spatial boundary for this VEC is set to the project site and the associated aquifer. Any direct effects of project activities on groundwater quality may be felt for an indefinite period. Taking into account mitigation and accepted industry practices, the quantity of contaminant that may potentially reach the aquifer following a spill or machinery malfunction would be very small, and active remediation techniques would likely not be employed.

Terrestrial Habitat and Species

Terrestrial habitat and species are valued as individuals, habitat, and key components of biological diversity. Special value is given to rare or uncommon species since loss of individuals of such species has the greatest potential to affect the ecological integrity of

an area. Projects could negatively affect terrestrial habitat and species by the disturbance/destruction of vegetation and habitat, the introduction of non-native species and opportunistic species, or the disruption to wildlife nesting and rearing activities.

The spatial boundary for this VEC is set to the project site. The effects of the project activities will be felt temporarily, until suitable natural recovery and re-vegetation has taken place, and visual evidence of all activities fade. Thus, identified effects of project activities will be felt until project site is restored to a state equivalent to preconstruction conditions.

Cultural and Heritage Resources
Cultural and heritage resources include cultural landscapes, archaeological and paleontological sites, structures, engineering works and artifacts, and any other associated records assigned important historic value. Cultural resources are valued for their association with aspects of human history and their contribution to the understanding of past events. Project activities have potential to damage surface and below ground cultural resources, and affect cultural and heritage resources through loss and/or disruption.

The spatial boundary for this VEC is set to the project site. Depending on the nature of the cultural and heritage resource, the effects of project activities will be felt temporarily until the resource can be appropriately restored or indefinitely in the unlikely event that a resource is destroyed before or during project construction.

4.4 Potential Environmental Effects

The environmental assessment focuses on the evaluation of potential environmental effects resulting from interactions between the various project components/activities and the VECs for each project phase. While many of these projects will result in an overall net-positive result, only potential adverse environmental effects are identified.

The environmental effects resulting from project-environment interactions will, for the most part, take place during the construction phase; however, effects can still occur during all phases of the project. The spatial and temporal environmental effects will be limited to the boundaries identified in *Section 4.3.1 Description of Valued Ecosystem Components*. The nature of these effects is related to: Soils, Surface Water Quality, Groundwater Quantity and Quality, Terrestrial Habitat and Species, Cultural and Heritage Resources.

Each type of project in the 2 sub-classes considered within this RCSR was analyzed on a subclass basis. Table 4.3 identifies the potential adverse environmental effects for the VECs deemed relevant in *Section 4.3: Issues Scoping and Valued Ecosystem Components* for each project sub-class.

4.5 Mitigation

Mitigation measures are those measures identified as a means of eliminating, reducing or controlling adverse environmental effects resulting from project activities, and are components of proper project planning, site preparation, construction and restoration practices. Table 4.3 identifies the mitigation measures that should be enlisted to eliminate, reduce or control potential adverse environmental effects on identified VECs,

as a result of project activities. This includes the effects of related accidents and malfunctions.

Water well construction and decommissioning projects which fall within this RCSR involve routine projects with predictable environmental effects that can be avoided or minimized using proven mitigation.

In order to ensure that conditions of funding, including mitigation, provided to the proponent have been successfully completed, AAFC will provide technical advice to selected projects during project planning, and may, upon completion of the project, conduct either telephone interviews or site visits to selected projects.

4.6 Analysis and Prediction of Significance of Residual Environmental Effects

Analysis and prediction of the significance of residual environmental effects is based on several criteria. These criteria consider a project's magnitude, geographic extent, duration, frequency of occurrence, and permanence. Table 4.2 summarizes the rating system used to determine the significance of residual environmental effects following the application of mitigation measures.

Table 4.2: Rating System used to Determine Significance of Residual Environmental Effects Following the Application of Mitigation Measures

Criterion	Criteria Ratings		
	Low (L)	Moderate (M)	High (H)
Magnitude	Effect is evident only at or nominally above baseline conditions	Effect is likely to be measurable over baseline conditions, however, is less than regulatory criteria, a published guideline value, or a level that might measurably affect the quality, quantity, value or use of a VEC	Effect may exceed a regulatory criteria, a published guideline value, or a level that might measurably affect the quality, quantity, value or use of a VEC
Geographic Extent	Effect is most likely to be limited to the project site/footprint	Effect is likely to extend into areas adjacent to the project site/footprint boundary	Effect is likely to extend into areas beyond those adjacent to the project site/footprint boundary
Duration	Effect is most likely to be evident only during one of the following phases of the project: site preparation, construction or decommissioning	Effect is likely to be evident during construction, decommissioning and/or operations phase of the project	Effect is likely to be evident beyond the life of the project
Frequency	Conditions or phenomena causing the effect occur only once	Conditions or phenomena causing the effect may occur more than once, but infrequently	Conditions or phenomena causing the effect are likely to occur at regular or frequent intervals
Permanence	Effect is likely to be	Effect is likely to be	Effect is likely to be

Criterion	Criteria Ratings		
	Low (L)	Moderate (M)	High (H)
	reversible over a short period of time (e.g., within several days or months) after the completion of the activity causing the effect	reversible over an extended period of time (e.g., a growing season, following a freshet)	permanent

After the application of these definitions, an environmental effect is assessed to be either a negligible effect, a minor adverse effect or a significant adverse effect, according to the following definitions:

a) Negligible Effect (NEG) (Not Significant) are those environmental effects which, after taking into consideration applicable mitigation measures, have been assessed to have a "low" rating for the majority (i.e., at least 3 out of 5) of the criteria described above and the effect cannot have been assessed to be "moderate" or "high" for either the "magnitude" or "permanence" criteria. Overall, these effects are not likely to be measurable or noticeable beyond the project site / footprint boundary, are only evident during the site preparation, construction or decommissioning phases of the project or occur only once. These effects are generally completely reversible, within a short period of time.

b) Minor Adverse Mitigable Effects (MIN) (Not Significant) are those environmental effects which, after taking into consideration mitigation measures, have been assessed to have a "low" or "moderate" rating for the majority of the criteria described above. Any effect that has been assessed as "moderate" or "high" for either the "magnitude" or "permanence" criteria (but not both) is considered to be a minor adverse effect (not significant).

c) Significant Adverse Effects (SIG) are those environmental effects which, after taking into consideration mitigation measures, have a magnitude that is approaching a legal regulatory limit (i.e., moderate) or exceeds a legal limit (i.e., high) and exhibit any or all of the following:

- effect extends into areas beyond those adjacent to the project site/footprint boundary;
- effect is evident beyond the life of the project;
- conditions or phenomena causing the effect occur at regular or frequent intervals; and
- effect is permanent.

The significance rating established represents the residual significance of each environmental effect, including accidents and malfunctions, following the application of mitigation measures. Table 4.3 identifies applicable VECs, associated environmental effects, necessary mitigation measures, and the predicted significance of residual adverse environmental effects, for projects covered by this RCSR.

Table 4.3: Potential Environmental Effects for Construction and Decommissioning of Water Wells

The proponent is responsible for observing and abiding by all applicable municipal, provincial/territorial and federal legislation relating to public health and safety, protection of the environment, wildlife habitat, labour codes, land use and zoning regulations, along with acquiring forthwith and prior to commencement of any work, all necessary rights, licenses, approvals and authorizations. This will help mitigate environmental effects associated with any environmental component affected by these projects.

Environmental Component	Description of Effect	Mitigation	Magnitude	Extent	Duration	Frequency	Permanence	Significance of Adverse Effect
Soils	➢ Reduced soil productivity through compaction and topsoil and subsoil mixing	➢ Avoid work during excessively wet site conditions.	L	L	L	L	L	NEG
	➢ Increased soil exposure resulting in erosion or slope instability	➢ Keep site clearing to a minimum to maintain vegetative cover and wind breaks. ➢ Phase work to minimize duration of exposure of disturbed areas at risk. ➢ Install sediment and erosion controls prior to work and maintain until the site has been stabilized. ➢ Where feasible, direct runoff and overland flows away from working areas and areas of exposed or susceptible soils. ➢ Ensure that any discharged fluid is directed to an appropriately sized energy dissipating outlet device to prevent erosion at the point of discharge.	L	L	L	L	L	NEG
Surface Water Quality	➢ Reduced water quality due to increased sediment loads	➢ Avoid work during excessively wet site conditions. ➢ Restore or re-vegetate work site to pre-construction conditions, to extent possible. ➢ Where feasible, direct runoff and overland flows away from working areas and areas of exposed or susceptible soils. ➢ Ensure drilling/discharge fluid does not enter water bodies.	L	L	L	L	L	NEG
	➢ Reduced water quality due to introduction of contaminants	➢ Ensure drilling/discharge fluid does not enter water bodies. ➢ Ensure proper abandonment of unused wells or test holes to prevent groundwater contamination. Abandoned water wells and test holes should be filled with impermeable clay or cement grout. ➢ If project might affect a surface water source that is used for drinking water (i.e. changes to chemical and/or physical parameters (e.g. Total Suspended Solids, Biological Oxygen Demand)) those responsible for the affected drinking water treatment facility (ies) must be informed of these possible changes. ➢ Maintain construction equipment in good working order to prevent leaks and spills of fuels, lubricants, hydraulic fluids, or coolants. ➢ Store, handle and dispose of fuel, wastes and hazardous waste materials in accordance with all relevant municipal, provincial, and federal legislation. ➢ Fuel and/or service mobile construction equipment and store hazardous materials at construction sites at a distance greater than 100m from a water body. ➢ Fuelling and/or servicing of immobile construction equipment within 100m of a water body is to be undertaken in a manner such that any spillage will not enter the water body . ➢ Capture, contain and clean up spills and leaks immediately. ➢ Contractor will maintain spill clean up materials on site (e.g. 25 kg of suitable commercial	L	L	L	L	L	NEG

Environmental Component	Description of Effect	Mitigation	Magnitude	Extent	Duration	Frequency	Permanence	Significance of Adverse Effect
		absorbent, 30 m^2 of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal (CPWCC, 1999)). ➢ Notify appropriate Provincial authorities in the event of any reportable spills of petroleum products or hazardous materials. Ensure emergency contact numbers are available on site .						
Groundwater Quantity	➢ Changes in groundwater flow patterns, groundwater levels in aquifers, yields of wells due to interception of aquifers, and increased withdrawal rates and aquifer depletion.	➢ Ensure that pumping rate does not exceed sustainable yields or yields specified in provincial/territorial permits. ➢ If working under formation pressures (e.g. flowing artesian conditions) it is important to maintain well control at all times. These conditions can be controlled and mitigated by setting/cementing casing set into competent formations and ensuring that the well has appropriate surface fittings.	L	L	L	L	L	NEG
Groundwater Quality	➢ Reduced groundwater quality due to introduction of contaminants	➢ Proposed well site should be properly planned. Well site should be located away from potentially polluting influences and proximal sources of contamination, in an area not prone to flooding events, and with ground sloping away from the well site. ➢ If ground drinking water source(s) might be adversely affected by project activities, well users/owners must be informed of this contamination and measures must be implemented to mitigate risk to human health (i.e. measures to eliminate/reduce predicted changes, treatment, use of alternative sources). ➢ After installation, follow standard chlorination procedures, including flushing well after appropriate contact time. ➢ Ensure refuelling and construction staging areas where contaminants are handled are located off-site where possible, or well away from a water body and from critical wildlife habitat. ➢ Ensure all equipment which comes in contact with water is free of contaminants. ➢ In areas of high concentration of known resources such as oil, gases and salt water aquifers, special permits and consultations may be required to avoid the risk of intersecting such resources. ➢ Ensure that proper drilling depths are targeted and not over drilled. ➢ Municipal and Provincial regulations will be adhered to for the site selection, drilling, testing, design, construction and operation of the well. ➢ Avoid multi aquifer completion. ➢ Mound soil around well head to divert flows away from the well site.	L	L	L	L	L	NEG
Terrestrial Habitat and Species	➢ Disturbance or destruction of vegetation and habitat	➢ Keep site clearing to a minimum to maintain vegetative cover and wind breaks. ➢ Use existing roads and trails for site access. ➢ Salvage and replace the topsoil stripped and disturbed during the project as quickly as possible to allow quick re-vegetation. ➢ Re-vegetate disturbed areas and exposed soils with species that existed prior to construction or suitable native species. ➢ Avoid vegetation clearing during the sensitive breeding and nesting periods until fledglings have left parental territories, to minimize impacts on migratory birds and in compliance with the Migratory Birds Convention Act. ➢ Dispose of cleared vegetation in such a way as to avoid adverse effects upon surface water or fish	L	L	L	L	L	NEG

Environmental Component	Description of Effect	Mitigation	Magnitude	Extent	Duration	Frequency	Permanence	Significance of Adverse Effect
		habitat.						
	➢ Introduction of non-native species, including opportunistic species	➢ Clean all machinery and equipment prior to transport to new construction areas. ➢ Re-vegetate with species that existed prior to construction or suitable natural species.	L	L	L	L	L	NEG
	➢ Disruption to wildlife nesting and rearing	➢ Survey the area for nests or dens prior to clearing, and avoid disturbing any active nests or dens. ➢ If migratory birds or wildlife are found in the project area, avoid construction activities during sensitive nesting/rearing periods.	L	L	L	L	L	NEG
Cultural and Heritage Resources	➢ Loss or disruption to cultural and heritage resources	➢ In the event that any cultural or heritage resources are discovered, construction and decommissioning activities will cease and the appropriate provincial authority notified immediately; construction or decommissioning activities will occur as directed by appropriate provincial authorities.	L	L	L	L	L	NEG

4.7 Accidents and Malfunctions

The likelihood of accidents and malfunctions during water well construction and decommissioning projects that would cause negative environmental effects is minimal, after implementing mitigation. Table 4.4 identifies the potential accidents and malfunctions of each phase of the project.

Table 4.4: Potential Accidents and Malfunctions

Project Phase	Physical Works and Project Activities	Accidents and Malfunctions				
		Spills and Accidental Releases	Formation Fractures	Vehicle Collisions	Equipment misuse or malfunction	Fires
Construction	**Site planning and Selection**					
	Site Access	●		●	●	●
	Vegetation Clearing and Grubbing	●			●	●
	Operation of Hand Machinery/Tools	●			●	●
	Operation of Heavy Equipment, Vehicles	●		●	●	●
	Construction of Well Components	●	●	●	●	●
	Disinfection	●			●	
	Earthworks	●		●	●	●
	Seeding/Planting	●			●	
Operation and Maintenance	**Operation of Hand Machinery/Tools**	●			●	●
	Operation of Heavy Equipment, Vehicles	●		●	●	●
	Operation and Maintenance of Well Components	●		●	●	
	Disinfection	●			●	
Decommissioning	**Operation of Heavy Equipment, Vehicles**	●		●	●	●
	Closure of Well Components	●		●	●	●
	Disinfection	●			●	
	Earthworks	●		●	●	●
	Seeding/Planting	●			●	

4.8 Cumulative Effects

Cumulative effects may result when VECs are affected by interactions between or among multiple projects. It is necessary to consider past, present, and future projects to determine the full extent of potential environmental effects associated with each project activity.

Consideration of the cumulative effects associated with projects covered in this RCSR includes all project activities associated with the agricultural sector. Potential interactions between other

projects and activities outside the land supporting the agricultural sector are also assessed for their potential to result in cumulative effects.

Water well construction and decommissioning projects have the potential to interact with: 1) other well construction or decommissioning projects; 2) operational activities related to the agricultural sector and; 3) projects/activities occurring outside the site boundaries.

Interactions between water well construction and decommissioning projects

Water well construction or decommissioning projects within this RCSR are unlikely to interact with each other. The proper development of water well projects limits the number of wells located in a certain area. Proper planning and siting of water well projects takes into account the location of surrounding wells and the cumulative demand they would place on the associated aquifer. In addition, the environmental effects associated with water well construction and decommissioning projects, as defined by this RSCR, have been found to be negligible, insignificant and limited to the immediate area of the project. Considering these factors, individual water well construction and decommissioning projects are not likely to interact with each other and contribute to significant adverse cumulative effects.

Interactions between water well construction or decommissioning projects, and operational activities related to the agricultural sector

Interactions between water well construction or decommissioning projects, and operational activities related to the agricultural sector must be factored into the consideration of cumulative effects.

Generally, operational activities within the project area have been taking place for extended periods of time, and the immediate environment has been routinely exposed to these activities prior to any water well construction or decommissioning projects. In the case of water wells, operational activities related to the agricultural sector are routinely located near the project site, however, direct contact between the well site and routine operational activities is limited. Since the water drawn from wells is used in an off site location, there is little need for operational activities to be located directly near a water well site.

Further, operational activities are unlikely to interact with water well construction or decommissioning projects within this RCSR. Properly planned, sited, constructed, managed and/or decommissioned wells will help prevent groundwater contamination from operational activities and environmental factors (i.e. soil bacteria, contaminated runoff), and therefore are seen to help avoid risks to the environment and help avoid adverse environmental effects.

The operation of these wells is also not expected to adversely affect water quantity, as these wells will be properly planned and sited, according to local legislation and permitting requirements, as well as aquifer specifics such as recharge rates, annual yields, and existing extraction from the aquifer. Considering project specifics and appropriate site planning and site selection, the wells covered by this RCSR are not expected to have a negative impact on groundwater quantity. Considering the limited interaction of water well construction and decommissioning projects with other operational activities, it can be determined that significant adverse cumulative effects are not likely to occur.

Interactions between water well construction and decommissioning projects, and projects/activities outside site boundaries

The interactions between water well construction and decommissioning projects, and projects/activities outside the site boundaries must also be considered during cumulative effects assessment.

Water well construction and decommissioning projects are located on or adjacent to land that supports the agricultural sector. Effects such as aquifer draw down interference, depletion and changes in ground water flow patterns that may affect others outside the project and surrounding areas are not considered a significant adverse environmental effect after proper site planning and selection, as well as implementation of mitigation measures. By properly constructing or decommissioning a water well to prevent aquifer contamination, aquifer draw down, aquifer depletion, and changes in ground water flow patterns, water well construction and decommissioning projects, within this RCSR are seen to help avoid risks to the environment and help avoid adverse environmental effects. Considering the limited interaction of water well construction and decommissioning projects with activities outside the project boundaries, it is unlikely that significant adverse cumulative environmental effects will occur.

Based on the past five years of projects that have been covered by this RCSR, this report can now predict cumulative effects with more confidence. Since this RCSRs declaration, AAFC has used this report many times, for a variety of projects. Over this period there has been minimal public interest in the projects. Where interest existed, it was general questions, and not related to concerns with potential environmental effects. Projects for which this RCSR applied provided verification that the material in the original document remained valid, as all projects continued to fit the required setting and qualifications of the CS. AAFC feels that the previously described mitigation are still appropriate today, as the projects and environmental settings have not changed. Periodic site visits on these projects have also helped us validate the mitigation measures, minimal adverse environmental effects, and the absence of adverse cumulative effects of the projects covered by this RCSR. Given all the above, the previous cumulative effects assessment of this RCSR remains valid for this re-declaration.

5.0 ROLES AND RESPONSIBILITIES

It should be noted that since the RA is AAFC, the RCSR can be applied, where appropriate, by AAFC until such time as the Agency declares the RCSR not to be a class screening report or the declaration period expires.

The following section discusses, in general terms, the federal, provincial and territorial regulatory requirements and coordination mechanisms for water well construction and decommissioning projects.

5.1 Federal Coordination

This section summarizes the involvement of responsible and federal authorities in this RCSR process.

This RCSR does not exempt a proponent from the requirement to obey all other relevant federal legislation, such as the *Fisheries Act.* This RCSR is not designed to compensate for any other federal requirements. If a project involves any other RAs, the RCSR will not apply.

5.1.1 *Responsible Authorities*

AAFC is the only RA involved in the environmental assessment process of water well construction and decommissioning projects covered by this RCSR. No federal authorizations, permits, or approvals are required for these projects; no other federal departments are expected to be involved in the environmental assessment process. There is potential for other RAs to become involved in the project (e.g. funding); if any other RAs are involved, then the RCSR would not apply.

It will be the responsibility of AAFC to:

- ensure that projects are properly identified as class-applicable;
- ensure that applicable mitigation is implemented;
- place a regular statement on the Registry Internet site describing the extent to which the RCSR has been used, as identified in section 1.5;
- maintain the Registry project file, ensure convenient public access, and respond to information requests in a timely manner; and
- provide annual confirmation of the continuing validity of cumulative effects assessment conditions to the Agency.

5.1.2 *Federal Authorities*

No other FAs have been identified which are likely to require an environmental assessment of the project under Section 5 of the Act or to possess specialist or expert information or knowledge that is necessary to conduct the environmental assessment of the water well construction and decommissioning projects covered by this RCSR. No other federal departments are expected to be involved in the environmental assessment process. Any projects which require an environmental assessment by any other RA will not be covered by this RCSR.

5.2 Provincial/Territorial Coordination

The Act allows the Minister of the Environment to enter into agreements with provincial and territorial governments relating to the environmental assessment of projects where both governments have an interest. These bilateral agreements provide guidelines for the roles and responsibilities of each government in the EA of such projects. Several bilateral agreements have been signed and others are currently under negotiation. FAs and provincial agencies must adhere to the bilateral agreements where they are in place.

In some provinces certain water well construction and decommissioning projects will trigger the provincial environmental assessment legislation but only projects not requiring a provincial/territorial environmental assessment will be covered by this RCSR.

Provincial/territorial regulatory requirements for water well construction and decommissioning projects vary by province and territory. Standard practices or guidelines relating to project siting, construction, operation, and/or decommissioning may exist in conjunction with, or independently of, provincial/territorial regulations. Some projects may require an authorization, permit, approval, or licence from a provincial/territorial government agency or authority. Generally, water well construction and decommissioning projects may require provincial/territorial approval to conduct exploratory drilling, develop new or maintain existing wells, withdraw groundwater, or confirm decommissioning.

5.3 The Proponent

Projects proponents can include AAFC, individual farmers, farmer groups, businesses, incorporations and research groups.

Project proponents are responsible for providing project specific information to AAFC and for ensuring that mitigation measures described in the RCSR are implemented. AAFC is responsible for providing mitigation measures to the proponent. Proponents are responsible for obtaining all relevant licenses, permits, and authorizations and ensuring that the project meets all federal, provincial/territorial, and municipal legislative requirements. All relevant licenses, permits, approvals, or authorizations must be made available to AAFC upon request.

6.0 Procedures for Amending the Replacement Class Screening Report

The RA will notify the Agency in writing of its interest to revise the RCSR as per the terms and conditions of the declaration. It will discuss the proposed revisions with the Agency and affected federal government departments and may invite comment from stakeholders on the proposed changes. For a re-declaration of the RCSR, a public consultation period will be required. The RA will then submit the proposed revisions to the Agency, along with a statement providing a rationale for each revision proposed, as well as a request that the Agency amend or re-declare the RCSR.

6.1 Amendments

The purpose of an amendment is to allow for minor modifications to the RCSR after experience has been gained with its operation. Amendments do not require public consultation and do not allow for changes to the term of application. In general, amendments to the RCSR can be made if the Agency is satisfied that the changes:

- represent editorial changes intended to clarify or improve the document and procedures screening process;
- streamline or modify the planning process; and/or
- do not materially alter either the scope of the projects subject to the RCSR or the factors to be considered in the assessment required for these projects.

6.2 Re-declaration

The purpose of a re-declaration is to allow substantial changes to the RCSR after experience has been gained with its operation. Re-declarations require a public consultation period. A re-

declaration of an RCSR may be undertaken for the remaining balance of the original declaration period or for a new declaration period if the changes:

- extend the application of the RCSR to projects or environmental settings that were not previously included, but are similar or related to projects included in the class definition;
- represent modifications to the scope of the projects subject to the RCSR or the factors to be considered in the assessment required for these projects;
- reflect new or changed regulatory requirements, policies or standards;
- introduce new design standards and mitigation measures;
- modify the federal coordination notification procedures;
- extend the application of the RCSR to RA(s) who are(were) not previously declared users of the report;
- remove projects that are no longer suitable for the class; and/or
- extend the term of application of the RCSR.

6.3 Term of Application

This report will be in effect for five *(5)* years from its date of declaration. Near the end of the RCSR declaration period, and at other times as necessary, AAFC will review content and usage to allow for report updates and the preparation for potential re-declaration.

6.0 List of References

AAFC – PFRA. 2004. Water Well Abandonment and Decommissioning (Online) Available: http://www.agr.gc.ca/pfra/water/wells_e.htm (September 12, 2004)

AAFC – PFRA. 2004. Guide for Sealing Abandoned Water Wells in Manitoba (Online) Available: http://www.agr.gc.ca/pfra/water/abwells_e.htm (September 12, 2004)

Agricultural & Biological Engineering Department, Purdue University. 2001. Water Well Location and Condition on the Farm. (Online) Available: http://www.epa.gov/seahome/well/src/main.htm (September 12, 2004)

Alberta Agriculture, Food and Rural Development, Alberta Environmental Protection and Agriculture and Agri-Food Canada, 2001. Water Wells…that last for generations. (Online) Available: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/wwg404?opendocument (September 12, 2004)

CPWCC (Canadian Pipeline Water Crossing Committee). 1999. Watercourse Crossings - 2nd Edition.

Ministry of Agriculture and Food, Ontario Government. 2004. Water Well Publications. (Online) Available: http://www.gov.on.ca/OMAFRA/english/environment/water/publications.htm#Important (September 12, 2004)

Glossary of Technical Terms

Abandonment
The long term or permanent cessation of an operation and the discontinued service of a physical work.

Agricultural Land
Improved and unimproved land which is used primarily in support of the primary production of crops and livestock, such as cultivated land, forages, pasture (native and non-native), orchards, shelterbelts, and other treed areas, farmsteads and building sites and associated access routes.

Agricultural Sector
The sector of an economy formed around agriculture. This includes sectors that support primary agricultural systems and secondary production systems that contribute to agricultural products, Land that supports the agricultural sector will range, and may include general farm land (e.g. cultivated fields, greenhouse operations, and farm yards) and rural or municipal land occupied by facilities that processes agricultural products (secondary agricultural processing facilities such as grain processing facilities, meat processing facilities, juice extraction facilities, fruit and vegetable packaging facilities). This land could be in urban or industrial areas, however will more often exist is rural settings. This land will have been pre-disturbed. These projects will be small parts of existing facilities or operations

Aquifer
A porous and permeable geological formation which stores, transmits, and yields significant and usable amounts of water to wells and springs.

Artesian Well
A type of well which normally gives a continuous flow, the water being forced upwards by hydrostatic pressure.

Canadian Environmental Assessment Registry (CEAR)
An electronic internet listing of all environmental assessments conducted by all Responsible Authorities under the CEAA. The listing is called the Canadian Environmental Assessment Registry (CEAR) and is available to the public through the Agency's internet site (http://www.ceaa-acee.gc.ca/050/index_e.cfm).

Cumulative Environmental Effects
The effect on the environment which results from effects of a project when combined with those of other past, existing and imminent projects and activities. These may occur over an extended period of time and distance.

Decommissioning
The sealing, dismantling, and/or removal of a physical work where the operation or use has permanently ceased and service has been discontinued; decommissioning is often regulated or carried out in accordance with standards or pre-defined conditions designed to ensure safety and security and to mitigate potential environmental effects.

Environment
The components of the Earth, including

a) land, water, air, including all layers of the atmosphere,
b) all organic and inorganic matter and living organisms, and
c) the interacting natural systems that include components referred to in (a) and (b).

Environmental Effect
a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as defined in the Species at Risk Act,
b) any effect of any change referred to in a) on health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes by aboriginal persons or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and
b) any change to the project that may be caused by the environment.

Environmentally Sensitive Area
A region of the landscape with a higher risk of its environmental components (i.e. soil or water) being impacted. Sensitive ecosystem components could include fragile vegetation, and rare species. Examples of potential impacts are: leaching, erosion, or runoff. Examples of potentially sensitive areas are: eroded knolls, rapidly permeable areas, and depressions.

Farm
Any operation involved in the primary production of agricultural crops or livestock. For the purposes of applying the Act, greenhouse operations and intensive livestock operations are included in the definition of farm.

Federal Authority
Federal authority is a Minister of the Crown, an agency or body accountable in right of Canada. Federal Authorities may provide expert advice to the Responsible Authorities for environmental assessments.

Fish Habitat
Under the federal *Fisheries Act*, "fish habitat" is defined as: spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their "life processes". The *Fisheries Act* also defined "fish" to include:
(*a*) parts of fish,
(*b*) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and
(*c*) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals

Fixed Structure
Means the electrical, heating, fire-prevention, plumbing or security structure of an existing building, but does not include a structure that is intended to produce goods or energy.

Follow-up program
A program for verifying the accuracy of the environmental assessment of a project; and/or determining the effectiveness of any measures implemented to mitigate the potential adverse environmental effects of the project.

Footprint
The area of land occupied by a building or structure at ground level.

Groundwater
Water which is found in the saturated subsurface zone where water completely fills all the soil or rock pores.

Migratory Bird Sanctuary
Areas that are protected under the Migratory Bird Sanctuary Regulations.

Mitigation
Mitigation refers to activities that eliminate, reduce or control the adverse environmental effects of the project, and includes restitution for any damage by replacing, restoring or compensating habitat or any other means.

Modification
An alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion.

Monitoring Well
A well used either to collect water samples for purposes of water quality testing, or to measure groundwater levels and is not normally a producing well.

Physical Work
Human-made structures/equipment/materials set in a fixed location. Physical works do not include constructed items that are portable (e.g. table, tractor).

Piezometer
A solid walled pipe open only at its lower end which measures the head, or water pressure at its lower end and hence the elevation of the water table.

Polluting Substance
A substance that, if added to a water body, is likely to degrade or alter or form part of a process of degradation or alteration of the physical, chemical or biological conditions of the water body to an extent that is detrimental to its use by human beings, animals, fish or plants.

Project
• In relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment, or other undertaking in relation to that physical work; or
• Any proposed physical activity not relating to a physical work that is prescribed in the *CEAA* regulations.

Residual Environmental Effects
Residual Environmental Effects are found when a project still has adverse effects even after mitigation is applied. Thus, residual effects are the effects remaining after mitigation.

Responsible Authority
A federal authority that is required to ensure that an environmental assessment is conducted for a project which has a *CEAA* trigger.

Right-of-Way
With respect to the Exclusion List Regulations, land that is subject to a right-of-way and that is developed for an electrical transmission line, pipeline, road, or other similar linear feature.

Scope of Project or Assessment
Both the scope of the project and assessment need to be delineated in the environmental assessment. Scoping refers to determining the spatial and temporal boundaries i.e., what area is affected and for how long. Scope of the project refers to what activities or works are triggered by *CEAA*. Scope of the assessment refers to the area and duration of environmental effects considered within the assessment.

Sensitive Area (Environmentally)
A region of the landscape with a higher risk of its environmental components (i.e. soil or water) being impacted. Sensitive ecosystem components could include fragile vegetation, and rare species. Examples of potential impacts are: leaching, erosion, or runoff. Examples of potentially sensitive areas are: eroded knolls, rapidly permeable areas, and depressions.

Significant Adverse Environmental Effects
For the environmental assessment, adverse effects are judged as to whether they are likely and significant. Adverse effects occur if the project degrades the quality of the environment. Significance is determined by evaluating severity of impacts based on the duration and frequency, and the area affected by the project, including cumulative effects.

Species at Risk
The *Species at Risk Act* defines Species at Risk as an extirpated, endangered or threatened species or a species of special concern. Extirpated species means a wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild. Endangered species means a wildlife species that is facing imminent extirpation or extinction. Threatened species means a wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction. Species of special concern means a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Water Body
A water body can include a canal, river, lake, creek, ocean, and wetland, up to the high-water mark, but does not include a sewage or waste treatment lagoon or a mine tailings pond.

Water Table
The level separating the static surface of groundwater, or the saturated zone, from a zone where water in the pores of soil or rock is held up by capillary tension and the unsaturated soil-water zone above.

Wetland
A wetland is land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment. Wetlands include bogs, fens, marshes, swamps and shallow waters (usually 2 m deep or less) as defined in *The Canadian Wetland Classification System*. For more clarity, wetlands can sometimes be defined in terms of the presence of wetland vegetation -- i.e., land that has the water table at, near, or above the surface or which is saturated for a long enough period to promote wetland processes that are indicated by the presence of wetland vegetation (e.g., reeds, rushes, cattails, and sedges).

Wildlife Area
An area of public lands, administered by the Minister of the Environment, and described in Schedule I of the Wildlife Area Regulations. Note: these lands are referred to as National Wildlife Areas and involve federal lands.

Valued Ecosystem Component (VEC)
Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern.

List of Acronyms

AAFC	Agriculture and Agri-Food Canada
APF	Agricultural Policy Framework
CEAR	Canadian Environmental Assessment Registry
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EC	Environment Canada
FA	Federal Authority
PFRA	Prairie Farm Rehabilitation Administration
PVC	Polyvinyl Chloride
RA	Responsible Authority
RCSR	Replacement Class Screening Report
SARA	Species at Risk Act
VEC	Valued Ecosystem Component

Appendix 1 Contract Mitigation

1. Proponents are responsible for obtaining and complying with all applicable licenses, permits, approvals, or authorizations and for meeting all legislative requirements.

Part 1- General Mitigation

Site Selection

2. Adhere to Municipal and Provincial regulations for the site selection, drilling, testing, design, construction, and operation of the well.
3. Avoid multi-aquifer completion.
4. Proposed well site should be properly planned. Well site should be located away from potentially polluting influences and proximal sources of contamination, in an area not prone to flooding events, and with ground sloping away from the well site.

Equipment and the Introduction of Contaminants

5. Maintain construction equipment properly to prevent leaks and spills of fuels, lubricants, hydraulic fluids, or coolants.
6. Store, handle and dispose of fuel, wastes and hazardous waste materials properly and in accordance with all relevant municipal, provincial, and federal legislation.
7. Avoid fuelling and/or servicing of mobile construction equipment and storing hazardous materials within 100m of a water body. Fuelling and/or servicing of immobile construction equipment within 100m of a water body is to be undertaken in a manner to ensure spillage will not enter the water body.
8. Ensure that the contractor has spill clean up materials on site (e.g. 25 kg of suitable commercial absorbent, 30 m^2 of 6 mil polyethylene, a shovel and an empty fuel barrel for spill collection and disposal (CPWCC, 1999)). In the event of any reportable petroleum products or hazardous material spills, the spill must be captured, contained and cleaned immediately and appropriate Provincial authorities must be notified. Ensure emergency contact numbers are available on site.
9. Clean all machinery and equipment prior to transport to new construction areas.

Land and Water Protection

10. Use existing roads and trails for site access.
11. Avoid work during excessively wet site conditions.
12. Phase work to minimize duration of exposure of disturbed areas.
13. Keep site clearing to a minimum and maintain vegetative cover and wind breaks.
14. Conserve topsoil by removing, salvaging and stockpiling prior to construction. Topsoil should also be replaced as quickly as possible, to help conserve and allow natural re-vegetation.
15. Install effective short and long-term erosion and sediment controls prior to work and maintain until the site has been stabilized.
16. Divert runoff and overland flow away from working areas and areas of exposed or susceptible soils, where feasible.
17. Restore or re-vegetate all disturbed areas, including riparian areas, to pre-construction conditions, as soon as possible and to the extent possible. All re-vegetation should be done with species that existed prior to construction or suitable native species.

18. If working under formation pressures (e.g. flowing artesian conditions) it is important to maintain well control at all times. These conditions can be mitigated by setting/cementing casing set into competent formations and ensuring that the well has appropriate surface fittings.
19. Ensure proper abandonment of unused wells or test holes to prevent groundwater contamination. Abandoned water wells and test holes should be filled with impermeable clay or cement grout.
20. If project might affect a surface water source that is used for drinking water (i.e. changes to chemical and / or physical parameters (e.g. Total Suspended Solids, Biological Oxygen Demand)) those responsible for the affected drinking water treatment facility (ies) must be informed of these possible changes.
21. If ground drinking water source(s) might be adversely affected by project activities, well users/owners must be informed of this contamination and measures must be implemented to mitigate risk to human health (i.e. measures to eliminate/reduce predicted changes, treatment, use of alternative sources).

Other

22. Minimize disturbance to fish and wildlife by avoiding sensitive periods (eg. spawning, nesting) and areas (i.e. residences, spawning beds).
23. Cease construction and notify the appropriate provincial authority immediately if any cultural or heritage resources are discovered. If this occurs, construction will occur as directed by the appropriate Provincial authority.

Part 2- Additional Mitigation for Water Well Construction and Decommissioning

24. After installation, follow standard chlorination procedures, including flushing well after appropriate contact time.
25. Ensure that any discharged fluid is directed to an appropriately sized energy dissipating outlet device to prevent erosion at the point of discharge
26. Ensure drilling/discharge fluid does not enter water bodies
27. Ensure that pumping rate does not exceed sustainable yields or yields specified in provincial/territorial permits
28. Ensure refuelling and construction staging areas where contaminants are handled are located off-site where possible, or well away from a water body and from critical wildlife habitat.
29. Ensure all equipment which comes in contact with water is free of contaminants
30. Obtain special permits and carry out consultation, as appropriate in areas of high concentration of known resources such as oil, gases and salt water aquifers, to avoid the risk of intersecting such resources.
31. Ensure that proper drilling depths are targeted and not over drilled.
32. Mound soil around the well site to ensure that flows are diverted away from the well head.