
Appendix B
Correspondence



Minutes of Meeting

Grand Bend Wind Farm Ministry of Natural Resources Project Status Meeting

Meeting Date: April 10, 2012

Date Prepared: April 17, 2012

Time: 10:00 am – 12:00 pm (noon)

Location: Neegan Burnside Ltd., Guelph Office

File No.: PIA019991

Those in attendance were:

Jim Beal	MNR
Amy Cameron	MNR
Graham Buck	MNR Guelph District Office
Erin Harkins	MNR Guelph District Office
Sarah Mainguy	North-South Environmental
Gordon Potts	Northland Power Inc.
Carol-Ann Fletcher	Northland Power Inc.
Lyle Parsons	Neegan Burnside Ltd.
Chris Pfohl	Neegan Burnside Ltd.
Tricia Radburn	Neegan Burnside Ltd.
Paul Stubbert	Neegan Burnside Ltd.
Kristy Ramkisson	Neegan Burnside Ltd.

The following items were discussed:

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1. **Project Status, work completed to date, proposed timelines**
 - 1.1 Lyle provided a status of the Project to date following issuance of a FIT Contract by the OPA in 2011. He indicated that some fieldwork was carried out last year; however noted that with ongoing changes to the rules and protocols it is becoming somewhat difficult to keep up to date.
 - 1.2 Jim noted that regarding the Endangered Species Act (ESA), a scientific panel decides which species should be on or off the Species

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at Risk in Ontario (SARO) list. Northland is responsible for addressing any Endangered or Threatened species that get listed during the approval process.

- 1.3 Lyle indicated that if there is a number of species being considered by the scientific panel for this year it would be helpful if this information can be provided to Neegan Burnside. Tricia confirmed that Neegan Burnside has a copy of the species list.
- 1.4 Lyle indicated that the study team is working towards completing the NHA & EIS by end of June 2012 and subsequently will be submitted to MNR. He noted that the second set of Public Information Centres will be held in October 2012. He informed the attendees that the REA application will be submitted to the Ministry of Environment at the end of December 2012 or early 2013.
- 1.5 Tricia provided an outline of the fieldwork completed to date. She indicated that a preliminary layout was completed and stated that there are two transmission line route options and the preferred option will be selected shortly. Tricia indicated that studies are to be completed for both transmission lines.
- 1.6 Amy indicated that she did not have digital copies of the preliminary reports submitted by Neegan Burnside to provide comments. Tricia noted that work is ongoing on the reports and they will be re-submitted at a later date once they are in a more complete state.
- 1.7 Lyle and Gordon both indicated that the northern transmission route is the preferred option for the Project.
- 1.8 Jim noted that there are 48 turbine locations shown on the map provided for this Project; however inquired as to how many turbines are considered as optional and whether any additional turbines were being considered. Gordon indicated that the Project will consist of 48 turbines; however 45 turbines will provide a maximum capacity of 100 MW.
- 1.9 Jim questioned whether further changes to the layout are expected due to noise studies. Lyle indicated that noise studies have been undertaken and the layout is generally considered to be final with the exception of minor "tweaking".
- 1.10 Jim advised that a broad study area should be included in the NHA to allow for flexibility in the layout if required.
- 1.11 Lyle noted that the transmission line will be on a single pole approximately 85 feet high and the intent is to install these poles close to the road side within road allowance. Gordon indicated that it is expensive to bury road cable. He noted that the final design will determine whether directional drilling will be undertaken.
- 1.12 Lyle noted that directional drilling may be anticipated under wetlands. Tricia confirmed that Hay Swamp Provincially Significant Wetland (PSW) is located in the study area. Amy advised that if the wetland

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comes close up to the road, directional drilling should be undertaken under the road or on the opposite side of the road if possible. *In a follow-up email after the meeting it was clarified that directional drilling may be permitting under a PSW. The area below the wetland is considered to be “adjacent” to the wetland. Mitigation such as a frac out plan would be required.

2. MNR Guidance Documents/Ecoregion Criteria Schedules

- 2.1 Tricia asked about the MNR’s draft schedule of Significant Wildlife Habitat (SWH) for Ecoregion 6. She inquired as to whether the document is still “Draft” and if any changes are anticipated to the criteria. Amy advised that Neegan Burnside use the draft version that is posted on the EBR website and indicated that the MNR does not anticipate any significant changes to the criteria. Amy noted that if there are changes, Northland would be obligated to address them but could use the option of conducting pre-construction surveys after the REA submission.
- 2.2 Gordon inquired about surveys required prior to construction and whether the project could be denied after the REA application if that option was used. Amy indicated that the proponent is allowed to build in a SWH. She noted that MNR reviews to make sure the correct study methodologies were used. SWH can be treated as significant and brought forward to the Environmental Impact Study (EIS). She noted that the EIS will address significant habitats and appropriate mitigation measures must be included. For pre-construction surveys, mitigation must be given at the time of the REA application and then only applied if necessary, based on the findings of the pre-construction surveys.

3. Bats

- 3.1 Tricia inquired about the Bat Migratory Stopover Areas. Jim indicated that the criteria for confirming Bat Migratory Stopover Areas are not currently defined in the SWH Technical Guide and therefore in the absence of such criteria, the MNR is unable to evaluate this habitat.
- 3.2 Tricia noted COSEWIC listed 3 bats species as Species of Conservation concern and questioned how these should be addressed. Amy indicated that bat hibernacula and bat colonies should be considered; however there is not enough information presently to determine whether these species are considered Species at Risk. She noted that the Eastern Small-footed Bat is also listed as a candidate species at risk expected to be assessed by COSARRO.
- 3.3 Tricia indicated that there are karst features present along the northern transmission line route but no known sink holes and asked whether the karst should be treated as significant. Noted that it is difficult to survey for bats from the roadside. Both Amy and Graham noted that karst is not necessarily bat habitat. Sinkholes may be bat habitat. Graham noted that he will provide a list of species to be reviewed by COSSARO including bats. Tricia noted that she has a copy of the list already.

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Graham indicated once there is enough information these species will be assessed by COSSARO and will be included in the June 2012 schedule.

4. Species at Risk

4.1 Tricia inquired about information required for the APRD document.

4.2 Graham noted that information will be sent to Tricia providing guidance on the forms required for submission. He noted that the SAR template should be used as a guide when completing the SAR Report. Amy advised that the SAR Report and Information Gathering Form be sent to Graham for review

MNR

4.3 Erin noted that there is a 3 month review period for the SAR report and following this a decision will be made. Indicated that this decision is timed with MOE's decision regarding the REA application.

5. Species-specific survey protocols

5.1 Erin asked whether there were any specific questions relating to ESA and habitat.

5.2 Sara inquired about the Barn Owl protocol and whether they should be looking for pellets.

5.3 Graham indicated that the team should be looking for Barn owl roosting areas such as barns and or hollow trees. He noted that the team should examine pellets in and around built structures. Graham indicated that roadside surveys were done in the past; however this type of survey is not always effective.

5.4 Tricia provided hard copies of a table reproduced listing the protocols followed for each survey. She indicated that the ELC was completed for the project area and is yet to be done for both transmission line routes. Tricia also indicated that aquatic habitat mapping was completed.

5.5 Tricia requested information on Redside Dace. Advised that all in - water works will occur in intermittent drains only. The overhead transmission line will cross other watercourses but there will be no in-water work associated with this. Graham noted that the watercourse crossings would not be considered Redside Dace habitat and thus there is no need for sampling or permits. This will be confirmed upon submission of the Information Gathering Form.

5.6 Tricia indicated that in the spring of 2011, some bird surveys were completed but the SWH criterion was not followed. She noted that bird surveys to be conducted this year will follow the criteria and will be part of the site investigation.

5.7 Graham asked if surveys were completed for Chimney Swift, Common Nighthawk and Whip-poor-will. Sarah noted Whip-poor-will inhabit open areas; however these areas are not found in the study area.

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- 5.8 Graham noted that for the species mentioned above, the field specialists should be looking for turbines located close to buildings that are slated for removal. Lyle indicated that majority of the buildings in the study area are approximately 500 m away. He noted that barns and houses are fairly close to each other. Graham indicated that if there are no buildings slated for removal or modification then there is no need to survey for these species.
- 5.9 Tricia inquired as to whether SAR habitats should be treated as "significant" along the transmission line routes. Tricia noted that it is somewhat difficult to determine the habitat since only roadside surveys can be conducted. Amy asked whether any trees will be removed and/or directional drilling under wetlands will be undertaken. Gordon indicated that some trees may be removed. Graham noted that if habitat is being removed, SAR will be affected as there is the potential for the habitat to exist. Gordon indicated that there is the possibility of installing cable underground and asked whether there would be any implications regarding the permitting.
- 5.10 Amy noted that the NHA process considers Deer and Raptor Wintering Areas. Tricia indicated that these areas exist in the study area. Lyle inquired as to the relation between deer yard and underground lines. Amy indicated that Deer Yards provide shelter or protection for deer from winter conditions. She noted that Deer yards are dominated by coniferous species and if a portion of the trees is taken out ultimately the habitat is removed.
- 5.11 Tricia noted that Blanding's Turtles may be present in the Hay Swamp. She indicated that Chris conducted surveys in and around the swamp and roadside surveys along the transmission line routes. Tricia inquired as to whether the habitat should be considered as generalized. Graham advised that Section 9 of the ESA prohibits killing, harming or harassing Blanding's turtles. He indicated that habitat regulations should be finalized in 2013. Noted that depending on the project's construction date the habitat may or may not have protection; however advised to be aware of Section 9 of the ESA if the turtle is identified. Graham noted that detailed surveys are not required if the habitat does not have protection. Chris indicated confirmation is needed if Blanding's turtles have been using the area and thus he will re-visit the area in April when there is a warm spell.
- 5.12 Tricia noted that West Virginia White is found in deciduous forest. Amy advised that if a portion of the habitat is being removed recommended that a survey be conducted. She indicated that the survey window for West Virginia White is short. Amy indicated that if no habitat is being removed, the habitat should be considered as generalized and the mitigation measure should read "no woodland habitat will be removed". Graham noted that Garlic Mustard (an invasive plant species) is a problem for West Virginia White. Amy inquired as to how many acres of woodland and or branches will be removed. Gordon indicated 10 m

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- from the road shoulder and ditch.
- 5.13 Sarah asked about bird breeding areas along the transmission line routes and indicated that grassland habitat may exist along these routes. Graham advised that with the introduction of a predator-perch (hydro pole), the habitat for grassland birds will shrink as raptors feed from along the roadside. This potential loss of habitat should be considered.
- 5.14 Chris indicated that on March 30, 2012 surveys for Salamanders were undertaken by visual inspection of vernal pools during the day to look for egg masses. He noted that no egg masses were observed. Chris indicated that he will be conducting another survey during the week of April 18 to April 30, 2012.
- 5.15 Chris asked about the next suitable time to survey for snakes in the study area. Graham noted three days with temperatures over 20°C.
- 5.16 Tricia inquired about deer migration corridors areas. Amy noted that the impacts will be negligible because the road already exists which poses a constraint to movement and the impacts associated with a transmission line in the road right-of-way would be negligible.
- 5.17 Sarah asked whether a permit was required for playback surveys for Least Bittern. Graham advised that a permit is not required for this survey.
- 5.18 Tricia indicated that a ESA permit application was submitted for surveys for rusty-patched bumblebee. There was a discussion regarding the need to complete these surveys. No meadow areas will be disturbed with the exception of narrow roadside and field edges. Larger meadow areas cannot be surveyed due to site restrictions. Graham suggested submission of the Information Gathering Form and ELC mapping to map a determination.
- 5.19 Graham noted that Chimney Swift surveys if necessary should not be conducted every week but using methodology; one hour before dusk and one hour after sunset. He noted that the Information Gathering Report should also include Eastern Hog-nosed snake which is listed as threatened on the SARO list. Graham indicated that this species was observed in close proximity to Pinery Provincial Park and there has been one known population in the Huron County. He noted that this species is difficult to detect; however can be surveyed in the spring for potential wintering habitat.
- 5.20 Amy noted that if hibernaculum is identified a 30 m buffer protection is required and mitigation measures should be provided. Amy indicated that if the Eastern Hog-nosed snake is identified, Neegan Burnside should engage in discussions with Graham to discuss impacts and mitigation measures.
- 5.21 Tricia indicated that regarding Red-headed Woodpeckers, if not removing woodland habitat or habitat is not located within 120 m of

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- project location asked whether the habitat should be considered as generalized habitat. Amy confirmed that the habitat should be considered as generalized and treated as significant even if within 120 m of project location.
- 5.22 Amy indicated that there has been a known occurrence of Bald eagles in the Grand Bend area. Graham advised that Neegan Burnside should view Bird Studies Canada website where Bald eagles are tracked and recorded. Erin indicated that she would send the web address.
- 5.23 Tricia questioned how to address Raptor nesting areas in locations where only a portion of a forest is accessible and large areas cannot be searched for nests due to site access restrictions. Amy advised that if no infrastructure is proposed at or within 120 m, the habitat should be considered as generalized.
- 5.24 Tricia noted that the public expressed concern regarding wildlife mortality. Amy advised that pre- and post-construction requirements should include bird and bat monitoring at the wind site and follow Ontario's Bird and Bat guidelines for Wind Power. She noted that the NHA process focuses on habitat, not individual animals.
- 5.25 Graham asked if an analysis of petroleum wells were completed and inquired as to whether Neegan Burnside have a copy of the petroleum guidance documents. He advised that the analysis involves a 2 step process; indicated that the MNR Oil & Gas Resources library provides information on petroleum resources within 75 m of the project location. He also noted that the Guelph District Office surveys land that the MNR is not aware of for petroleum facilities. Jim indicated that if petroleum resources exist within 75 m of project location, the MNR intends to review the results as part of the NHA report but noted that Health & Safety issues will be dealt with by the proponent.
- 5.26 Graham noted that regarding Crown land, the information submitted by Neegan Burnside will be forwarded to the MNR's Crown Lands Technician for review. He indicated that crown land issues may relate to water crossings. Neegan will be informed of any issues or the need for further information. Chris indicated that temporary and permanent culvert crossings are being considered.
- 5.27 Lyle asked whether the MNR had experiences where turbines had to be relocated and/or removed as a result of MNR concerns. Amy advised that the regulation allows the proponent to build in a Significant Wildlife Habitat and Significant woodland provided there are mitigation measures; however noted that renewable energy projects are not permitted within Provincially Significant Wetlands. She indicated that she has not seen situations where a wind farm cannot be constructed due to MNR concerns.
- 5.28 Graham also noted that he has never seen a situation where a turbine had to be dropped as a result of a SAR issue. He also made reference to Section 9 Prohibition on killing of the Endangered Species Act if

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- exceeding thresholds. Noted that turbines would have to be shut down if exceeding mortality thresholds. Also made reference to Section 10 of the ESA which speaks to Prohibition on damage to habitat.
- 5.29 Lyle inquired as to whether there are any updates regarding bird and bat mortality associated with Wolfe Island Wind Farm. Amy indicated that the Wolfe Island Wind Farm mortality rates will be considered under different guidelines than current wind energy projects. Graham noted that there are other wind energy projects such as Kingsbridge I and near the Goderich area that have reported high mortality rates; however the figures are not known to date.
- 5.30 Tricia inquired about mitigation measures for Bobolink. Erin indicated that possible measures include avoidance and or habitat compensation. Gordon indicated that work will be done along the roadside and asked that if a portion of bobolink habitat is removed would it be possible to offset habitat elsewhere. Graham noted that Northland Power can restore a piece of land or work with NGO's or the Conservation Authorities to assist with this work. He indicated that habitat creation is good but not required under the regulation.
- 5.31 Sarah noted that Bobolinks primary nesting habitat is active hayfields. Tricia indicated that Bobolinks have been observed during bird studies completed last year. She noted that additional surveys will be done this year again and to the locations where they were observed last year. Graham advised that Neegan Burnside look for potential habitat and survey for Bobolinks in that location. He suggested a brief consultation with the landowners asking whether there are any hayfields in the area. There was a discussion regarding the fact that most farms have a crop rotation and hay fields may be present one year and not the next. Graham suggested doing surveys in one year rather than over several years as habitat may change.
- 5.32 Graham asked whether culverts were being replaced or added as Barn Swallows usually nest in culverts. Chris indicated that there will be no replacement of large box culverts; however approximately 4-5 new small size CSP culverts will be installed at associated water crossings.
- 5.33 Following this discussion, Lyle asked if there were any additional comments or issues.
- 5.34 Amy indicated that Neegan Burnside continue working on the NHA and provide reports to the MNR in Microsoft word documents so as to ensure changes are tracked. NB
- 5.35 Lyle thanked everyone for attending and the meeting was adjourned.

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise within seven days. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Action by

Minutes prepared by:

Neegan Burnside Ltd.

Kristy Ramkissoon
Environmental Technologist

Distribution:

Carol-Ann Fletcher, Northland
Lyle Parsons, Neegan Burnside
Chris Pfohl, Neegan Burnside
Sarah Mainguy, North-South Environmental
Jim Beal, MNR
Amy Cameron, MNR
Graham Buck, MNR
Erin Harkin, MNR



RE: Information Requirements for Waterbodies and Assessment Reports based on REA Guidelines - PIA019991
Abernethy, Scott (ENE)
to:
Chris Pfohl
05/24/2012 08:29 AM
Cc:
"Tricia Radburn", "Lyle Parsons"
Show Details

History: This message has been replied to.

2 Attachments



image001.gif image002.gif

This level of detail is acceptable REA information for the project described below.

Scott Abernethy
Surface Water Group Leader, MOE Southwestern Region
733 Exeter Road, London, Ontario, N6E 1L3
Phone: (519) 873-4779

From: Chris Pfohl [<mailto:Chris.Pfohl@rjburnside.com>]
Sent: May 23, 2012 3:41 PM
To: Abernethy, Scott (ENE)
Cc: Tricia Radburn; Lyle Parsons
Subject: RE: Information Requirements for Waterbodies and Assessment Reports based on REA Guidelines - PIA019991

Hi Scott,

Neegan Burnside is currently working on a wind power project north east of Grand Bend and are looking for clarification from MOE on the information requirements based on the REA Guidelines for Waterbodies and Assessment reports.

We have completed detailed assessments of any watercourses that will require a culvert for access roads (or other infrastructure) and includes the information required under the REA Guidelines for the Waterbodies and Assessment reports.

For watercourses that are within the 120m of a "project location" that will not have potential to be impacted from construction or can be protected using mitigation measures (i.e. sediment and erosion control, no in-water works, avoidance), we have completed a records review that includes detailed information provided by the ABCA Drainage Mapping, MNR and 2010 ortho imagery collected by MNR (Southwestern Ontario Orthoimagery Project - SWOOP 2010) to confirm the location of the watercourse (or waterbody).

Based on the proposed layout, numerous drains are within the 120m project location although will not be impacted by construction or in-water works. The need for detailed information on these low sensitivity

watercourses seems excessive if there is no potential for impact.

We agree that a general description is warranted due to it's proximity to the project although access to reaches of these drains where they encroach on the 120m boundary is very time consuming (due to distances off the main roads).

This has been our approach to date, please clarify if your comfortable with the level of detail and it complies with the information requirements for the Waterbodies and Assessment Report under the REA Information Guidelines.

Thanks for your time Scott, it is greatly appreciated.

regards,

Chris

NEEGAN BURNSIDE

Christopher Pfohl, C.E.T.
Aquatic Resources Specialist

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Thank you.

From: "Abernethy, Scott (ENE)" <Scott.Abernethy@ontario.ca>
To: "Chris Pfohl" <Chris.Pfohl@rjburnside.com>
Cc: "Harman, Bruce (ENE)" <Bruce.Harman@ontario.ca>
Date: 05/18/2012 11:06 AM
Subject: RE: Information Requirements for Waterbodies and Assessment Reports based on REA Guidelines

If a waterbody is at the edge of the 120m and the potential for impact can be shown to be minimal then I would suggest a scaled-back or more cursory (desktop?) investigation be done compared to the detailed investigation required for closer waterbodies. If you would like to suggest an outline for a scaled-back assessment I could give you some feedback about its acceptability.

Scott Abernethy
Surface Water Group Leader, MOE Southwestern Region
733 Exeter Road, London, Ontario, N6E 1L3
Phone: (519) 873-4779

From: Chris Pfohl [<mailto:Chris.Pfohl@rjburnside.com>]
Sent: May 16, 2012 1:51 PM
To: Abernethy, Scott (ENE)
Cc: Harman, Bruce (ENE)
Subject: Information Requirements for Waterbodies and Assessment Reports based on REA Guidelines

Hi Scott,

As discussed with Bruce, I would like to discuss the information requirements regarding waterbodies and site investigation based on the REA Technical Guidelines. I need to determine the requirement to do a site investigation on every waterbody within 120m of the "project location". For waterbodies that are on the edge of the 120m boundary that will not be impacted or have the potential to be impacted, is there still a need to do a physical site investigation even though no components of the project will have an impact on that particular waterbody?

We have a site that has numerous small drains that are similar in size and condition that are setback from main access points and the requirement to look at every watercourse could be time consuming and costly.

Just looking for clarification on the Technical Guidelines and referring to a wind power project in the Grand Bend area.

thanks and regards,

Chris



Christopher Pfohl, C.E.T.
Aquatic Resource Specialist

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Thank you.

Appendix C
Records Review Results

ABCA Fish Collection Data

Site	FirstOfUTM	FirstOfU_1	FirstOfwtr	Date_	Method	Fish_Count	Fish_speci	FMA	Scientific
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	common shiner	Abundant	Luxilus cornutus
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	creek chub	Many	Semotilus atromaculatus
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	hornyhead chub	Many	Nocomis biguttatus
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	rainbow darter	Many	Etheostoma caeruleum
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	striped shiner	Abundant	Luxilus chrysocephalus
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	0	white sucker	Many	Catostomus commersoni
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	1	longear sunfish		Lepomis megalotis
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	1	smallmouth bass		Micropterus dolomieu
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	1	stonecat		Noturus flavus
10003-AB	461866.000000000000	4800451.000000000000	Ausable River	8/28/2003	Backpack Electrofishing	2	rock bass		Ambloplites rupestris
387-AB	462794.000000000000	4807588.000000000000	Mitchell Drainage Works	6/1/2003	Observation	0	brook trout		Salvelinus fontinalis
4045-UK	462216.000000000000	4807236.000000000000	Dunn Drain	9/16/2005	Backpack Electrofishing	2	creek chub		Semotilus atromaculatus
4045-UK	462216.000000000000	4807236.000000000000	Dunn Drain	9/16/2005	Backpack Electrofishing	2	white sucker		Catostomus commersoni
4045-UK	462216.000000000000	4807236.000000000000	Dunn Drain	9/16/2005	Backpack Electrofishing	4	brook stickleback		Culaea inconstans
4045-UK	462216.000000000000	4807236.000000000000	Dunn Drain	9/16/2005	Backpack Electrofishing	6	brook trout		Salvelinus fontinalis
4045-UK	462216.000000000000	4807236.000000000000	Dunn Drain	9/16/2005	Backpack Electrofishing	16	blacknose dace		Rhinichthys atratulus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	1	fathead minnow		Pimephales promelas
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	2	bluntnose minnow		Pimephales notatus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	2	iowa darter		Etheostoma exile
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	3	smallmouth bass		Micropterus dolomieu
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	4	stonecat		Noturus flavus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	5	blacknose dace		Rhinichthys atratulus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	5	northern hog sucker		Hypentelium nigricans
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	5	shiner sp.		Notropis sp.
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	6	johnny darter		Etheostoma nigrum
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	6	striped shiner		Luxilus chrysocephalus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	57	rock bass		Ambloplites rupestris
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	60	white sucker		Catostomus commersoni
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	70	creek chub		Semotilus atromaculatus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	74	common shiner		Luxilus cornutus
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	89	rainbow darter		Etheostoma caeruleum
4048-UK	462808.000000000000	4800733.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	104	hornyhead chub		Nocomis biguttatus
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	1	smallmouth bass		Micropterus dolomieu
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	2	rock bass		Ambloplites rupestris
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	6	common shiner		Luxilus cornutus
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	6	hornyhead chub		Nocomis biguttatus
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	6	northern hog sucker		Hypentelium nigricans
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	19	creek chub		Semotilus atromaculatus
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	56	rainbow darter		Etheostoma caeruleum
4050-UK	460610.000000000000	4800715.000000000000	Ausable River	6/10/2005	Backpack Electrofishing	137	white sucker		Catostomus commersoni
4051-UK	460728.000000000000	4800481.000000000000	Ausable River	10/5/2005	Backpack Electrofishing	1	common carp		Cyprinus carpio
4051-UK	460728.000000000000	4800481.000000000000	Ausable River	10/5/2005	Backpack Electrofishing	1	creek chub		Semotilus atromaculatus
4051-UK	460728.000000000000	4800481.000000000000	Ausable River	10/5/2005	Backpack Electrofishing	1	striped shiner		Luxilus chrysocephalus
4051-UK	460728.000000000000	4800481.000000000000	Ausable River	10/5/2005	Backpack Electrofishing	2	river chub		Nocomis micropogon
4051-UK	460728.000000000000	4800481.000000000000	Ausable River	10/5/2005	Backpack Electrofishing	3	darter sp.		Etheostoma sp.

ABCA Fish Collection Data

Site	FirstOfUTM	FirstOfU_1	FirstOfwtr	Date_	Method	Fish_Count	Fish_speci	FMA	Scientific
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	4	bluntnose minnow		Pimephales notatus
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	4	shiner sp.		Notropis sp.
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	5	white sucker		Catostomus commersoni
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	6	stonecat		Noturus flavus
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	10	common shiner		Luxilus cornutus
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	10	iowa darter		Etheostoma exile
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	12	northern hog sucker		Hypentelium nigricans
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	12	rock bass		Ambloplites rupestris
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	39	greenside darter		Etheostoma blennioides
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	45	central stoneroller		Campostoma anomalum
4051-UK	460728.00000000000	4800481.00000000000	Ausable River	10/5/2005	Backpack Electrofishing	63	rainbow darter		Etheostoma caeruleum
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	1	bluntnose minnow		Pimephales notatus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	1	Chinook salmon		Oncorhynchus tshawytscha
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	1	hornyhead chub		Nocomis biguttatus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	3	rock bass		Ambloplites rupestris
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	4	central stoneroller		Campostoma anomalum
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	5	blacknose dace		Rhinichthys atratulus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	5	stonecat		Noturus flavus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	5	white sucker		Catostomus commersoni
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	24	greenside darter		Etheostoma blennioides
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	24	river chub		Nocomis micropogon
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	28	common shiner		Luxilus cornutus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	62	creek chub		Semotilus atromaculatus
4052-UK	458738.00000000000	4801154.00000000000	Ausable River	6/29/2004	Backpack Electrofishing	73	rainbow darter		Etheostoma caeruleum
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	6/28/2005	Backpack Electrofishing	1	northern pike		Esox lucius
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	6/28/2005	Backpack Electrofishing	2	rainbow darter		Etheostoma caeruleum
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	6/28/2005	Backpack Electrofishing	5	rock bass		Ambloplites rupestris
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	6/28/2005	Backpack Electrofishing	5	white sucker		Catostomus commersoni
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	8/25/2009	Backpack Electrofishing	3	johnny darter		Etheostoma nigrum
4053-UK	459596.60702900000	4800898.62635000000	Ausable River	8/25/2009	Backpack Electrofishing	5	rainbow darter		Etheostoma caeruleum
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	1	creek chub		Semotilus atromaculatus
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	1	largemouth bass		Micropterus salmoides
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	1	white crappie		Pomoxis annularis
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	2	johnny darter		Etheostoma nigrum
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	4	common carp		Cyprinus carpio
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	5	longear sunfish		Lepomis megalotis
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	5	pumpkinseed		Lepomis gibbosus
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	6	blackside darter		Percina maculata
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	10	greenside darter		Etheostoma blennioides
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	13	smallmouth bass		Micropterus dolomieu
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	19	rock bass		Ambloplites rupestris
4054-UK	458694.00000000000	4801067.00000000000	Ausable River	10/3/2005	Backpack Electrofishing	26	rainbow darter		Etheostoma caeruleum
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	1	golden shiner		Notemigonus crysoleucas
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	1	smallmouth bass		Micropterus dolomieu
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	2	johnny darter		Etheostoma nigrum

ABCA Fish Collection Data

Site	FirstOfUTM	FirstOfU_1	FirstOfwtr	Date_	Method	Fish_Count	Fish_speci	FMA	Scientific
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	2	least darter		Etheostoma microperca
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	3	striped shiner		Luxilus chrysocephalus
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	6	bluntnose minnow		Pimephales notatus
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	9	pumpkinseed		Lepomis gibbosus
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	9	rock bass		Ambloplites rupestris
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	11	largemouth bass		Micropterus salmoides
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	11	longear sunfish		Lepomis megalotis
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	17	white sucker		Catostomus commersoni
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	24	yellow perch		Perca flavescens
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	32	white crappie		Pomoxis annularis
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	35	yellow bullhead		Ameiurus natalis
4055-UK	463161.00000000000	4800718.00000000000	Ausable River	5/9/2005	Seine - wading	118	common shiner		Luxilus cornutus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	1	blackside darter		Percina maculata
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	1	bluntnose minnow		Pimephales notatus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	1	longear sunfish		Lepomis megalotis
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	1	mimic shiner		Notropis volucellus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	1	yellow bullhead		Ameiurus natalis
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	2	black bullhead		Ameiurus melas
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	2	common shiner		Luxilus cornutus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	2	white sucker		Catostomus commersoni
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	3	black crappie		Pomoxis nigromaculatus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	3	redfin shiner		Lythrurus umbratilis
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	4	bluegill		Lepomis macrochirus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	4	johnny darter		Etheostoma nigrum
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	8	pumpkinseed		Lepomis gibbosus
423-AB	456087.00000000000	4800440.00000000000	Ausable River	8/29/2002	Backpack Electrofishing	10	spotfin shiner		Cyprinella spiloptera
498-AB	463454.00000000000	4807685.00000000000	Mitchell Drainage Works	7/1/2003	Observation	0	brook trout		Salvelinus fontinalis
506-AB	465134.00000000000	4809603.00000000000	Shephard Creek Drainage Works	10/31/2001	Backpack Electrofishing	0	blacknose dace	Many	Rhinichthys atratulus
506-AB	465134.00000000000	4809603.00000000000	Shephard Creek Drainage Works	10/31/2001	Backpack Electrofishing	0	bluntnose minnow	Few	Pimephales notatus
506-AB	465134.00000000000	4809603.00000000000	Shephard Creek Drainage Works	10/31/2001	Backpack Electrofishing	0	brook stickleback	Few	Culaea inconstans
506-AB	465134.00000000000	4809603.00000000000	Shephard Creek Drainage Works	10/31/2001	Backpack Electrofishing	0	johnny darter	Few	Etheostoma nigrum
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	1	common carp		Cyprinus carpio
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	2	blackside darter		Percina maculata
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	3	bluntnose minnow		Pimephales notatus
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	3	fathead minnow		Pimephales promelas
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	4	rock bass		Ambloplites rupestris
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	5	white sucker		Catostomus commersoni
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	7	brook stickleback		Culaea inconstans
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	11	northern redbelly dace		Phoxinus eos
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	13	johnny darter		Etheostoma nigrum
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	15	common shiner		Luxilus cornutus
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	44	creek chub		Semotilus atromaculatus
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	52	greenside darter		Etheostoma blennioides
775-AB	455355.00000000000	4806527.00000000000	Black Creek Drain, aka Black Creek	8/29/2002	Backpack Electrofishing	192	blacknose dace		Rhinichthys atratulus
AUSR-12-04	458419.00000000000	4801232.00000000000	Ausable River	7/15/2004	Backpack Electrofishing	1	bluegill		Lepomis macrochirus

ABCA Fish Collection Data

Site	FirstOfUTM	FirstOfU_1	FirstOfwtr	Date_	Method	Fish_Count	Fish_speci	FMA	Scientific
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	1	common shiner		Luxilus cornutus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	1	mimic shiner		Notropis volucellus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	1	smallmouth bass		Micropterus dolomieu
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	1	stonecat		Noturus flavus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	2	brown bullhead		Ameiurus nebulosus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	5	hornyhead chub		Nocomis biguttatus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	6	pumpkinseed		Lepomis gibbosus
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	7	blackside darter		Percina maculata
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	7	northern pike		Esox lucius
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	8	white sucker		Catostomus commersoni
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	9	rainbow darter		Etheostoma caeruleum
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	10	longear sunfish		Lepomis megalotis
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	12	rock bass		Ambloplites rupestris
AUSR-12-04	458419.0000000000	4801232.0000000000	Ausable River	7/15/2004	Backpack Electrofishing	13	greenside darter		Etheostoma blennioides
DD01	462289.8700000000	4807102.1100000000	Dunn Drain	6/18/2010	Backpack Electrofishing	1	brook trout		Salvelinus fontinalis
DD01	462289.8700000000	4807102.1100000000	Dunn Drain	6/18/2010	Backpack Electrofishing	1	creek chub		Semotilus atromaculatus
DD01	462289.8700000000	4807102.1100000000	Dunn Drain	6/18/2010	Backpack Electrofishing	2	brook stickleback		Culaea inconstans
DD01	462289.8700000000	4807102.1100000000	Dunn Drain	6/18/2010	Backpack Electrofishing	34	blacknose dace		Rhinichthys atratulus
DD02	462245.5900000000	4807230.4300000000	Dunn Drain	6/16/2010	Backpack Electrofishing	7	brook stickleback		Culaea inconstans
DD02	462245.5900000000	4807230.4300000000	Dunn Drain	6/16/2010	Backpack Electrofishing	11	blacknose dace		Rhinichthys atratulus
DD02	462245.5900000000	4807230.4300000000	Dunn Drain	6/16/2010	Backpack Electrofishing	16	brook trout		Salvelinus fontinalis
DD03	462065.0400000000	4807203.1100000000	Dunn Drain	6/17/2010	Backpack Electrofishing	1	creek chub		Semotilus atromaculatus
DD03	462065.0400000000	4807203.1100000000	Dunn Drain	6/17/2010	Backpack Electrofishing	7	brook trout		Salvelinus fontinalis
DD03	462065.0400000000	4807203.1100000000	Dunn Drain	6/17/2010	Backpack Electrofishing	13	blacknose dace		Rhinichthys atratulus
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	1	fathead minnow		Pimephales promelas
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	1	rainbow trout		Oncorhynchus mykiss
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	2	creek chub		Semotilus atromaculatus
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	4	bluntnose minnow		Pimephales notatus
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	5	brook trout		Salvelinus fontinalis
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	6	johnny darter		Etheostoma nigrum
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	12	blacknose dace		Rhinichthys atratulus
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	20	white sucker		Catostomus commersoni
DD04	462059.8500000000	4807241.1600000000	Geiger Drain	6/17/2010	Backpack Electrofishing	25	brook stickleback		Culaea inconstans
GUL-19	441821.5400000000	4798894.1000000000	Unknown Hay H	6/14/2011	Backpack Electrofishing	11	white sucker		Catostomus commersoni
GUL-19	441821.5400000000	4798894.1000000000	Unknown Hay H	6/14/2011	Backpack Electrofishing	26	creek chub		Semotilus atromaculatus
GUL-19	441821.5400000000	4798894.1000000000	Unknown Hay H	6/14/2011	Backpack Electrofishing	35	blacknose dace		Rhinichthys atratulus
HABLA1	461996.5500000000	4807199.6500000000	Black Creek	6/18/2010	Observation	0	brook trout		Salvelinus fontinalis
HABLA1	461996.5500000000	4807199.6500000000	Black Creek	6/18/2010	Observation	0	rainbow trout		Oncorhynchus mykiss
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	5	brook stickleback		Culaea inconstans
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	7	rainbow trout		Oncorhynchus mykiss
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	15	Minnow family		Cyprinidae
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	24	bluntnose minnow		Pimephales notatus
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	32	white sucker		Catostomus commersoni
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	51	creek chub		Semotilus atromaculatus
HL-1-06	459275.0900000000	4807608.9900000000	Black Creek	7/12/2006	Backpack Electrofishing	59	johnny darter		Etheostoma nigrum

ABCA Fish Collection Data

Site	FirstOfUTM	FirstOfU_1	FirstOfwtr	Date_	Method	Fish_Count	Fish_speci	FMA	Scientific
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	7/12/2006	Backpack Electrofishing	123	blacknose dace		Rhinichthys atratulus
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	1	Minnow family		Cyprinidae
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	2	brook stickleback		Culaea inconstans
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	2	rainbow trout		Oncorhynchus mykiss
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	2	white sucker		Catostomus commersoni
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	16	bluntnose minnow		Pimephales notatus
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	22	creek chub		Semotilus atromaculatus
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	28	johnny darter		Etheostoma nigrum
HL-1-06	459275.09000000000	4807608.99000000000	Black Creek	11/2/2006	Backpack Electrofishing	77	blacknose dace		Rhinichthys atratulus
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	1	rainbow trout		Oncorhynchus mykiss
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	3	northern redbelly dace		Phoxinus eos
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	5	johnny darter		Etheostoma nigrum
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	17	blacknose dace		Rhinichthys atratulus
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	24	brook trout		Salvelinus fontinalis
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	36	brook stickleback		Culaea inconstans
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	46	creek chub		Semotilus atromaculatus
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	7/12/2006	Backpack Electrofishing	55	white sucker		Catostomus commersoni
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	7	brook trout		Salvelinus fontinalis
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	8	bluntnose minnow		Pimephales notatus
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	10	brook stickleback		Culaea inconstans
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	14	johnny darter		Etheostoma nigrum
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	35	white sucker		Catostomus commersoni
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	49	blacknose dace		Rhinichthys atratulus
HL-2-06	459197.91000000000	4807617.56000000000	Black Creek	10/31/2006	Backpack Electrofishing	50	creek chub		Semotilus atromaculatus

Appendix D

**ABCA South Gullies Watershed Report
Card**



South Gullies Watershed Report Card

Grades:

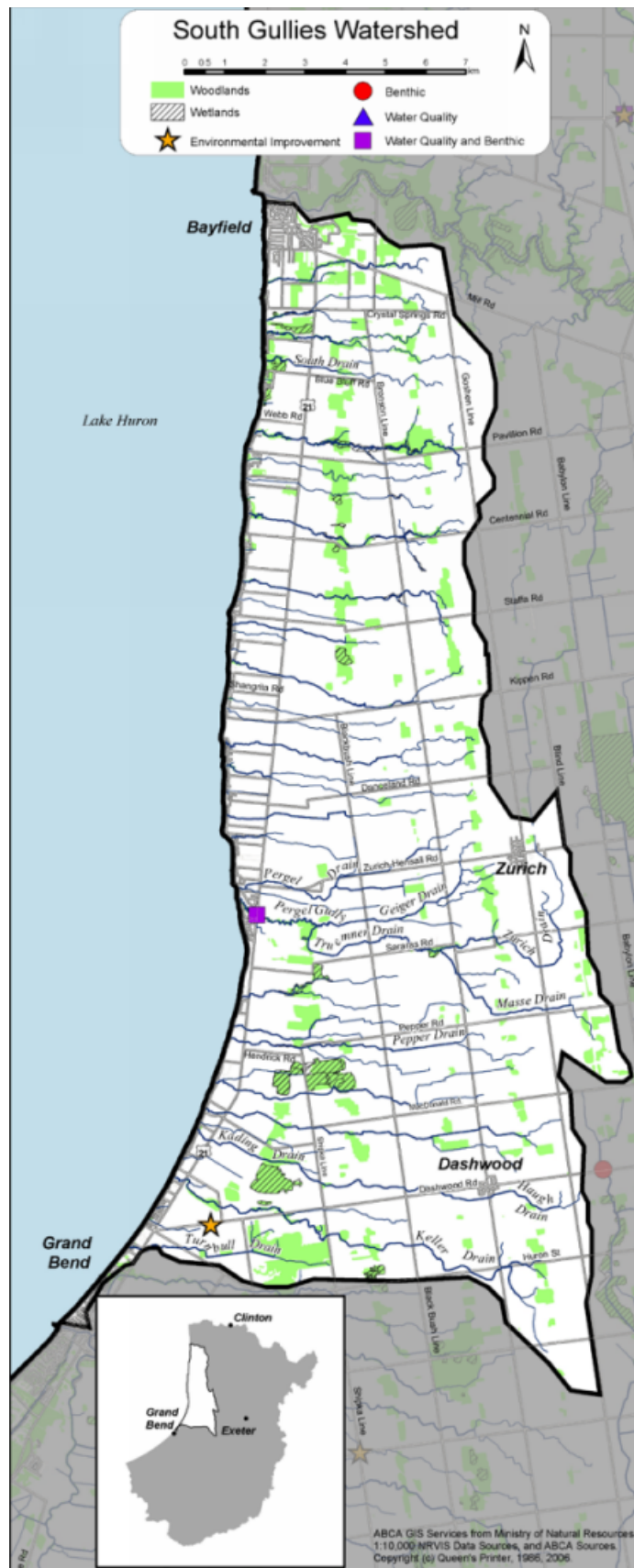
Forest Conditions

D

Surface Water Quality

C

This report card summarizes water quality and forestry information for the South Gullies watershed (the highlighted area on the map at right). This map also shows water quality stations and example environmental improvement locations. For consistency across watersheds, Conservation Ontario has recommended the use of specific water quality and forestry indicators that are described in the following tables. The summary is intended to provide landowners, groups, municipalities and agencies with information to protect, enhance and improve natural features of the watershed. The ongoing monitoring will be reported on a five-year cycle which will help local people manage their natural features. This report card is part of a larger report entitled **The Ausable Bayfield Conservation Authority Watershed Report Card** available at: www.abca.on.ca. Further information, including methodology, comparisons to the other 15 Ausable Bayfield watersheds and references are also found in the report.



Priority Strategy for South Gullies Watershed

Improve:

Develop an assessment of shoreline tributary contaminant loading and erosion potential.



South Gullies Watershed Features



Area: 201 km² **Municipalities:** Bluewater, Lambton Shores, South Huron

Geology 56% Bevelled Till Plains; 27% Till Moraines; 13% Sand Plains; 4% Beaches and Shorecliffs (GIS derived using physiographic maps) (Chapman and Putnam 1984)

Soils 60% Clay Loam; 27% Sandy Loam; 7% Loam; 6% Bottomland (County Soils Maps 1951-1991)

Land Use 85% agriculture; 10% woodlot; 3% urban; 2% other (OMAFRA 1983)

Streamside Cover 22% of the 15 metre area on both sides of open streams is vegetated (OMNR 1986, ABCA 1999)

Wetlands Existing: 1% (OMNR 2003, ABCA 2004); Potential: 13% (ABCA 2005)

Natural Areas Bayfield South, Dashwood Area Earth Science, St. Joseph Till (Area of Natural and Scientific Interest); Datars-Miller Swamp, Keller Swamp (Locally Significant Wetland); Hay Environmentally Significant Areas 6 to 9; Stanley Environmentally Significant Areas 1 to 3; Stanley Environmentally Significant Area 8; Zurich Conservation Area

Groundwater Both shallow (Former Lake Warren Shoreline Aquifer and the Wyoming Moraine Aquifer) and bedrock aquifers are found in this watershed. The bedrock aquifer is the most common source of drinking water and is part of a large aquifer system in southwestern Ontario. The shallow aquifers are possibly a rare source of drinking water for dug or bored wells in the area and are most likely a minor source of the flow for the small streams and gullies that drain into Lake Huron. In this area, only the bedrock aquifer has been sampled and nitrate, chloride concentrations are well below provincial drinking water standards, while levels of fluoride are naturally elevated. A thick sequence of mostly fine-grained glacial sediment separates the small streams and gullies from the bedrock aquifer in this area.

Fishes Fish community dominated by warm water baitfish

Species at Risk

(As determined by the Committee on the Status of Endangered Wildlife in Canada)

(SOURCE: Natural Heritage Information Centre, 2006)

- Vegetation:** None identified at this time.
- Reptiles:** None identified at this time.
- Birds:** None identified at this time.
- Fishes:** None identified at this time.
- Mussels:** None identified at this time.
- Mammals:** None identified at this time.

Wastewater Treatment Plants Zurich



South Gullies

Forest Cover, Surface Water Quality

	Indicator and Description	South Gullies		Ausable Bayfield Area	
		Result	Grade	Result	Grade
Forest Conditions	Forest Cover is the percentage of the watershed that is forested. Environment Canada recommends 30% of a watershed should be in forest cover.	9.8%	D	12.6%	C
	Forest Interior is the area inside a woodlot that some bird species need for breeding. Environment Canada recommends 10% of a watershed should be in forest cover that is at least 100 m from the forest edge.	1.7%	F	2.8%	D
Water Quality	Total Phosphorus is an element that enhances plant growth and contributes to excess algae and low oxygen in streams and lakes. The Ministry of the Environment has established an environmental health objective concentration of 0.03 mg/L .	0.07	B	0.08	B
	E. coli (<i>Escherichia coli</i>) are bacteria found in human and animal waste. Their presence in water indicates the potential for the water to have other disease-causing organisms. The Ministry of Health has established a guideline of 100 cfu (colony forming units)/ 100 mL in recreational waters.	236	C	233	C
	Benthic Invertebrates are small animals without backbones that live in stream or lake sediments. The Family Biotic Index (FBI) summarizes the information about the numbers and types of these animals in a sediment sample. FBI values provide stream health information and values range from 1 (healthy) to 10 (degraded) .	5.2	C	5.6	C

Grade	Explanation
A	Indicates excellent ecosystem conditions and protection may be required. Some areas may require enhancement.
B	Indicates good ecosystem conditions. Some areas may require enhancement.
C	Indicates ecosystem conditions that need to be enhanced.
D	Indicates poor ecosystem conditions that need to be improved.
F	Indicates degraded ecosystem conditions that need considerable improvement.



South Gullies Next Steps and Local Successes



To improve forest conditions ...

- Dogwood, wild rose, and honey locust are native shrubs/trees that help to prevent erosion yet not block lake views.
- More forests required in headwater areas.

To improve water quality ...

- Protect all wetlands.
- The drinking water intake located north of Grand Bend services approximately 500,000 people. A committee comprised of both agricultural and lakeshore representatives would be one long-term strategy that might provide a forum to discuss specific water quality issues.
- Short but severe rain events that occur in the small watersheds that drain directly to Lake Huron can cause downstream erosion problems. To address this issue, a first step is to assess the gullies to determine which tributary has potential to have the most severe erosion issues. A second step is to determine what storm water retention options exist upstream in these most severe cases.
- Plant windbreaks and practise conservation tillage on erosion-prone soils (Programs available through ABCA).
- Fix faulty septic systems and establish a septic maintenance plan.
- Decommission abandoned wells and upgrade existing wells to prevent groundwater contamination.
- Upgrade Zurich sewage lagoons.
- Manure Management:
 - Apply manure at rates and times to optimize crop uptake of nutrients and prevent runoff.
 - Monitor tile outlets for contaminants during and following manure application and implement spill contingency plans if necessary.
 - Ensure manure storage facilities are adequate and properly functioning.
 - Keep records; develop a nutrient management plan (Environmental Farm Plan funding may be available).

Other recommendations

- Continue to support the province's natural heritage policies through local official plans and zoning by-laws (i.e., storm water management, tree cutting bylaw).
- Complete Environmental Action Plans (Farmers see Environmental Farm Plan; Lakeshore residents see Lakeshore Stewardship Manual). A stewardship manual for rural non-farm landowners should be completed by 2007. Contact the ABCA for more information.



Thumbs up!

The local community through the Huron County Water Protection Steering Committee continues to facilitate dialogue about water quality issues in the lakeshore and agricultural communities.

This is just one example in the watershed – give us a call and tell us about your project.



Ausable Bayfield Conservation Authority

71108 Morrison Line, RR 3 Exeter, ON N0M 1S5

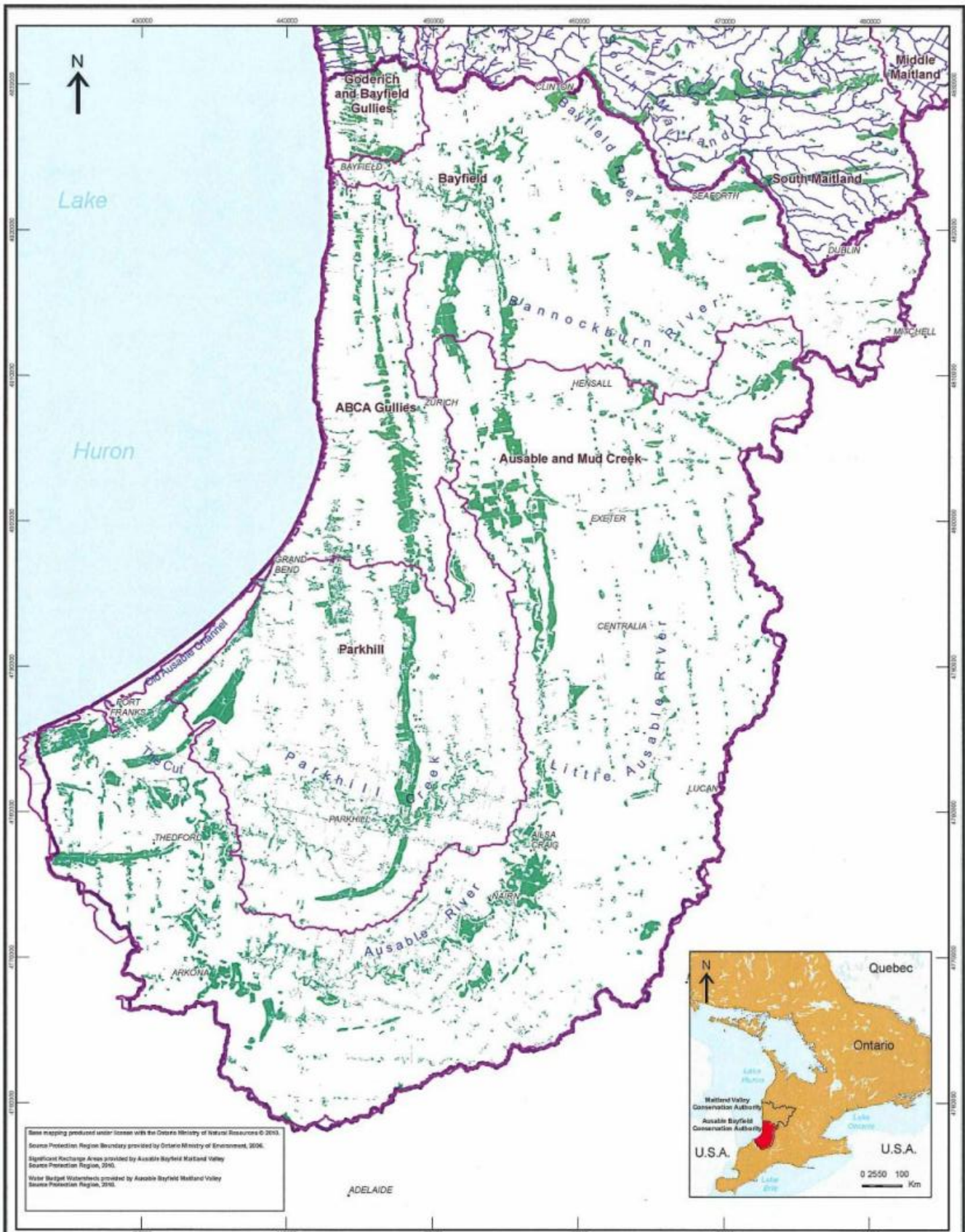
E-mail: info@abca.on.ca

Web site: www.abca.on.ca

Phone (519) 235-2610, 1-888-286-2610

Appendix E

ABCA Source Protection Maps



DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

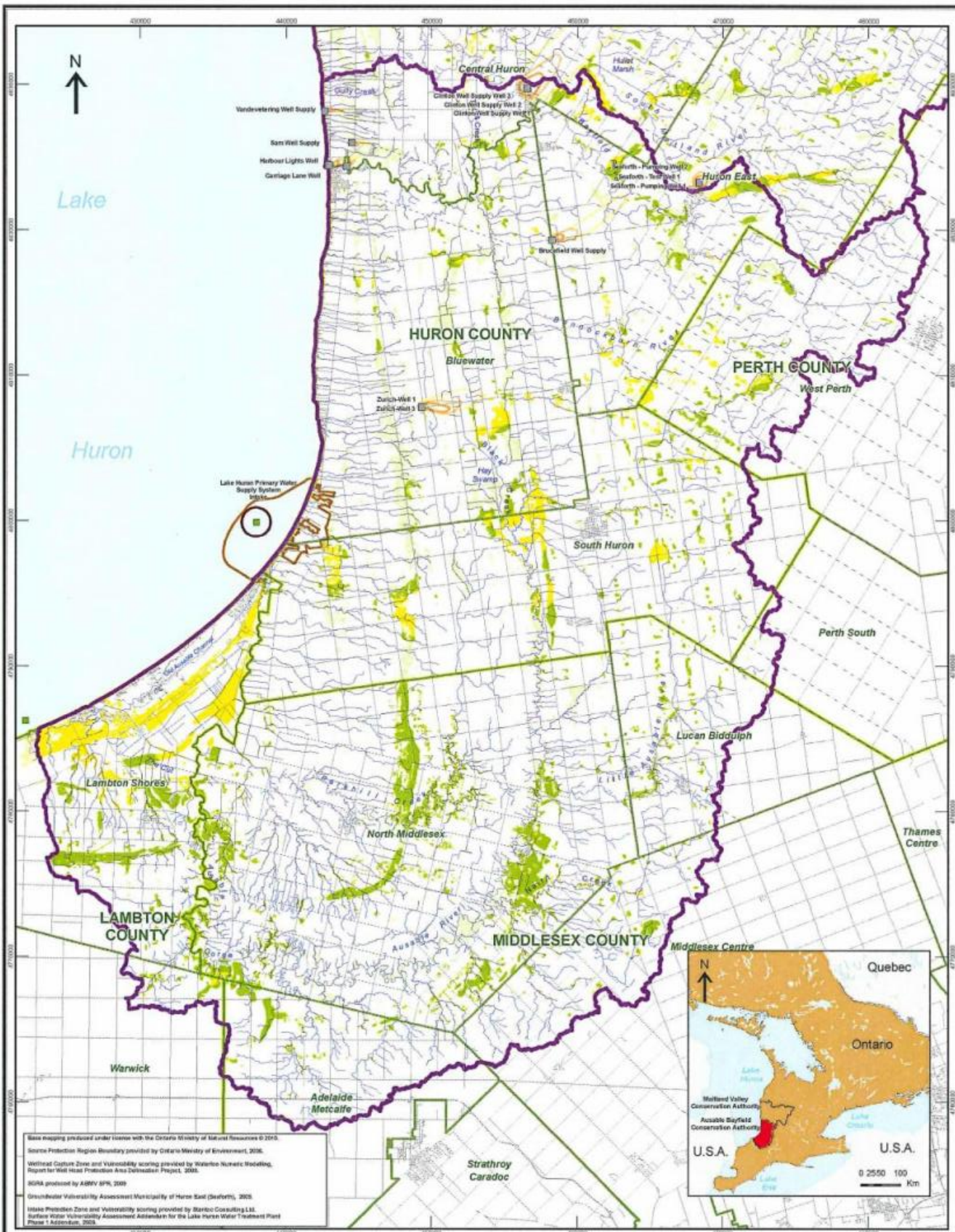
Ausable Bayfield & Maitland Valley Source Protection Region

Map 3.19 - Ausable Bayfield Significant Groundwater Recharge Areas

Ontario

ABCAMVCA GIS Services
Copyright © Queen's Printer, 2010
This map is for illustrative purposes only, it is not a legal survey.

File: C:\env\mapinfo\assessment_report\cupp_ab_jrb_map_3_19_abmrv_03.mxd
Date: May 17, 2011
Produced By: Corral Jones ABCAMVCA CWSP Region



Base mapping produced under license with the Ontario Ministry of Natural Resources © 2005.
 Source Protection Region Boundary provided by Ontario Ministry of Environment, 2006.
 Wellhead Capture Zone and Vulnerability scoring provided by Waterloo Numeric Modeling, Report for Well Head Protection Area delineation Project, 2005.
 MORA produced by ASBY SPR, 2009
 Groundwater Vulnerability Assessment Municipal by of Huron East (2007), 2005.
 Intake Protection Zone and Vulnerability scoring provided by Starline Consulting Ltd. Surface Water Vulnerability Assessment Addendum for the Lake Huron Water Treatment Plant Phase 1 Addendum, 2008.

LEGEND					
	Source Protection Area		Wellhead Protection Zone		Significant Groundwater Recharge Area
	Municipal Boundary		Zone A - 100m		Vulnerability Scoring
	County Boundary		Zone B - 2yr tot		GWVA 6
	Municipal Well		Zone C - 5yr tot		GWVA 4
	Surface Water Intake		Zone D - 25yr tot		GWVA 2
	Watercourse		Zone E - GUDI zone		
	Road		Intake Protection Zone		
			IPZ1		
			IPZ2		

Ausable Bayfield & Maitland Valley Source Protection Region

Map 4.3 - Ausable Bayfield SPA Significant Groundwater Recharge Areas

File: C:\gvs\gvs\assessment_report\map_43_map_3_asis_v1.mxd
 Date: May 17, 2011
 Produced by: Daniel Innes ABCANVCA DWSP Region

Map Projection: UTM NAD83 Zone 17



Appendix F
Field Notes

GENERAL INFORMATION									
PROJECT #: P14019991		PROJECT DESCRIPTION: NLWP			DAY: 13	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section: Yes <input type="radio"/> No <input checked="" type="radio"/> Unknown <input type="radio"/>									
COLLECTORS: CP		WEATHER CONDITIONS: cloudy to sun			TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus for 2011/12/13 am									
LOCATION									
NAME OF WATERBODY:		DRAINAGE SYSTEM: Turnbull Drain			CROSSING #:		STATION #: CR-003 + CR014		
LOCATION OF CROSSING: Corbett Line(s) head west along drain									
UTM EASTING & NORTHING: 17T 441827.09E 4797683.36mN					MTO CHAINAGE:				
TOWNSHIP: Hwy					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agricultural (corn, w. wheat)					SOURCES OF POLLUTION: Agriculture				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP @ Road		N/A	
Other Describe:							Size (w x h) m2 ≈ 800mm		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:					SECTION LOCATION: (include on habitat map)				
TYPE: Stream / river		Channelized <input checked="" type="checkbox"/>		Permanent		Intermittent <input checked="" type="checkbox"/>		Ephemeral	
								ASSOCIATED WETLAND: upstream of culvert	
TOTAL SECTION LENGTH (m): ≈ 300m					CURRENT VELOCITY (m/s): 0.20 m/s				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area				Drain F 100%					
mean depth wetted (m)				0.20m					
mean width wetted (m)				0.90m					
Mean bankfull width (m)				≈ 7.00m					
Mean bankfull depth (m)				1.80m					
Substrate				SA/GR					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	✓						
Right Upstream Bank	✓						
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris	Organic debris	Vascular plants	None
				Instream 5% Overhanging 2%		Instream 60% Overhanging 30%	
SHORE COVER (% stream shaded):	100 - 90 %	90 - 60% ✓	60 - 30%	30 - 1%	None		
VEGETATION TYPE (%) :	Submergent		Floating		Emergent		None
Predominant Species					Grasses		
MIGRATORY OBSTRUCTIONS:	None		Seasonal ✓		Permanent		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
- Deeper pools @ inlet + outlet of culverts - Substrate in culverts							
COMMENTS :							
- Drain classification is F - Possible seasonal habitat - Stable banks - No evidence of recent clean-out - Muskrat, Deer tracks							
Additional Notes Appended? No Yes number of pages _____							

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
			PROJECT #: PIA019991
			MAPPER: CP
			NAME OF WATERBODY: Turnbull Drain
			CROSSING #:
			STATION #: CR-003 + CR-014
			DATE: DD-MMM-YY 13-12-2011
<p style="text-align: center;">LEGEND</p> <ul style="list-style-type: none"> 10d depth (cm) 6w width ➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar • Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder * * * Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank XXX Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction Ⓜ Riparian Tree └ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌ Culvert 			
<p>PROFILE: Horiz. Scale 1m Vert. Scale 1m</p>			

GENERAL INFORMATION									
PROJECT #: VIA 019091		PROJECT DESCRIPTION: NLWP			DAY: 27	MONTH: 6	YEAR: 2012		
Is STREAM REALIGNMENT required for this section:									
Yes		<input checked="" type="radio"/> No		Unknown					
COLLECTORS: CP			WEATHER CONDITIONS: Sunny		TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus									
LOCATION									
NAME OF WATERBODY: Unknown Hay 6			DRAINAGE SYSTEM:		CROSSING #: CR-013		STATION #:		
LOCATION OF CROSSING: East of Hwy 21 for access Roads to T-36, T-37									
UTM EASTING & NORTHING:					MTO CHAINAGE:				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agricultural					SOURCES OF POLLUTION: Agricultural				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP @ Hwy 21		N/A	
Other Describe:							Size (w x h) m2		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	Intermittent <input checked="" type="checkbox"/>	Ephemeral	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s): N/A				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area				100% (dry)					
mean depth wetted (m)				≈ 0.05					
mean width wetted (m)				≈ 0.20					
Mean bankfull width (m)				≈ 0.50					
Mean bankfull depth (m)				≈ 0.20					
Substrate				silts					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY								
	Stable	Slightly Unstable	Moderately Unstable	Unstable				
Left Upstream Bank	✓							
Right Upstream Bank	✓							
HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris		Organic debris	Vascular plants	None
				Instream			Instream <i>grasses</i>	
				Overhanging			Overhanging	
SHORE COVER (% stream shaded):	100 – 90 %		90 – 60%		60- 30%		30 – 1% ✓	None
VEGETATION TYPE (%) :	Submergent			Floating		Emergent ✓		None
Predominant Species						<i>grasses</i>		
MIGRATORY OBSTRUCTIONS:	None			Seasonal ✓ <i>low water</i>		Permanent ✓ <i>@ Hwy 21</i>		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning			Evidence of Groundwater		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:								
<ul style="list-style-type: none"> - None this is an open channel to convey tile drainage from agricultural fields - tile drainage ± 200m upstream of proposed culvert crossing ⊗ - culvert under Hwy 21 conveys flow underground to Lake Huron 								
COMMENTS :								
<ul style="list-style-type: none"> - use typical culvert crossing design 								
Additional Notes Appended? No Yes number of pages _____								

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m): 20	SCALE (cm / m):
		PROJECT #: D1A09991	
		MAPPER: CP	
		NAME OF WATERBODY: unknown Hay 6	
		CROSSING #: CR-013	
		STATION #:	
		DATE: DD-MMM-YY 27-06-12	
		LEGEND	
<p>10d depth (cm) 6w width</p> <p>➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining // // // // // Eroded Bank XXX Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ↳ Seep/Spring - - - - Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌ └ Culvert</p>			
PROFILE:	Horz. Scale	Vert. Scale	

GENERAL INFORMATION									
PROJECT #: P101991		PROJECT DESCRIPTION: NLWP			DAY: 13	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes		No		Unknown					
COLLECTORS: CP			WEATHER CONDITIONS: overcast/sun		TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: See olympus @ ± 12:50 - 1:20 pm									
LOCATION									
NAME OF WATERBODY:			DRAINAGE SYSTEM: Kading Drain		CROSSING #:		STATION #: CR-018		
LOCATION OF CROSSING: East of Bluewater Hwy 21, South of Shadeview Rd									
UTM EASTING & NORTHING: T17 442380.97mE 4800338.82mN					MTO CHAINAGE:				
TOWNSHIP: Han					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agriculture / woodlot					SOURCES OF POLLUTION: Agriculture				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP		N/A	
Other Describe: minor elevation on d/s side						Size (w x h) m2 2100mm ² ^{~9m L}			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND: upstream?			
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s): 0.10 to 0.30 m/s				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area	100%				Farm crossing				
mean depth wetted (m)	0.30m				0.20m				
mean width wetted (m)	1.60m				73.0m				
Mean bankfull width (m)	3.30m				~5.0m				
Mean bankfull depth (m)	1.40m				1.60m				
Substrate	SA/GR/CO				SA/CI/GR				
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Ci	Muck Mu	Detritus D	

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank			✓	
Right Upstream Bank			✓	

HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris	Organic debris	Vascular plants	None
	20%			Instream 10% Overhanging 15%		Instream Overhanging 50%	
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
Predominant Species							✓
MIGRATORY OBSTRUCTIONS:	None		Seasonal ✓ culvert + depth		Permanent		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
COMMENTS :							
- active erosion upstream + downstream of CSP - debris jam on upstream side of culvert - cyprinids observed d/s of culvert chub (creek?) adults							
Additional Notes Appended? No Yes number of pages _____							

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
			PROJECT #: PIA019991
			MAPPER: CP
			NAME OF WATERBODY: Kading Drain
			CROSSING #: CR018
			STATION #:
			DATE: DD-MMM-YY 13-12-2011
			<p style="text-align: center;">LEGEND</p> <p>10d depth (cm) 6w width</p> <p>➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar</p> <p>••• Fine Substrate ### Gravel Substrate</p> <p>o Cobble / Boulder * * * Debris</p> <p>CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress</p> <p>Fe Iron Staining // // // Eroded Bank</p> <p>xxx Riprap / Other Stabilization</p> <p>○ Instream Log/Tree ^^^ Dam/Weir/Obstruction</p> <p>Ⓡ Riparian Tree</p> <p>▶ Seep/Spring - - - - Undercut Bank</p> <p>— Barrier to Fish Movement -S- Seasonal Barrier</p> <p>-x-x- Fence line ┌ └ Culvert</p>
PROFILE:	Horz. Scale	Vert. Scale	

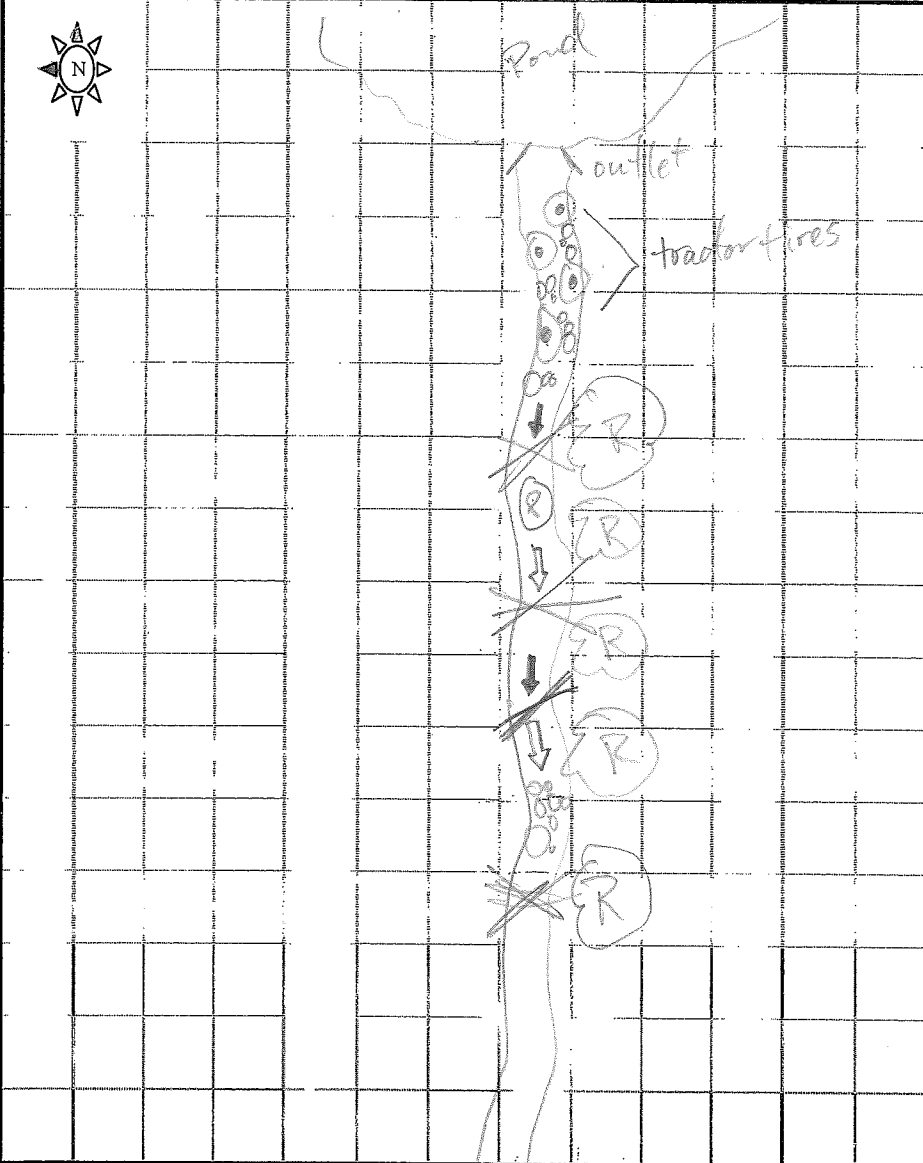
GENERAL INFORMATION									
PROJECT #: PIA-019991		PROJECT DESCRIPTION: NLWP			DAY: 13	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes		<input checked="" type="radio"/> No		Unknown					
COLLECTORS: CP		WEATHER CONDITIONS: overcast			TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus (previous photos are clean out)									
LOCATION									
NAME OF WATERBODY:		DRAINAGE SYSTEM: Hay E drain			CROSSING #: CR-023		STATION #:		
LOCATION OF CROSSING: West of Shipka, South of Hendrick									
UTM EASTING & NORTHING: T17 443075.28mE 4802363.83mN					MTO CHAINAGE:				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agriculture (winter wheat soybean, corn)					SOURCES OF POLLUTION: Agriculture				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP		<input checked="" type="radio"/> N/A	
Other		Describe: <input checked="" type="radio"/> 2 tile outlets on N side of drain					Size (w x h) m2		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized <input checked="" type="checkbox"/>	Permanent	Intermittent <input checked="" type="checkbox"/>	Ephemeral	ASSOCIATED WETLAND: E of Shipka			
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s): 0.05m/s				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area				Drain 100%					
mean depth wetted (m)				0.15m					
mean width wetted (m)				0.50m					
Mean bankfull width (m)				1.30m					
Mean bankfull depth (m)				0.60m					
Substrate				sand/leaves grasses					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	✓						
Right Upstream Bank	✓						
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris Instream Overhanging	Organic debris	Vascular plants Instream Overhanging	None
						grasses 80%	
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None		
			✓				
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
					10%		
Predominant Species					cattails		
MIGRATORY OBSTRUCTIONS:	None		Seasonal		Permanent		
			✓				
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
COMMENTS :							
Shallow drain - indirect habitat potential due to depth - 2 tile outlets @ crossing - access from Shipka going west to crossing, cleared area, ⊗ Fish (Cyprinids) observed in March / April 2012							
Additional Notes Appended?				No	Yes number of pages _____		

SECTION IDENTIFIER:		SECTION LOCATION:		SECTION LENGTH (m):	SCALE (cm / m):				
				PROJECT #: PIA019991	MAPPER: CP				
				NAME OF WATERBODY: Hau Edrain		CROSSING #: CR-023	STATION #:		
				DATE: DD-MMM-YY 13-12-2011		LEGEND			
				10d depth (cm) 6w width		→ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining // // // // // Eroded Bank XXX Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▽ Seep/Spring - - - - Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert			
				PROFILE:		Horz. Scale	Vert. Scale		

GENERAL INFORMATION									
PROJECT #: PWA019991		PROJECT DESCRIPTION: NLWP			DAY: 22	MONTH: 03	YEAR: 12		
Is STREAM REALIGNMENT required for this section:									
Yes		No <input checked="" type="radio"/>		Unknown					
COLLECTORS: CP			WEATHER CONDITIONS: Sunny - cool		TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: * See Olympus									
LOCATION									
NAME OF WATERBODY: Chalette Drain			DRAINAGE SYSTEM:		CROSSING #: CR-026		STATION #:		
LOCATION OF CROSSING: South of Sararas Rd									
UTM EASTING & NORTHING:					MTO CHAINAGE: N/A				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agricultural					SOURCES OF POLLUTION: Agricultural				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP		<input checked="" type="radio"/> N/A	
Other Describe:							Size (w x h) m2		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map) d/s of pond					
TYPE:	Stream / river	Channelized	Permanent <input checked="" type="checkbox"/>	Intermittent	Ephemeral	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m): 20m					CURRENT VELOCITY (m/s): ~ 0.20m/s				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area	50%		50%						
mean depth wetted (m)	~ 0.12m	to 0.18m	~ 0.07m	to 0.12m					
mean width wetted (m)	~ 1.00m	to 2.20m	Varies 0.90 to 2.10m						
Mean bankfull width (m)	3.40m		~ 3.30m						
Mean bankfull depth (m)	~ 0.50m	to 0.70	~ 0.50m to 0.70m						
Substrate	Gr/Co		Gr/Sa						
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY								
	Stable	Slightly Unstable	Moderately Unstable	Unstable				
Left Upstream Bank	✓							
Right Upstream Bank		✓						
HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris		Organic debris	Vascular plants	None
	2%		2%	Instream 5%			Instream	
				Overhanging 5%			Overhanging 10%	
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60-30%		30 – 1%	None		
			✓					
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None	
Predominant Species							✓	
MIGRATORY OBSTRUCTIONS:	None		Seasonal		Permanent			
			✓ depth					
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other			
POTENTIAL ENHANCEMENT OPPORTUNITIES:								
<ul style="list-style-type: none"> - pool creation - removal of tractor tire, garbage - bottom draw from farm pond 								
COMMENTS :								
<ul style="list-style-type: none"> - Wood Frog observed d/s of pond - Woody debris within channel ⊗ Proposed directional drill location for collector line 								
Additional Notes Appended? No Yes number of pages _____								

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
		PROJECT #: PIA00991	
		MAPPER: CP	
		NAME OF WATERBODY: Charette Drain	
		CROSSING #: CR-026	
		STATION #:	
		DATE: DD-MMM-YY 20-03-12	
		LEGEND 10d depth (cm) 6w width → Riffle ⇨ Run/Glide ○ Pool ▨ Island/Bar ▨ Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining // // // // // Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ® Riparian Tree ▶ Seep/Spring - - - - Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌ └ Culvert	
PROFILE:	Horz. Scale	Vert. Scale	

GENERAL INFORMATION									
PROJECT #: PIA019991		PROJECT DESCRIPTION:			DAY: 14	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes		No <input checked="" type="radio"/>		Unknown					
COLLECTORS: CP			WEATHER CONDITIONS: light rain		TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus photos									
LOCATION									
NAME OF WATERBODY:			DRAINAGE SYSTEM: Hay Drain B ^N		CROSSING #: CR-031		STATION #:		
LOCATION OF CROSSING: North of Danceland R, N Branch of Hay Drain B									
UTM EASTING & NORTHING: 17T 443918.68mE 4809716.61mN					MTO CHAINAGE:				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agriculture					SOURCES OF POLLUTION: Agriculture				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP/d/s		<input checked="" type="radio"/> N/A	
Other Describe:							Size (w x h) m2		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	Intermittent <input checked="" type="checkbox"/>	Ephemeral	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m): 30m				CURRENT VELOCITY (m/s): 0.2 m/s					
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area	80%			20%					
mean depth wetted (m)	0.08m			0.15m					
mean width wetted (m)	0.80m			1.30m					
Mean bankfull width (m)	3.20m			3.30m					
Mean bankfull depth (m)	0.90m			0.90m					
Substrate	SA/GRCO			SA/GRCO					
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY								
	Stable	Slightly Unstable	Moderately Unstable	Unstable				
Left Upstream Bank	✓							
Right Upstream Bank	✓							
HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris		Organic debris	Vascular plants	None
	10%	5%	5%	Instream 2%	Overhanging 5%		Instream 20%	Overhanging 40%
SHORE COVER (% stream shaded):	100 – 90 %		90 – 60%		60- 30%		30 – 1% ✓	None
VEGETATION TYPE (%)	Submergent		Floating			Emergent 30%		None
Predominant Species						grasses		
MIGRATORY OBSTRUCTIONS:	None		Seasonal ✓ low flow + depth			Permanent		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater			Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:								
COMMENTS :								
- potential seasonal habitat depending on d/s barriers - culvert d/s on non participating landowner								
Additional Notes Appended? No Yes number of pages _____								

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
			PROJECT #: P1A019991
			MAPPER: CP
			NAME OF WATERBODY: Hay Drain B North
			CROSSING #: CR-031
			STATION #:
			DATE: DD-MMM-YY 14-12-2011
			<p align="center">LEGEND</p> <p>10d depth (cm) 6w width</p> <p>➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOoO Cobble / Boulder * * * Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining // // // Eroded Bank xxx Riprap / Other Stabilization</p>
PROFILE:	Horz. Scale	Vert. Scale	<p>○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ⊗ Riparian Tree ▶ Seep/Spring - - - Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line □ Culvert</p>

GENERAL INFORMATION									
PROJECT #: PA109991		PROJECT DESCRIPTION: NLWP			DAY: 14	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes <input type="checkbox"/>		No <input checked="" type="checkbox"/>		Unknown <input type="checkbox"/>					
COLLECTORS: CP		WEATHER CONDITIONS: Rain			TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus									
LOCATION									
NAME OF WATERBODY:			DRAINAGE SYSTEM: Hay B south		CROSSING #: CR-032		STATION #:		
LOCATION OF CROSSING: North of Danceland Rd, Hay B drain south, West of Hwy 21									
UTM EASTING & NORTHING: 17T 443958.75mE 4809441.55mN					MTO CHAINAGE:				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agricultural					SOURCES OF POLLUTION: Agricultural				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP		N/A	
Other Describe:							Size (w x h) m2		
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	Intermittent <input checked="" type="checkbox"/>	Ephemeral	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m): ≈ 20m				CURRENT VELOCITY (m/s): 0.20m/s					
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area	90%	10%							
mean depth wetted (m)	0.10m	0.27m							
mean width wetted (m)	0.60m	1.30m							
Mean bankfull width (m)	3.20m	73.50m							
Mean bankfull depth (m)	0.90m	1.20m							
Substrate	SALGRCo		SALGRCo						
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY								
		Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank			✓					
Right Upstream Bank				✓				
HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris		Organic debris	Vascular plants	None
	5%		5%	Instream 100%	Overhanging 20%	5%	Instream	Overhanging 40%
SHORE COVER (% stream shaded):	100 – 90 %		90 – 60%	60- 30%	30 – 1%		None	
				✓				
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None	
					40%			
Predominant Species					grasses			
MIGRATORY OBSTRUCTIONS:	None		Seasonal		Permanent			
			✓ low flow + depth					
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater		Other			
POTENTIAL ENHANCEMENT OPPORTUNITIES:								
- Scour pools @ culvert crossings?								
COMMENTS :								
- Water quality appears good - some bank erosion on upstream right @ tile outlet - metal tile outlet from south bank @ crossing location								
Additional Notes Appended? No Yes number of pages _____								

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
			PROJECT #: P1A019921
			MAPPER: CP
			NAME OF WATERBODY: Hay B south
			CROSSING #: CR-032
			STATION #:
			DATE: DD-MMM-YY 14-12-2011
			<p align="center">LEGEND</p> <p>10d depth (cm) 6w width</p> <p>➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar</p> <p>••••• Fine Substrate ### Gravel Substrate</p> <p>oOooO Cobble /Boulder *** Debris</p> <p>CT Cattail SV/FV Submerg/Float Veg</p> <p>EV Emergent Vegetation W Watercress</p> <p>Fe Iron Staining // // // // Eroded Bank</p> <p>XXX Riprap / Other Stabilization</p>
PROFILE:	Horz. Scale	Vert. Scale	<p>○ Instream Log/Tree ^^^ Dam/Weir/Obstruction</p> <p>⊗ Riparian Tree</p> <p>▶ Seep/Spring - - - - Undercut Bank</p> <p>— Barrier to Fish Movement -S- Seasonal Barrier</p> <p>-x-x- Fence line □ Culvert</p>

GENERAL INFORMATION									
PROJECT #: H1A019991		PROJECT DESCRIPTION: NLWP			DAY: 13	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes		<input checked="" type="radio"/> No		Unknown					
COLLECTORS: CP		WEATHER CONDITIONS: overcast/cloudy			TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus									
LOCATION									
NAME OF WATERBODY:			DRAINAGE SYSTEM: St Joseph Airports drain		CROSSING #:		STATION #: CR-041		
LOCATION OF CROSSING: Sof DanceLand Rd, North of Zurich/Hersall Road									
UTM EASTING & NORTHING:					MTO CHAINAGE:				
TOWNSHIP: Han					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agriculture (corn)					SOURCES OF POLLUTION: Agriculture				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		<input checked="" type="radio"/> CSP		N/A	
Other Describe:						Size (w x h) m ² = 9m x 2m = 1800m ²			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	<input checked="" type="checkbox"/> Intermittent	Ephemeral	ASSOCIATED WETLAND:			
TOTAL SECTION LENGTH (m): ~ 30m					CURRENT VELOCITY (m/s): Ranges 0.20 to 0.30 m/s				
SUB-SECTION(S)	Run 50%	Pool 30%	Riffle 20%	Flats	Inside culvert	Other			
Percentage of area	(upstream)	(below culvert)	(below pool)			⊗ culvert is perched			
mean depth wetted (m)	0.20m	0.40m	0.15m			~ 0.30m			
mean width wetted (m)	0.80m	2.20m	0.35m						
Mean bankfull width (m)	2.5m	3.8m	3.0m						
Mean bankfull depth (m)	1.2m	2.0m	1.8m						
Substrate	SA/GR	Bo/CO/SA GR	CO/BO/SA GR						
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY								
		Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank		✓	Ld/s ✓					
Right Upstream Bank		✓						
HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris		Organic debris	Vascular plants	None
		20%	10%	Instream	Overhanging		Instream	
							Overhanging	30%
SHORE COVER (% stream shaded):	100 – 90 %		90 – 60%		60- 30%		30 – 1%	None
							✓	
VEGETATION TYPE (%):	Submergent			Floating		Emergent		None
						40%		
Predominant Species						grassed w/s		
MIGRATORY OBSTRUCTIONS:	None			Seasonal		Permanent		
				✓				
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning			Evidence of Groundwater		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:								
- lower culvert - substrate in culvert								
COMMENTS :								
- existing crossing ≈ 9m CSP 1800mm Ø - Barriers to fish movement w/s @ culvert and shallow depth w/s of culvert - Trapezoidal channel								
Additional Notes Appended?		No	Yes number of pages _____					

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
			PROJECT #: P1A019991
			MAPPER: CP
			NAME OF WATERBODY: St. Joseph Airport Drain South
			CROSSING #: CR-041
			STATION #: 12
			DATE: DD-MMM-YY 13-12-2011
			<p style="text-align: center;">LEGEND</p> <p>10d depth (cm) 6w width</p> <ul style="list-style-type: none"> ➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ▨ Fine Substrate ### Gravel Substrate oOooO Cobble /Boulder * * * Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining ///// Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction Ⓡ Riparian Tree └▶ Seep/Spring ----- Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌└ Culvert
PROFILE:	Horz. Scale	Vert. Scale	

GENERAL INFORMATION									
PROJECT #: PIA019991		PROJECT DESCRIPTION: NLWP			DAY: 14	MONTH: 12	YEAR: 2011		
Is STREAM REALIGNMENT required for this section:									
Yes		No		Unknown					
COLLECTORS: CP			WEATHER CONDITIONS: rain		TIME STARTED:		TIME FINISHED:		
PHOTOS NUMBERS AND DESCRIPTIONS: see olympus camera									
LOCATION									
NAME OF WATERBODY:			DRAINAGE SYSTEM: Stan M (F)		CROSSING #: CR-043		STATION #:		
LOCATION OF CROSSING: North of Kippen R, East of Hwy 21									
UTM EASTING & NORTHING: 17 444254.05mE 4811177.25mN					MTO CHAINAGE:				
TOWNSHIP: Hay					MNR DISTRICT: Guelph				
LAND USE AND POLLUTION									
SURROUNDING LAND USE: Agriculture / Livestock (Pigs) →					SOURCES OF POLLUTION:				
EXISTING STRUCTURE TYPE									
Bridge		Box Culvert		Open Foot Culvert		CSP		N/A	
Other Describe: @ Kippen Rd (concrete)						Size (w x h) m2			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER:				SECTION LOCATION: (include on habitat map)					
TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:			
				✓	✓				
TOTAL SECTION LENGTH (m):					CURRENT VELOCITY (m/s):				
SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other			
Percentage of area	100%								
mean depth wetted (m)	0.08m								
mean width wetted (m)	0.90m								
Mean bankfull width (m)	2.80m								
Mean bankfull depth(m)	1.10m								
Substrate	GR (from road) some sand								
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	✓						
Right Upstream Bank	✓						
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris	Organic debris	Vascular plants	None
	30%			Instream Overhanging		Instream 10% Overhanging 60%	
SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60-30%	30 – 1%	None		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
	10%				60%		
Predominant Species	Veronica				Cattails/grasses		
MIGRATORY OBSTRUCTIONS:	None		Seasonal ✓ low flow + depth		Permanent		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning		Evidence of Groundwater Veronica ALS of crossing		Other		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
- improve road culvert and stop road gravel from entering watercourse - scour pools @ new culvert location							
COMMENTS :							
- veronica observed ALS of crossing ~ 30-40m - Livestock south of Kippen Rd.							
Additional Notes Appended? No Yes number of pages _____							

SECTION IDENTIFIER: T-01		SECTION LOCATION:		SECTION LENGTH (m):		SCALE (cm / m):	
				PROJECT #: P100991			
				MAPPER: CP			
				NAME OF WATERBODY: StauM			
				CROSSING #: CR-043			
				STATION #:			
				DATE: DD-MMM-YY 14-12-2011			
				<p style="text-align: center;">LEGEND</p> <p>10d depth (cm) 6w width</p> <p>➔ Riffle ⇨ Run/Glide ○ Pool ■ Island/Bar ● Fine Substrate ### Gravel Substrate oOoO Cobble /Boulder *** Debris CT Cattail SV/FV Submerg/Float Veg EV Emergent Vegetation W Watercress Fe Iron Staining // // // // Eroded Bank xxx Riprap / Other Stabilization ○ Instream Log/Tree ^^^ Dam/Weir/Obstruction ⊗ Riparian Tree ▶ Seep/Spring - - - - Undercut Bank — Barrier to Fish Movement -S- Seasonal Barrier -x-x- Fence line ┌ └ Culvert</p>			
PROFILE:		Horz. Scale		Vert. Scale			

NEEGANBURNSIDE

Appendix G
Curriculum Vitae



Profession

Aquatic Resource Specialist

Education

Terrain and Water Resources Technologist, Sir Sandford Fleming College, School of Natural Resources, 1996

Certificates

CISEC-Certified Inspector for Sediment and Erosion Control, Aug 2011

MNR/TRCA Ontario Stream Assessment Protocol (OSAP), June 2010.

OBBN-Ontario Benthos Biomonitoring Network Certification, June 2010

DFO, Ontario Freshwater Mussel Identification Course, 2007

MTO/DFO/MNR Fisheries Protocol, Fisheries Assessment Specialist, Fisheries Contract Specialist (RAQs Certified), 2006

MNR Class 1 Electrofishing Certification and Trainer, 2006

ROM, Ontario Freshwater Fishes Identification Course, 2005

Professional Societies

Ontario Association of Certified Engineering Technicians and Technologists (OACETT)

Employment Record

Aquatic Resource Specialist, R.J. Burnside & Associates Limited (2007-Present)

Aquatic Resources Technologist, AMEC Earth and Environmental, Mississauga, Ontario (2003-2006)

Environmental Technologist, AMEC Earth and Environmental, Vancouver, British Columbia (1998-2003)

Citizenship

Canadian

Languages

English

Christopher Pfohl, C.E.T.

Christopher has a broad range of experience in Canada and internationally, with 13 years of professional experience in Aquatic Resources including environmental assessment, existing condition studies, habitat restoration, environmental monitoring and protection, determination of fish habitat, Species at Risk, hydrology, hydrogeology and contaminated sites. He has extensive knowledge of the *Fisheries Act*, as it pertains to the protection of fish and fish habitat. Christopher is responsible for obtaining permits from various government agencies, environmental impact assessment, environmental and construction monitoring, developing and conducting sampling programs for fisheries and aquatic habitat inventories, and the preparation of technical reports based on project requirements. He has coordinated and conducted numerous sampling programs for fish, amphibians, invertebrates and sediment, surface and ground water. He is responsible for liaison with government agencies, First Nations, large corporations, and stakeholders.

Christopher has undertaken projects for a wide range of clients throughout the energy, development, transportation and mining sectors in local and remote areas of Canada and overseas. This requires the development and coordination of extensive aquatic investigations and includes the management of logistics, field staff and sub-consultants, data analysis, report and proposal preparation.

Christopher is also a former member of the Canadian Fly Fishing Team (2007 to 2010) and has competed in numerous events across North America and internationally.

Biological Resources

Coves ESA Master Plan and Rehabilitation of the East Pond, City of London, London, Ontario (2011-Ongoing)

Mr. Pfohl was subcontracted by North South Environmental to provide aquatic support for development of the Coves ESA Master Plan located in an urban environment. He was responsible for background review, confirmation of existing conditions and input to rehabilitation of the Coves ponds and watercourses as it pertains to aquatic resources. A rehabilitation matrix was developed by Mr. Pfohl to determine the best options for improvements to the aquatic conditions in the Coves ponds and watercourses. A rehabilitation concept and plan has been provided for funding approval.

Bronte Creek Rehabilitation and Natural Channel Design, Trout Unlimited, Lowville, Ontario (2011)

Aquatic Resources Specialist responsible for natural channel design options and prescriptions for areas that have been impacted by erosion, heavy pedestrian use, and areas of channel widening. Christopher conducted spawning surveys for rainbow trout (steelhead) and Chinook salmon to determine critical habitat areas to be protected during construction. Habitat prescriptions included spawning areas, riffle sections, boulder clusters, large



Christopher Pfohl

woody debris, pool creation, juvenile habitat and retrofit of existing riffle structures. He conducted swim-up counts for steelhead fry and determination of prescription success based on the contractor's rehabilitation works. Trout Unlimited has been overwhelmed with the positive feedback on the construction and design.

Barrier Mitigation for Redside Dace, Don Head West, Town of Richmond Hill, Ontario (2011-Ongoing)

Aquatic Resource Specialist responsible for collection of Endangered Species (Redside dace) based on the conditions of the Endangered Species Act (ESA) permit. Mr. Pfohl provided support during the application for the ESA permit along with the appropriate animal care protocols. He was required to salvage all aquatic life from a work area planned for barrier mitigation under the conditions set-out in the ESA permit. A "rocky ramp" was constructed to mitigate the impassable barrier for fish movement. A Scientific Collectors Report has been submitted to MNR on behalf of the client and the conditions of the ESA permit. Ongoing monitoring for habitat success is required during 2012.

Siloam Pond Natural Channel Design, Mill Run Golf and Country Club, Uxbridge, Ontario (2010-Ongoing)

Mr. Pfohl provided aquatic resource input into the final design of more than 350m of brook trout habitat in Uxbridge, Ontario. The Siloam Pond was taken off-line to reduce thermal impacts to a cold water fishery and provide a constant water source for the golf club. Christopher provided suitable habitat designs for large woody debris, riffle sections and over-wintering habitat in strategic locations along the channel and as part of the compensation required for the DFO Authorization. He was also responsible for obtaining the Scientific Collectors Permit from MNR, fish salvage, construction monitoring, and submission of fish collection records as part of the condition of the MNR permit. Mr. Pfohl will be monitoring the new channel for habitat use, substrate movement and naturalization of the riparian corridor as part of the permit conditions provided in the DFO Authorization.

Colgan Well, Determination of Surface Water Impacts, Township of Adjala-Tosorontio, Colgan, Ontario (2011-Ongoing)

Aquatic Resources Specialist responsible for determination of groundwater areas that may be impacted from a production well located in Colgan, Ontario. Groundwater upwelling and seepage areas were documented to determine potential impacts to receiving watercourses from groundwater extraction and potential effects to the fishery.

Endangered Species Act Approval, King Street Reconstruction, Region of Peel, Bolton, Ontario (2011)

Mr. Pfohl was responsible for acquiring approval from MNR for an outlet to Cold Creek, a tributary of the Humber River. Cold Creek is designated as potential Redside dace habitat and a Letter of Advice (LOA) was obtained from MNR for the construction works associated with an outlet structure to the watercourse. The LOA was provided by MNR based using approved Best Management Practices and Mitigation measures associated with the construction works.

Erosion and Aquatic Assessment, Upper Rouge River and Beaver Creek, Town of Richmond Hill, Ontario (2010-2011)

Aquatic Resources Specialist responsible for erosion and aquatic conditions assessment for 18km of the Upper Rouge River, and Beaver Creek, a tributary of the Rouge River, Richmond Hill. Required to identify areas of erosion that may cause impacts to municipal infrastructure, public and private land. Aquatic conditions were assessed in conjunction with erosion areas that may be improved during future works. Collected information was used to determine a level of potential hazard.

GO Transit Class Environmental Assessment, Group B for the Proposed Rail Expansion from Toronto to Milton, GO Transit, Ontario (2011-Ongoing)

Aquatic Resource Specialist responsible for coordinating existing conditions surveys for all watercourse crossings from Union west to Milton Station. Efforts included site visits to watercourses to document existing and critical fish habitat and determination for potential Fisheries Act Authorizations. Responsible for reporting information under the requirements for Municipal Class Environmental Assessment Projects for the preparation of the Environmental Study Report (ESR).

Environmental Monitoring, Richmond Hill Community Environmental Center, Region of Peel, Richmond Hill, Ontario (2010-2011)

Environmental Monitor responsible for inspecting erosion and sediment controls required for the construction of the Richmond Hill Community Environmental Center. Receiving waters from the site connect to protect Redside dace habitat that is highly sensitive. Stringent monitoring was required during construction along with weekly reporting.

Species at Risk Monitor, Water Treatment and Distribution System, Moose Deer Point First Nations Reserve, MacTier, Ontario (2009-2011)

Species at Risk and Environmental monitor for construction of a water treatment and distribution system along the eastern shore of Georgian Bay. Protected Species at Risk include endangered and threatened turtles and snakes. Required to



facilitate and conduct Species at Risk training for First Nations and construction workers based on mandatory requirements from the Environment Canada, Species at Risk permit.

GO Transit Class Environmental Assessment, Group B for the Proposed Rail Expansion from Hamilton to Niagara Falls, GO Transit, Ontario (2010)

Aquatic Resource Specialist responsible for coordinating existing conditions surveys for all watercourse crossings in the Hamilton to Niagara region. Efforts included site visits to watercourses to document existing and critical fish habitat and determination for potential Fisheries Act Authorizations. Responsible for reporting information under the requirements for Municipal Class Environmental Assessment Projects for the preparation of the Environmental Study Report (ESR).

Erosion and Aquatic Assessment, German Mills Creek, Town of Richmond Hill, Ontario (2009-2010)

Aquatic Resources Specialist responsible for erosion and aquatic conditions assessment for 10km of German Mills Creek, a tributary of the East Don River, Richmond Hill. Required to identify areas of erosion that may cause impacts to municipal infrastructure, public and private land. Aquatic conditions were assessed in conjunction with erosion areas that may be improved during future works. Collected information was used to determine a level of potential hazard.

Stream Realignment, Upper Nottawasaga River, Township of Mono, Ontario (2009-2010)

Project Coordinator responsible for stream realignment of 105 linear metres of coldwater habitat in the Upper Nottawasaga River watershed. Project required coordination of contractors, reporting to the Township of Mono and Nottawasaga Valley Conservation Authority and liaison with landowners. Realignment involved creation of suitable habitat for coldwater species (brook trout and migratory rainbow trout) including riffle structures, large woody debris placement, native substrate loading, vegetative mats for undercut and riparian plantings. Responsible for salvage efforts and compliance with the Department of Fisheries and Oceans (DFO) authorization for the "Harmful alteration, disruption or destruction" (HADD) of fish habitat and future monitoring requirements.

Ribb Dam Supplemental EA, World Bank, Ethiopia (2008-2009)

Project Coordinator/Aquatic Resource Specialist on a World Bank funded project to undertake a series of studies to update the existing EA in compliance with World Bank guidelines. Assisted in the development of Habitat Suitability Curves for Physical Habitat Simulation (PHABSIM) model to determine potential impacts to habitat for African barb, Nile tilapia, and African catfish of the Ribb River. Studies focused primarily on aquatic and wetland baseline information, potential hydrological effects, and impacts and mitigation measures related to the construction of a large water supply dam.

GO Transit Class Environmental Assessment, Group B for the Proposed Rail Expansion from Georgetown to Kitchener, GO Transit, Ontario (2008-2009)

Aquatic Resource Specialist responsible for coordinating existing conditions surveys for over 50 watercourse crossings in the Credit Valley and Grand River watersheds. Efforts included site visits to watercourses to document existing and critical fish habitat and determination for potential Fisheries Act Authorizations. Responsible for reporting information under the requirements for Municipal Class Environmental Assessment Projects for the preparation of the Environmental Study Report (ESR).

Unexploded Ordnance Clearing, Species at Risk Biologist, XTEC, Former Camp Ipperwash, Ipperwash, Ontario (2007-2009)

Biologist Team member responsible for adherence to the Environment Canada (EC) Species at Risk Permit required for vegetation clearing on the Former Camp Ipperwash, Military Training Center. EC issued a permit under the Species at Risk Act to protect threatened and endangered species known to exist on site based on previous observations during biological inventories required under the Canadian Environmental Assessment Act. Vegetation clearing was required to conduct electromagnetic (EM) surveys to determine unexploded ordnance locations. The Biologist Team was responsible for identification and avoidance of Federal and Provincial Species at Risk during site operations.

Fixed Link Project CEEA Screening, Chippewas of Georgina Island First Nation, Sutton West, Ontario (2007-2008)

Responsible for the preparation of an aquatic existing conditions report for the study area and made recommendations on a preferred alternative route based on potential effects to the aquatic environment. Information prepared was included in the Preliminary Evaluation of Engineering and Environmental Alternatives Study and CEEA Screening Report for the proposed Fixed Link. The proposed Fixed Link is to be a reliable all-weather transportation (vehicle and passenger) link from Georgina Island to the mainland.



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Water Intake Repair, CEAA Screening, Six Nations, Ontario (2007-2008)

Preparation of a Letter of Intent (LOI) to the Department of Fisheries and Oceans (DFO) for work within hazard lands to repair a communal water intake structure. The intake structure, which is built into the bank of the Grand River, is experiencing erosion around the sheet pile facing walls, as well as movement of the sheet pile walls. The repair must alleviate the sheet pile movement, and erosion around the structure.

Natural Gas Pipeline Construction, Senior Environmental Monitor, Union Gas, Strathroy, Ontario (2007)

Lead Environmental Monitor reporting to Union Gas for the construction of an 18km, 48" Natural Gas pipeline loop from Strathroy to Lobo Station. Responsible for all environmental aspects of the project including; protection of Cultural resource sites, fish and wildlife, sediment and erosion control, spill clean-up, and selection of discharge sites for dewatering applications. Also responsible for maintaining adherence to Water Take Permits (MOE), Protection of Fish and Fish Habitat (DFO), Flood/Fill Regulation for St. Clair Regional Conservation Authority (SCRCA), and the reporting requirements based on the conditions of each permit. A total of seven watercourse crossings were completed in the dry, following proper mitigation measures required for sediment and erosion control and fish and wildlife salvage. Also responsible for bank stabilization, riparian area planting, and pipeline cover project on the adjacent 28" pipeline, including associated meetings with DFO and SCRCA.

Peer Review of MAQ Quarry Natural Environment Report, Township of Grey Highlands, Ontario (June 2008-Ongoing)

Mr. Pfohl provided a peer review of aquatic existing conditions report to determine if potential impacts to aquatic life was determined and appropriately addressed. He provided a review of the field program for suitable sampling methods and determination of fish habitat. Significant environmental resources were present on, and adjacent to, the proposed below- water table quarry, including a provincially significant wetland, habitat of endangered species and other provincially-rare species. Proponents challenged the identification of Significant Wildlife Habitat and Significant Woodlands on the site. The proposal also created debate over the protection of environmental resources and whether the provision of a supply of aggregate material close to markets should take precedence. Proponents have yet to address outstanding comments.

Fish Habitat Assessments, Road Crossings, Various Clients across Ontario (2007-Ongoing)

Responsible for collecting and mapping fish habitat information for over 70 various road crossing and highway twinning projects in Ontario. Habitat Assessments (MTO Protocol 2006) were completed as part of the information requirements based on the Environmental Assessment Act. Information has been presented at Public Information Centers, in Environmental Study Reports and various Environmental Assessment documents for regulatory review.

Municipal Class Environmental Assessment, Schedule C for the Dissette Street Widening, Town of Bradford West Gwillimbury, Ontario (2007-2010)

Aquatic Resource Specialist responsible for coordinating the aquatic existing conditions survey to determine potential for fish habitat as defined under the Fisheries Act for future road widening. Consultation with the Lake Simcoe Region Conservation Authority (LSRCA) to develop a program which included sampling of local watercourses, habitat mapping (MTO Protocol 2006) and background review for reporting EA requirements. Submission of a Letter of Intent (LOI) to LSRCA to provide watercourse improvements in conjunction with mitigation and monitoring efforts to avoid a HADD to fish habitat was facilitated.

Municipal Class Environmental Assessment, Brook Trout Spawning Surveys, Credit River, Orangeville Waste Water Treatment Plant Expansion, Town of Orangeville, Ontario (2007-Ongoing)

Aquatic Resources Specialist responsible for conducting Brook trout spawning surveys with the Credit Valley Conservation Authority (CVC) on the upper Credit River. Spawning Surveys were required to determine presence/absence of critical habitat for Brook trout in sections of the Credit River downstream from the Orangeville Waste Water Treatment Plant. Concerns from CVC on the proposed expansion of the plant triggered more intense investigations of the Credit River immediately downstream of the outfall.

Various Wind Energy Projects, Amphibian Monitoring, Confidential Clients, Southern Ontario (2007-Ongoing)

Responsible for developing and conducting Amphibian Monitoring programs for spring breeding surveys. Breeding surveys were developed based on the Marsh Monitoring program for Ontario. Survey results were reported for each study area and included in the Provincial and Federal Environmental Assessment documents.

Victor Diamond EIA/Baseline Study, Annual Fisheries Surveys, DeBeers Canada, Attawapiskat, Ontario (2004-2006)

Field project manager responsible for baseline studies and annual fisheries surveys to quantify Whitefish and Brook trout abundance in potential groundwater drawdown areas for a proposed diamond mine in northern Ontario. Required to obtain



Fish and Wildlife Act "Scientific Collection Permits" and Public Lands Act "Work Permits" from Ministry of Natural Resources (MNR) to conduct annual surveys. Construction of a full span fish fence to determine fall migratory species and abundance in the Nayshkootayow River. Trained First Nations field staff to monitor water quality and fish abundance in potential groundwater drawdown areas. Obtained "Permit to Take Water" from MOE for waterway crossings and provided environmental monitoring during construction. Collection of tissue samples analyzed for the "Sportfish Eating Guide of Ontario" and future reference for Brook trout DNA. Collection of aging structures (otolith and scale) for Lake whitefish, Lake ciscoe and Brook trout. Initiated the first round of benthic collections and water sampling for the Environmental Effects Monitoring (EEM) program based on specific discharge locations. Information collected from baseline studies was included in the EIA and the Comprehensive Study Report for Government Agencies, Public, and First Nations review.

Aquatic Baseline Study, Howell's River, Lab Mag Services, Schefferville, Quebec (2006)

Field project manager responsible for baseline aquatic studies pertaining to the construction of an iron ore mine in northern Labrador. Responsible for locating last remaining stocks of *Ouaniche* (land locked Atlantic salmon) on the Howell's River system for a satellite based telemetry program. Conducted morphometrics, anaesthesia and surgical placement of transmitters in adult *Ouaniche*. Responsible for field crew logistics, aquatic data collection, health and safety in remote locations, and client liaison.

Redhill Creek By-Pass, Environmental Monitor, UMA and Dufferin Construction, City of Hamilton, Ontario (2006)

Environmental Monitor responsible for compliance to the Environmental Protection and Sediment and Erosion Control Plan related to highway construction works. Required to submit daily environmental monitoring reports to determine non-compliance issues related to contractor performance. Protection of significant habitat adjacent to project construction limits. MTO project number.

Goreway Road Expansion, Fisheries Assessment, Brampton, Ontario (2006)

Responsible for collecting field data for fish habitat assessments of approximately 7 water crossings along the proposed ROW using the new MTO/DFO/MNR protocol for future expansion of Goreway Road.

Lakes and Rivers Improvement Act (LRIA), Permit Application for Dam Construction, Confidential Client, Uxbridge Township, Ontario (2006)

Project coordinator responsible for the submission of a LRIA permit application to construct a dam on a tributary of Duffins creek. Required to coordinate and fulfill the information requirements set out in the LRIA guidelines for MNR permit applications.

Hwy 410 Extension, Fisheries Assessment, Brampton, Ontario (2005)

Responsible for conducting fish habitat assessments and fish inventories for a section of Etobicoke Creek for the Hwy 410 extension. The aquatic ecosystems inventory and assessment was carried out to meet the established criteria set forth by the Ontario Ministry of Transportation (MTO), "*Environmental Reference for Highway Design*", November 2002 (ERD).

Hwy 5 West of Hwy 6 and East of Hwy 8, Preliminary Design, Hamilton, Ontario (2005)

Aquatic ecosystem and existing conditions assessment for watercourses along Hwy 5, West of Hwy 6 and East of Hwy 8. The aquatic ecosystems inventory and assessment was carried out to meet the established criteria set forth by the Ontario Ministry of Transportation (MTO), "*Environmental Reference for Highway Design*", November 2002 (ERD).

GO Transit Rail Line Expansion, URS Corporation, Hamilton to Burlington, Ontario (2005)

Responsible for determining all waterway crossings and potential impacts to fish habitat associated with the expansion of an existing rail line from Hamilton to Burlington.

Parry Sound Power Generation, Seguin River Water Management Plan, Fisheries Impacts Associated with Historical Dam Manipulation, Parry Sound, Ontario (2005)

Responsible for determining potential fisheries habitat impacts for the Seguin River System based on historical information on dam manipulation provided by Parry Sound Power Generation.

Environmental/Construction Monitoring, Montcalm Mine, Falcon Bridge, Timmins, Ontario (2005)

Environmental monitor responsible for environmental and construction monitoring for the installation of a pipeline diffuser in the Groundhog river, Timmins, ON. Responsible for contractor supervision, fish and wildlife monitoring, water quality monitoring and the implementation of the Sediment and Erosion Control Plan.



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Walleye Spawning Survey, Parry Sound Power Generation, Parry Sound, Ontario (2005)

Responsible for enumeration of spawning Walleye (*Sander vitreus vitreus*) in the Seguin River downstream of the Parry Sound Power Generation, Hydroelectric Dam in Parry Sound. Information collected was presented to stakeholders and public interest groups in conjunction with the Ministry of Natural Resources (MNR) and Department of Fisheries and Oceans (DFO).

Habitat Suitability for Walleye, Three Nations Lake, Pamour Mine Expansion Project, Porcupine Joint Venture, Timmins, Ontario (2004)

Conducted an extensive literature review of Suitable Habitat for Walleye (*Sander vitreus vitreus*). The information was used to determine suitable habitat, substrate, depths, and spawning shoal design for a compensation plan for Three Nations Lake. The lake was dyked to provide access to subsurface gold deposits and a new section of the lake was flooded to provide a "no net loss" of fish habitat.

Site Reconnaissance of the Pembina Pipeline Oil Spill, Pine River, District of Chetwynd, British Columbia (2000-2003)

Field project manager responsible for coordinating and conducting the 2000-2002 site reconnaissance of the Pine River Oil Spill, the largest oil spill to a fresh water environment in North America which occurred on August 1, 2000. Responsible for coordinating and conducting a fingerprinting program with BC Research to determine the original source of hydrocarbons present in the Pine River. Accessed depositional areas along the river using a canoe, and video documented sampling locations for future legal evidence. Reviewed analytical data for report preparation and submission to regulatory agencies. Information regarding observations, sampling techniques, and analytical data were presented to the District council members, residents of Chetwynd, and Government Officials at public information sessions.

Kokanee Stranding Assessment, BC Hydro, Duncan River, Nelson, British Columbia (2003)

Field team member responsible for a Kokanee stranding assessment during a reduction in water flows at a BC Hydro generating dam on the Duncan River in Nelson, BC. Stranded fish were captured using electro-fishing methods for identification and enumeration. Data collected will be used to determine effects on fish during future flow reductions.

Environmental Monitoring and Fish Salvage, Stanley Park Seawall Undermining Repair, Vancouver Board of Parks and Recreation, Vancouver, British Columbia (2003)

Environmental monitor required to inspect construction activities including shotcrete applications in a marine environment for the Stanley Park Seawall. Responsible for obtaining specific fish collection permits and approval of work permit extensions from the DFO on behalf of the client. Selected tidal pools were bailed and marine life collected and transported to the Burrard Inlet for release prior to the preparation of undermined locations. An environmental monitoring report including fish collection details was submitted to the DFO for review.

Environmental Protection Plan, Stanley Park Seawall Undermining Repair, Vancouver Board of Parks and Recreation, Vancouver, British Columbia (2003)

Responsible for the preparation of an Environmental Protection Plan that was reviewed by DFO prior to gaining approval for the repair works along the Stanley Park Seawall.

Environmental Monitoring, BC Hydro Substation Construction, Alltec Corporation, Langley, British Columbia (2003)

Environmental monitor responsible for environmental and construction monitoring for a BC Hydro Substation adjacent to a Restrictive Covenant zone. Responsible for water quality testing and sampling, client liaison, and reporting any infractions to the provincial regulations. A final monitoring report was sent to the Ministry of Water Land and Air Protection, Habitat Protection Branch for final review.

Fisheries Habitat Overview, Aurora South, Syncrude, Fort MacMurray, Alberta (2003)

Responsible for conducting a reach break analysis for the Regional Study Area (RSA) selected for future Oil Sands mining in north-eastern Alberta. Potential fisheries and wildlife values have been determined and documented using background information and an aerial photography of the RSA. Information gathered was used for the Environmental Impact Assessment (EIA) for future development.

Natural Gas Well Feasibility Study, Rosetta Exploration, Hudson's Hope, British Columbia (2002)

Project manager and coordinator required to determine the feasibility of an exploration well for natural gas. Site investigations were conducted in a remote location in north-eastern BC to determine if previous occupants have impacted an area used for previous oil and gas exploration. Information collected was used to determine future impacts on the local ecology. Information



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presented to the client was reviewed by the Oil and Gas Commission prior to gaining permits for future exploration.

Environmental Effects Monitoring, Equity Mine, Placer Dome, Houston, British Columbia (2002)

Responsible for conducting and coordinating fieldwork and an Environmental Effects Monitoring (EEM) program for Silver mine in northern BC. A release of tailings effluent into the local watershed from previous spring runoff was investigated using biological indicators and water and sediment quality. Installation of periphyton blocks and invertebrate baskets used were used to monitor downstream conditions. A sediment-sampling program in a lake near the mine was also incorporated into the effects monitoring program to determine concentrations and toxicity to invertebrates from possible metals contamination.

Environmental Protection Plan/Environmental Monitoring for a Culvert Removal and Habitat Restoration, Innovative Housing, Surrey, British Columbia (2002)

Responsible for final submission of the Environmental Protection Plan to the Ministry of Water Land and Air Protection, Habitat Protection Section, for review and approval for "Working in and about a stream". Christopher was the on-site Environmental monitor for the construction work related to the removal of a culvert to daylight an existing creek and substrate placement to provide habitat restoration. Responsible for documenting construction activities, water quality monitoring, client liaison and final reporting required by Ministry of Water Land and Air Protection.

2000 Follow-up Studies to the Stewart Creek Oil Spill, Confidential Client, Stewart Creek, British Columbia (2000)

Responsible for conducting sediment and benthic invertebrate sampling program at seven sites in the fall of 2000, five years after a crude oil spill in the Stewart Creek watershed. The project involved comparisons of the hydrocarbon and benthic invertebrate data collected in 1995, 1997, and 2000.

Fish Collection and Sediment Sampling, Translink, Richmond, British Columbia (2000)

Conducted fish collection and sediment sampling to determine and compare Polycyclic Aromatic Hydrocarbons (PAHs) in fish tissue and sediment samples. Analytical results of the sediment were compared to the fish tissue and the consumption levels presented in the "Guide to Eating Sportfish, 2001", Ministry of Environment, Ontario.

Biological Inventory

Christopher has been certified by MNR/TRCA under the Ontario Stream Assessment Protocol (OSAP) with addition certification by the Ontario Benthos Biomonitoring Network (OBBN). He has completed the Ontario Fishes Identification Course presented by the Royal Ontario Museum, and is certified by MNR as a Class 1 Electrofishing Crew Leader and trainer. Christopher has been certified under the MTO/DFO/MNR Fisheries Protocol, Fisheries Assessment Specialist, Fisheries Contract Specialist presented by MTO/DFO/MNR in November 2006, and is RAQS certified by MTO. Christopher has completed the Ontario Freshwater Mussel Identification Workshop (DFO), the Marsh Monitoring protocol for Amphibian Breeding surveys and egg mass surveys for breeding salamanders (Species at Risk). He has conducted numerous aquatic inventories in Ontario, Labrador and British Columbia, in local watersheds to very remote areas in northern climates.

Health and Safety

Christopher has been a Health and Safety Committee member and employee representative for the last 6 years and has completed numerous Health and Safety Plans for a variety of projects.

Appendix H
DFO Operational Statements



NOTIFICATION FORM

Fisheries and Oceans Canada
Ontario Operational Statement

Version 3.1

PROPONENT INFORMATION

NAME:	STREET ADDRESS:	
CITY/TOWN:	PROVINCE/TERRITORY:	POSTAL CODE:
TEL. NO. (RESIDENCE):	TEL. NO. (WORK):	
FAX NO:	EMAIL ADDRESS:	

CONTRACTOR INFORMATION (provide this information if a Contractor is working on behalf of the Proponent)

NAME:	STREET ADDRESS:	
CITY/TOWN:	PROVINCE/TERRITORY:	POSTAL CODE:
TEL. NO. (RESIDENCE):	TEL. NO. (WORK):	
FAX NO:	EMAIL ADDRESS:	

PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- | | | |
|---|---|---|
| <input type="checkbox"/> Beach Creation for Residential Use | <input type="checkbox"/> Ice Bridges and Snow Fills | <input type="checkbox"/> Public Beach Maintenance |
| <input type="checkbox"/> Beaver Dam Removal | <input type="checkbox"/> Isolated Pond Construction | <input type="checkbox"/> Punch & Bore Crossings |
| <input type="checkbox"/> Bridge Maintenance | <input type="checkbox"/> Isolated or Dry Open-cut Stream Crossings | <input type="checkbox"/> Routine Maintenance Dredging |
| <input type="checkbox"/> Clear-Span Bridges | <input type="checkbox"/> Maintenance of Riparian Vegetation in Existing Rights-of-Way | <input type="checkbox"/> Submerged Log Salvage |
| <input type="checkbox"/> Culvert Maintenance | <input type="checkbox"/> Mineral Exploration Activities | <input type="checkbox"/> Temporary Stream Crossing |
| <input type="checkbox"/> Dock and Boathouse Construction | <input type="checkbox"/> Moorings | <input type="checkbox"/> Underwater Cables |
| <input type="checkbox"/> High-Pressure Directional Drilling | <input type="checkbox"/> Overhead Line Construction | |

Select the type of water body or watercourse at or near your project:

- | | | |
|---|---|----------------------------------|
| <input type="checkbox"/> River, Stream, Creek | <input type="checkbox"/> Marine (Ocean or Sea) | <input type="checkbox"/> Estuary |
| <input type="checkbox"/> Lake (8 hectares or greater) | <input type="checkbox"/> Pond or wetland (pond is less than 8 hectares) | |

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available Easting: _____ Northing: _____ Latitude: _____ Longitude: _____
Legal Description (Plan, Block, Lot, Concession, Township)	Directions to Access the Project Site (i.e., Route or highway number, etc.)
Proposed Start Date (YYYY/MM/DD):	Proposed Completion Date (YYYY/MM/DD):

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending in, by mail or by fax, this notification form to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to the Operational Statement.

I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

Signature _____ Date _____

Note: If you cannot meet all of the conditions and cannot incorporate all of the measures in the Operational Statement then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list), or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain more information on the possible options you should consider to avoid contravention of the *Fisheries Act*. For activities carried out under the *Crown Forest Sustainability Act*, the requirements of the applicable Operational Statements are addressed through an existing agreement and the Ontario Ministry of Natural Resources is the first point of contact.

Information about the above-noted proposed work or undertaking is collected by DFO under the authority of the *Fisheries Act* for the purpose of administering the fish habitat protection provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank DFO-SCI-605. Under the *Privacy Act*, individuals have a right to, and on request shall be given access to, any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at www.infosource.gc.ca or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provisions of the *Access to Information Act*.

FISHERIES AND OCEANS CANADA OFFICES IN ONTARIO

Southern Ontario District

Burlington

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Eastern Ontario District

Peterborough

Fisheries and Oceans Canada
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Peterborough, ON K9H 7S3
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Northern Ontario District

Parry Sound

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Sudbury and Sault Ste. Marie

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Thunder Bay and Kenora

Fisheries and Oceans Canada
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Aussi disponible en français

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp



[Home](#) > [Central and Arctic](#) > [Habitat Management](#) > [Operational Statements, Reviews and Authorizations](#)
> [Operational Statements](#) > [Ontario](#) > Punch & Bore Crossings

Punch & Bore Crossings

Version 3.0

Fisheries and Oceans Canada
Ontario Operational Statement

For the purpose of this Operational Statement, the term punch and bore refers to a trenchless crossing method which involves the excavation of a vertical bell hole or shallow depression on either side of the watercourse. Horizontal punching or boring between the two points, at an appropriate depth below the watercourse, completes the creation of a passage-way for the crossing. Punch and bore crossings allow cables and pipelines to be installed under watercourses without imparting any disturbance to the bed and banks. Punch and bore crossings differ from high-pressure directional drilled crossings, in that no pressurized mud systems are required, thereby avoiding the risk of sediment release due to frac-out.

Punch and bore crossings can negatively impact fish and fish habitat due to erosion and sedimentation from site disturbance and dewatering of bell holes or the collapse of the punch or bore hole under the stream. Disturbing riparian vegetation can reduce important shoreline cover, shade and food production areas. Machinery fording the stream can disturb bottom and bank substrates, disrupt sensitive fish life stages, and introduce deleterious substances if equipment is not properly maintained. Impacts can be reduced if an emergency response plan and clean-up materials are in place.

The general order of preference for carrying out a cable or pipeline stream crossing in order to protect fish and fish habitat is: a) a punch or bore crossing, b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling Operational Statement*), c) dry open-cut crossing, and d) isolated open-cut crossing (see *Isolated or Dry Open-cut Stream Crossings Operational Statement*). This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the [Fisheries Act](#) no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the [Fisheries Act](#).

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to be incorporated into your project in order to avoid negative impacts to fish habitat. You may proceed with your punch or bore crossing project without a DFO review when you meet the following conditions:

- the crossing is not a wet open-cut crossing,
- the crossing technique will not damage the stream bed or bank and thereby negatively impact fish or fish habitat,
- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Conducting Punch and Bore Crossings*, listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the [Fisheries Act](#) and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and

the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (<http://www.dfo-mpo.ca/regions/central/habitat/os-ao/provinces-territoires-territoires/on/os-ao20-eng.htm>) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Conducting Punch and Bore Crossings

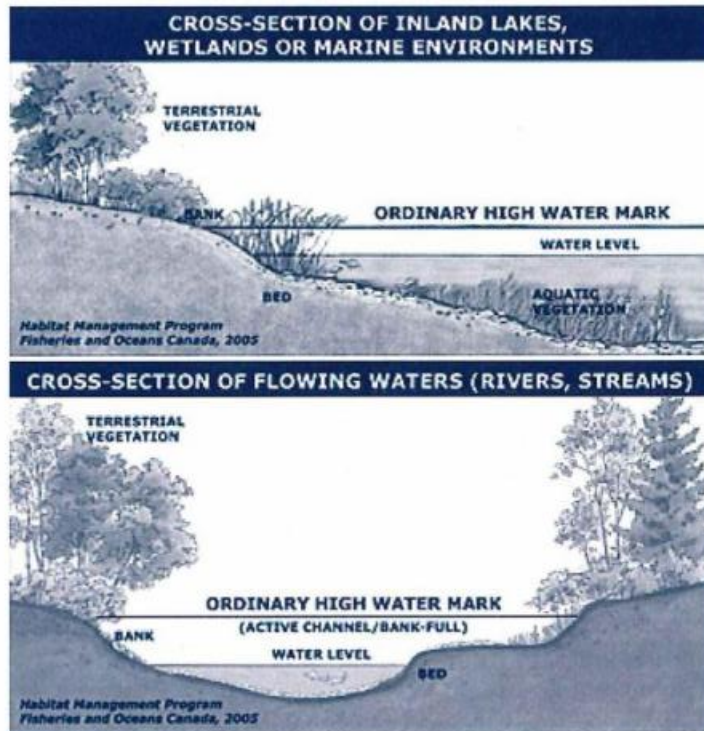
1. A punch or bore crossing can be conducted at any time of the year provided there is not a high risk of failure and it does not require in-water activities such as machinery fording.
2. Design the punch or bore path for an appropriate depth below the watercourse to prevent the pipeline or cable from becoming exposed due to natural scouring of the stream bed.
3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site and to excavate the bell holes. This removal is to be kept to a minimum and within the utility right-of-way.
4. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the water body. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.
 - 5.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
 - 5.2. Grading of the stream banks for the approaches should not occur.
 - 5.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
 - 5.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
 - 5.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
6. Operate machinery on land above the ordinary high water mark (HWM) (see definition below) and in a manner that minimizes disturbance to the banks of the watercourse.
 - 6.1. Machinery is to arrive on-site in a clean condition and is to be maintained free of fluid leaks.
 - 6.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
 - 6.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
7. Excavate bell holes beyond the HWM, far enough away from any watercourse to allow containment of any sediment or deleterious substances above the HWM.
 - 7.1. When dewatering bell holes, remove suspended solids by diverting water into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering the watercourse.

- 7.2. Stabilize any waste materials removed from the work site (including bell holes) to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
- 7.3. After suitably backfilling and packing the bell holes, vegetate any disturbed areas (see Measure 11).
8. Monitor the watercourse to observe signs of malfunction during all phases of the work.
 9. For the duration of the work, keep on-site and readily accessible, all material and equipment needed to contain and clean-up releases of sediment-laden water and other deleterious substances.
 10. Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance. This plan is to include measures to: a) stop work, contain sediment-laden water and other deleterious substances and prevent their further migration into the watercourse; b) notify all applicable authorities in the area, including the closest DFO office; c) promptly clean-up and appropriately dispose of the sediment-laden water and deleterious substances; and d) ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.
 11. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 11.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's *Fish Habitat and Determining the High Water Mark on Lakes*.



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Overhead Line Construction

Version 3.0

Fisheries and Oceans Canada
Ontario Operational Statement

Overhead lines are constructed for electrical or telecommunication transmission across many watercourses that range in size from small streams and ponds to large rivers, lakes and reservoirs. This Operational Statement applies to selective removal of vegetation along the right-of-way to provide for installation and safe operation of overhead lines, and passage of equipment and materials across the water body.

Although fish habitat occurs throughout a water system, it is the riparian habitat that is most sensitive to overhead line construction. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas. It is important to design and build your overhead line project to meet your needs while also protecting riparian areas. Potential impacts to fish and fish habitat include excessive loss of riparian vegetation, erosion and sedimentation resulting from bank disturbance and loss of plant root systems, rutting and compaction of stream substrate at crossing sites, and disruption of sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your overhead line project without a DFO review when you meet the following conditions:

- it does not require the construction or placement of any temporary or permanent structures (e.g. islands, poles, crib works, etc.) below the ordinary high water mark (HWM) (see definition below), and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (<http://www.dfo-mpo.ca/regions/central/habitat/os-oo/provinces-territoires-territoires/on/os-oo20-eng.htm>) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines

1. Installing overhead lines under frozen conditions is preferable in all situations. On wet terrains (e.g., bogs), lines should be installed under frozen conditions, where possible, or using aerial methods (i.e., helicopter).
2. Design and construct approaches so that they are perpendicular to the watercourse wherever possible to minimize loss or disturbance to riparian vegetation.
3. Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or overhead line structures.
 - 3.1. Wherever possible, locate all temporary or permanent structures, such as poles, sufficiently above the HWM to prevent erosion.
4. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to accommodate the overhead line. This removal should be kept to a minimum and within the road or utility right-of-way.
5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.
 - 5.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
 - 5.2. Grading of the stream banks for the approaches should not occur.
 - 5.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
 - 5.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
 - 5.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
6. Operate machinery on land and in a manner that minimizes disturbance to the banks of the watercourse.
 - 6.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
 - 6.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
 - 6.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
 - 6.4. Restore banks to original condition if any disturbance occurs.
7. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
 - 7.1. Avoid work during wet, rainy conditions or use alternative techniques such as aerial methods (i.e., helicopter) to install overhead lines.
8. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
9. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds

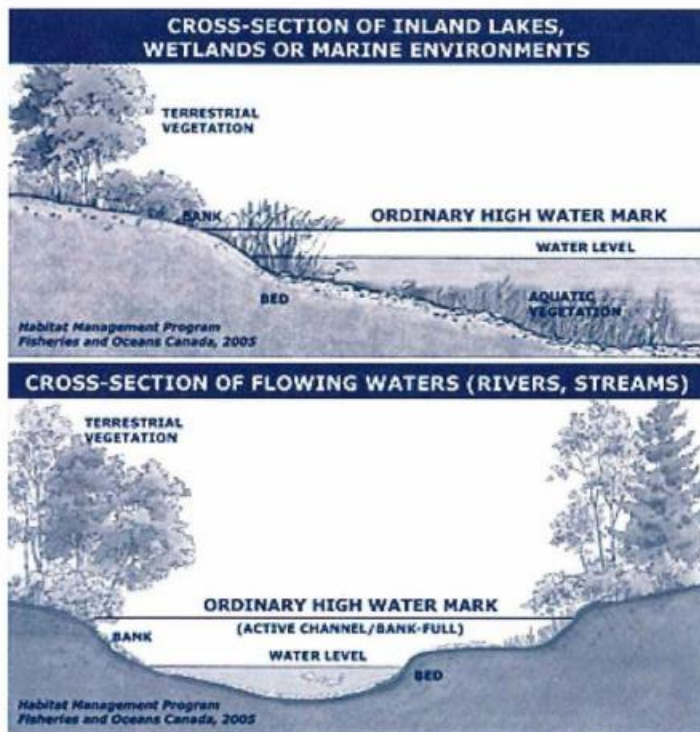
germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

9.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO’s *Fish Habitat and Determining the High Water Mark on Lakes*.



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High-Pressure Directional Drilling

Version 3.0

Fisheries and Oceans Canada
Ontario Operational Statement

For the purpose of this Operational Statement, the term High-Pressure Directional Drilling (HPDD) means trenchless methods of crossing a watercourse using pressurized mud systems. HPDD is used to install cables and pipelines for gas, telecommunications, fibre optics, power, sewer, oil and water lines underneath watercourses and roads. This method is preferable to open-cut and isolated crossings since the cable or pipeline is drilled underneath the watercourse with very little disturbance to the bed or banks. HPDD involves drilling a pilot bore hole underneath the watercourse towards a surface target, back-reaming the bore hole to the drill rig while pulling the pipe along through the hole. This process typically uses the freshwater gel mud system composed of a mixture of clean, freshwater as the base, bentonite (clay-based drilling lubricant) as the viscosifier and synthetic polymers.

The general order of preference for carrying out a cable or pipeline stream crossing in order to protect fish and fish habitat is: a) a punch or bore crossing (see *Punch & Bore Crossings* Operational Statement), b) HPDD crossing, c) dry open-cut crossing, and d) isolated open-cut crossing (see *Isolated or Dry Open-cut Stream Crossings* Operational Statement). This order must be balanced with practical considerations at the site.

One of the risks associated with HPDD is the escape of drilling mud into the environment as a result of a spill, tunnel collapse or the rupture of mud to the surface, commonly known as "frac-out". A frac-out is caused when excessive drilling pressure results in drilling mud propagating toward the surface. The risk of a frac-out can be reduced through proper geotechnical assessment practices and drill planning and execution. The extent of a frac-out can be limited by careful monitoring and having appropriate equipment and response plans ready in the event that one occurs. HPDD can also result in excessive disturbance of riparian vegetation and sedimentation and erosion due to operation of equipment on the shoreline or fording to access the opposite bank.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the [Fisheries Act](#) no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the [Fisheries Act](#).

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your high-pressure directional drill project without a DFO review when you meet the following conditions:

- the crossing technique will not damage the stream bed and thereby negatively impact fish or fish habitat,
- the crossing is not a wet open-cut crossing,
- you have an emergency frac-out response plan and a contingency crossing plan in place that outline the protocol to monitor, contain and clean-up a potential frac-out and an alternative method for carrying out the crossing, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when High-Pressure Directional Drilling* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent-Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Ontario Operational Statement notification form (<http://www.dfo-mpo.ca/regions/central/habitat/os-ao/provinces-territoires-territoires/on/os-ao20-eng.htm>) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when High-Pressure Directional Drilling

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.
2. Design the drill path to an appropriate depth below the watercourse to minimize the risk of frac-out and to a depth to prevent the line from becoming exposed due to natural scouring of the stream bed. The drill entry and exit points are far enough from the banks of the watercourse to have minimal impact on these areas.
3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility right-of-way.
4. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing Operational Statement* is also available.
 - 4.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
 - 4.2. Grading of the stream banks for the approaches should not occur.
 - 4.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
 - 4.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
 - 4.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
5. Operate machinery on land above the ordinary high water mark (see definition below) and in a manner that minimizes disturbance to the banks of the watercourse.
 - 5.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
 - 5.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
 - 5.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
 - 5.4. Restore banks to original condition if any disturbance occurs.

6. Construct a dugout/settling basin at the drilling exit site to contain drilling mud to prevent sediment and other deleterious substances from entering the watercourse. If this cannot be achieved, use silt fences or other effective sediment and erosion control measures to prevent drilling mud from entering the watercourse. Inspect these measures regularly during the course of construction and make all necessary repairs if any damage occurs.
 - 6.1. Dispose of excess drilling mud, cuttings and other waste materials at an adequately sized disposal facility located away from the water to prevent it from entering the watercourse.
7. Monitor the watercourse to observe signs of surface migration (frac-out) of drilling mud during all phases of construction.

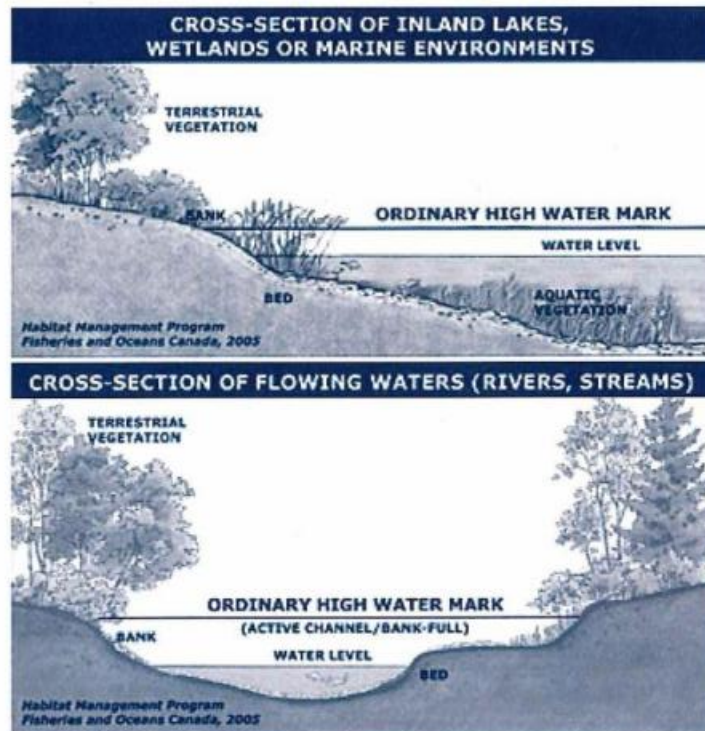
Emergency Frac-out Response and Contingency Planning

8. Keep all material and equipment needed to contain and clean up drilling mud releases on site and readily accessible in the event of a frac-out.
9. Implement the frac-out response plan that includes measures to stop work, contain the drilling mud and prevent its further migration into the watercourse and notify all applicable authorities, including the closest DFO office in the area (see Ontario DFO office list). Prioritize clean up activities relative to the risk of potential harm and dispose of the drilling mud in a manner that prevents re-entry into the watercourse.
10. Ensure clean up measures do not result in greater damage to the banks and watercourse than from leaving the drilling mud in place.
11. Implement the contingency crossing plan including measures to either re-drill at a more appropriate location or to isolate the watercourse to complete the crossing at the current location. See *Isolated or Dry Open-cut Stream Crossings Operational Statement* for carrying out an isolated trenched crossing.
12. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.
13. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 13.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Definition:

Ordinary high water mark – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

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Isolated or Dry Open-cut Stream Crossings

Version 1.0

Fisheries and Oceans Canada
Ontario Operational Statement

For the purpose of this Operational Statement, the term "Isolated Crossing" means a temporary stream crossing technique that allows work (e.g., trenched pipeline or cable installation) to be carried out "in-the-dry" while diverting the natural flow around the site during construction. These types of open trenched crossings are isolated using flume or dam and pump techniques (see *Pipeline Associated Watercrossings*, 2005 at www.capp.ca/library/publications/industryOperations/pages/pubInfo.aspx?DocId=96717). The term "Dry Open-cut Stream Crossing" means a temporary stream crossing work (e.g., trenched pipeline or cable installation) that is carried out during a period when the entire stream width is seasonally dry or is frozen to the bottom.

The risks to fish and fish habitat associated with isolated open cut stream crossings include the potential for direct damage to substrates, release of excessive sediments, loss of riparian habitat, stranding of fish in dewatered areas, impingement/entrainment of fish at pump intakes, and disruption of essential fish movement patterns. Similarly, dry open-cut stream crossings pose a risk to fish and fish habitat due to potential harmful alteration of substrates, loss of riparian habitat, and release of excessive sediment once stream flows resume.

The order of preference for carrying out a cable or pipeline stream crossing, in order to protect fish and fish habitat, is: a) punch or bore crossing (see *Punch & Bore Crossings* Operational Statement); b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling* Operational Statement); c) dry open-cut crossing; and d) isolated open-cut crossing. This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your isolated or dry open-cut stream crossing project without a DFO review when you meet the following conditions:

- if working within the Thames River, Sydenham River, Ausable River, Grand River, or Maitland River, you have contacted your Conservation Authority or local DFO Office (see Ontario DFO office list) to ensure that your project will not impact Schedule I mussel species at risk under the federal *Species at Risk Act* (SARA), before proceeding,
- for dry, open-cut crossings the watercourse is dry or frozen completely to the bottom at the site,
- for isolated crossings, the channel width of the watercourse at the crossing site is less than 5 meters from ordinary high water mark to ordinary high water mark (HWM) (see definition below),
- the isolated crossing does not involve the construction or use of an off-stream diversion channel, or the use of earthen dams,
- the isolated crossing ensures that all natural upstream flows are conveyed downstream during construction, with no change in quality or quantity,

- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling,
- the use of explosives is not required to complete the crossing, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-cut Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact your Conservation Authority, or the DFO office in your area (see Ontario DFO office list) or Parks Canada if the project is located within its jurisdiction, including the Trent- Severn Waterway and the Rideau Canal, if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with SARA (www.sararegistry.gc.ca). If you have questions regarding this Operational Statement, please contact one of the agencies listed above.

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Ontario Operational Statement notification form (www.dfo-mpo.gc.ca/regions/central/habitat/os-ao/provinces-territoires-territoires/on/os-ao20-eng.htm) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-Cut Stream Crossing

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.
2. Locate crossings at straight sections of the stream, perpendicular to the banks, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.
3. Complete the crossing in a manner that minimizes the duration of instream work.
4. Construction should be avoided during unusually wet, rainy or winter thaw conditions.
5. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the utility right-of-way.
6. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use. Operational Statements are also available for *Ice Bridges and Snow Fills*, *Clear-Span Bridges*, and *Temporary Stream Crossing*.
 - 6.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
 - 6.2. Grading of the stream banks for the approaches should not occur.
 - 6.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
 - 6.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Ontario In-Water Construction Timing Windows*).
 - 6.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

7. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
 - 7.1. Protect entrances at machinery access points (e.g., using swamp mats) and establish single site entry and exit.
 - 7.2. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
 - 7.3. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water.
 - 7.4. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
8. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
 - 10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated Crossing

Temporary isolation is used to allow work "in-the-dry" while maintaining the natural downstream flow by installing dams up and downstream of the site and conveying all of the natural upstream flow into a flume, or pumping it around the isolated area. In addition to measures 1 to 10, the following measures should be carried out when conducting an isolated stream crossing:

11. Time isolated crossings to protect sensitive fish life stages by adhering to fisheries timing windows (see Measure 6.4).
12. Use dams made of non-earthen material, such as waterinflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.
 - 12.1. If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
 - 12.2. Design dams to accommodate any expected high flows of the watercourse during the construction period.
13. Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.
 - 13.1. You will require a permit from DFO to relocate any aquatic species that are listed as either endangered or threatened under SARA. Please contact your Conservation Authority or the DFO office in your area to determine if an aquatic species at risk is in the vicinity of your project and, if appropriate, use the DFO website at www.dfo-mpo.gc.ca/species-especies/act-loi/act-loi-eng.htm to apply for a permit.
14. Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.
15. Remove accumulated sediment and excess spoil from the isolated area before removing dams.
16. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition before removing dams.

17. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.
18. If rock is used to stabilize banks, it should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events. The rock should be placed at the original stream bank grade to ensure there is no infilling or narrowing of the watercourse.
19. Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
20. During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.
21. **Pumped Diversions**

Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

 - 21.1. Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline (1995)*, available at [www.dfo-mpo.gc.ca/Library/ 223669.pdf](http://www.dfo-mpo.gc.ca/Library/223669.pdf) (PDF Version, 2.93 Mb)).
 - 21.2. Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.
 - 21.3. Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed.

Measures to Protect Fish and Fish Habitat when Carrying Out a Dry Open-Cut Stream Crossing

In addition to measures 1 to 10, the following measures should be carried out when conducting a dry open-cut stream crossing:

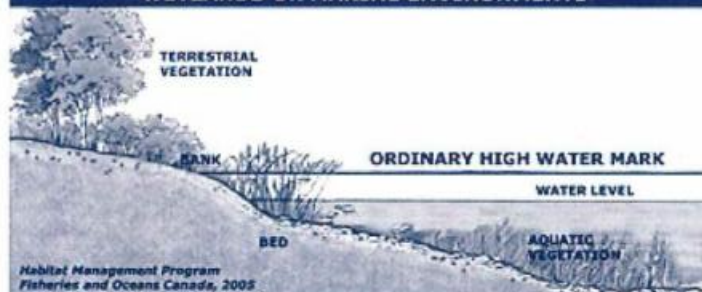
22. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition.
23. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and re-vegetated, preferably with native species.

Definition:

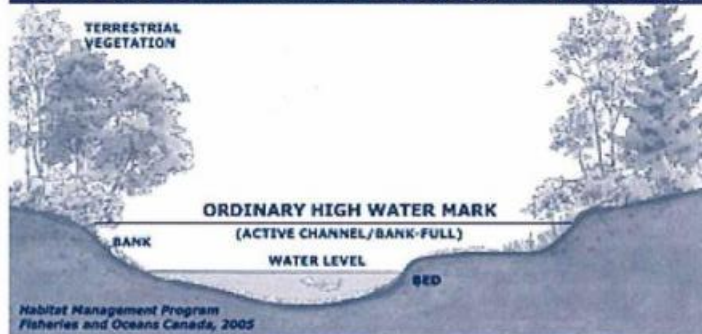
Ordinary high water mark (HWM) – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes, wetlands or marine environments it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).

For the Great Lakes this refers to the 80th percentile elevation above chart datum as described in DFO's Fish Habitat and Determining the High Water Mark on Lakes.

**CROSS-SECTION OF INLAND LAKES,
WETLANDS OR MARINE ENVIRONMENTS**



CROSS-SECTION OF FLOWING WATERS (RIVERS, STREAMS)



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