Appendix F:
Aquatics Technical Report

Technical Report on Fish and Fish Habitat at Sylvia Lake

Final Report

Stantec Consulting Ltd.

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1.0 Introduction

The Tim Horton Children's Foundation (THCF) is proposing the development of a youth leadership camp on the shores of the Winnipeg River at Sylvia Lake (herein referred to as the "Site"). It is our understanding that the development of the camp will include the following components which may affect aquatic habitat:

- Installation of dock structures and a swimming area along the eastern shoreline of the Site.
- Installation of a shallow shoreline well for an on-site potable water treatment system.
- Installation of a dry hydrant with an intake off the eastern shoreline north of the beach area for fire protection.

This technical report includes a description of the aquatic habitat within the project area and an assessment of fish habitat potentially affected by project activities. Specifically, the objectives of this analysis were to provide information on aquatic habitat quality along the shoreline of the Site, and to provide information on aquatic habitat quality in the vicinity of the proposed dock structures.

2.0 Methods

The habitat assessment presented below is based on both desktop analysis and field observation. Preliminary examination of the Site to determine existence of surface drainage pathways, shoreline substrate, shoreline length and riparian vegetation was facilitated through the use of high-resolution aerial photography acquired by THCF. A list of fish species inhabiting the Winnipeg River was developed from reference texts (Scott and Crossman 1973; Stewart and Watkinson 2004). A field assessment was carried out on August 18, 2010, for the proposed Site, and on September 23, 2010. The following information was collected:

- Water depth
- Water temperature
- Estimation of substrate composition and compaction
- Visual estimate of turbidity
- Species list of submerged and emergent aquatic plants, including an estimate of distribution and relative abundance based on a DAFOR (Dominant, Abundant, Frequent, Occasional, or Rare) scale (see Smith 1996 for numerical equivalent)
- Riparian and shoreline substrate and vegetation
- Susceptibility to disturbance

Based on the field data and reference texts, the existing aquatic habitat was described, including development of a list of expected fish species and identification of fish Species at Risk listed by the *Species at Risk Act* (SARA), *Manitoba Endangered Species Act* (MESA) or Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Based on the desktop study and field data, fish habitat was described with reference to spawning, rearing, feeding and overwintering habitat potential. The north and east shores of the Site were then assigned an overall fish habitat value of either ‘critical,’ ‘important,’ ‘marginal’ or ‘none,’ as based on guidelines discussed by the Department of Fisheries and Oceans Canada (1998). Critical habitats contain rare or unique features that support a life stage that is considered limiting to the persistence and/or productivity of a fishery (DFO 1998). Important habitats contain features that provide support for one or more life stages for one or more fish species, but are not immediately limiting to the fish they support (DFO 1998). Important habitats are common within an area and are readily available to fish. Marginal habitats have low productive capacity and contribute marginally to fish production (DFO 1998). The north and east shores of the Site were also assigned an overall fish spawning designation of H1 (‘no spawning’) or H2 (‘spawning site’), as based on guidelines for fish and fish habitat protection for blasting discussed by the Department of Fisheries and Oceans Canada (DFO 2010).

The potential for harmful alteration, disturbance or destruction (HADD) of fish habitat was then evaluated based on the assessment of the existing environment in relation to the proposed development at the Site.

3.0 Study Area

Sylvia Lake can be classified as a circumneutral, softwater, mesotrophic, lake. The pH is just above neutral and has been measured at approximately 7.5. Total hardness is approximately 40 mg/L, and the Trophic State Index (Carlson 1977), based on Total Nitrogen and Total Phosphorus[1], is estimated to be 48.

3.1 EAST SHORELINE

The east shoreline extends southward approximately 250 m from the NE bedrock point to the southern edge of the property (Figure 3-1). The shoreline consists of a narrow stretch of sand and silt backed by an almost vertical bank of silty-clay, approximately 1-1.5 m in height (Photo 3-1). The riparian area is heavily vegetated, with a mature tree canopy, and healthy shrub and herb layers. Trees include green ash, black ash, paper birch, trembling aspen and poplar. Several large trees have fallen into the water, creating a variety of habitat along the shoreline.

Photo 3-1: East Shoreline

Within the river, the substrate slopes gently (<10%) to a depth of approximately 2-2.5 m, at which point there is a steep drop-off to a depth of approximately 5 m. The gently sloping area is approximately 30-45 m in width, increasing in a southward direction. The primarily inorganic substrate is firm and is dominated by a silty-clay material, though in a few areas there are

[1] Based on water quality data collected. Not presented here.

patches of sand. Due to the fine sediments within the riparian and littoral zones, and the lack of cobble/boulder substrate, the area is susceptible to disturbance. Currents along the east shoreline are negligible.

The dominant aquatic vegetation (Table 3-1) within the littoral zone included *Elodea canadensis*, and *Vallisneria americana*, both of which were flowering at the time of the assessment. Abundant aquatic vegetation included *Myriophyllum exalbescens*, which was fruiting, and *Ranunculus aquatilis*, which was flowering. Occasional species included *Potamogeton richardsonii*, and the emergents *Scirpus validus*, *Sagittaria* sp., and *Typha latifolia*.

Table 3-1: Aquatic Plants Observed in the Winnipeg River Adjacent to the Project Site

Systematic Name	Common Name
Elodea canadensis	Canada waterweed
Vallisneria americana	wild celery
Myriophyllum exalbescens	water milfoil
Potamogeton richardsonii	Richardson's pondweed
Scirpus validus	softstem bullrush
Sagittaria sp.	arrowhead
Ranunculus aquatilis	large-leaved watercrowfoot
Typha latifolia	common cattail

The submerged aquatic plants were healthy and very dense, with 100% cover in most of the area that was >approximately 0.5 m and <approximately 2.5 m in depth. The depths, however, are more relative than absolute, because over time, considerable fluctuation occurs within the main channel of the Winnipeg River. In most areas, the aquatic plants grew to the surface and therefore filled the entire water column. There were a few areas where aquatic plants were absent, and beyond the drop-off, no plants were observed, though visibility was limited (<approximately 1 m) due to turbidity, so sparse growth may have been missed.

Despite the healthy growth of the submerged plant community, overall diversity was poor, with only five submerged species observed. The lack of diversity may be due to the fluctuating water levels within the Winnipeg River. Aquatic plants are known to be sensitive to changes in water level, particularly at the scale observed in reservoirs (Rorslett and Johansen 1996) where considerable fluctuation can occur over short time periods.

3.2 NORTH SHORE

The north shore extends westward approximately 650 m from the northeast bedrock point to the western edge of the property (Figure 3-1). The shoreline consists of bedrock with an almost vertical face, and a few areas of lesser slope, with boulder and bedrock (Photo 3-2). The shoreline vegetation, for the most part, is sparse, with mature pine, balsam fir, and spruce scattered amongst the bedrock outcroppings. There are also a few small areas of gentler slope that contain a shrubby understory.

Along most of the north shore, the vertical face of the bedrock continues into the river so that the water depth increases to between 5 and 8 m almost immediately, and there is little to no littoral zone. The substrate along most of the shoreline is bedrock, with some areas of bedrock/boulder. At the western edge of the property there is a small cove with an island just past the property boundary (Figure 3-1). This area contains softer sediments and a limited community of submerged aquatic plants. Species included *Elodea canadensis*, *Myriophyllum exalbescens*, and *Vallisneria americana*.

The western half of the north shore is a restricted narrow channel 50 to 150 m wide that is formed opposite Porcupine Island located in the middle of the Winnipeg River (Figure 3-1). Within the channel, the currents are strong, with noticeable areas of upwelling and turbulence where the channel constricts, or where underwater shelves further restrict flow. Depth in the channel varies, with a maximum depth of approximately 10 m in some areas.

Photo 3-2: Typical Section of North Shoreline (Note the turbid, turbulent water)

4.0 Fish Community

It is expected that approximately 53 species (Table 4-1; Scott and Crossman 1973; Stewart and Watkinson 2004) inhabit the reach of the Winnipeg River that contains Sylvia Lake (between Seven Sisters and Slave Falls). The fish community is complex, with numerous species of mid-level consumers such as Lake Sturgeon, Slimy Sculpin, Logperch and Lake Whitefish, top-level consumers such as Smallmouth Bass, Yellow Perch and Sauger, and apex predators such as Northern Pike, Walleye and Burbot. A number of these species, such as Northern Pike, Walleye, Yellow Perch, Sauger, and Smallmouth Bass, support a robust recreational fishery.

Table 4-1: Fish Species Inhabiting the Winnipeg River System[1]

Systematic Name	Common Name	Systematic Name	Common Name
Ichthyomyzon castanaeus	Chestnut Lamprey	*Esox lucius*	Northern Pike
Ichthyomyzon unicuspis	Silver Lamprey	*Umbra limi*	Central Mudminnow
Acipenser fluvescens	Lake Sturgeon	*Osmerus mordax*	Rainbow Smelt
Hiodon tergisus	Mooneye	*Coregonus artedii*	Cisco
Couesius plumbeus	Lake Chub	*Coregonus clupeaformis*	Lake Whitefish
Luxilus comutus	Common Shiner	*Oncorhynchus mykiss*	Rainbow Trout
Margariscus margarita	Pearl Dace	*Salmo trutta*	Brown Trout
Notemigomus chrysoleucas	Golden Shiner	*Salvelinus fontinalis*	Brook Trout
Notropis atherinoides	Emerald Shiner	*Peropsis omiscomayus*	Troutperch
Notropis heterodon	Blackchin Shiner	*Lota lota*	Burbot
Notropis heterolepis	Blacknose Shiner	*Culaea inconstans*	Brook Stickleback
Notropis hudsonius	Spottail Shiner	*Pungitius pungitius*	Ninespine Stickleback
Notropis percobromus	Carmine Shiner	*Cottus bairdi*	Mottled Sculpin
Notropis texanus	Weed Shiner	*Cottus cognatus*	Slimy Sculpin
Notropis volucellus	Mimic Shiner	*Morone chrysops*	White Bass
Phoxinus eos	Northern Redbelly Dace	*Ambloplites rupestris*	Rock Bass
Chrosomus neogaeus	Finescale Dace	*Micropterus dolomieu*	Smallmouth Bass
Pimephales promelas	Fathead Minnow	*Pomoxis nigromaculatus*	Black Crappie
Plalygobio gracillis	Flathead Chub	*Etheostoma exile*	Iowa Darter
Rhinichthys cataractae	Longnose Dace	*Etheostoma nigrum*	Johnny Darter
Catostomus catostomus	Longnose Sucker	*Perca flavescens*	Yellow Perch
Catostomus commersoni	White Sucker	*Perina caprodes*	Logperch
Moxostoma anisurum	Silver Redhorse	*Percina maculata*	Blackside Darter
Moxostoma macrolepidotum	Shorthead Redhorse	*Percina shumardi*	River Darter
Ameiurus melas	Black Bullhead	*Stizostedion canadense*	Sauger
Ameiurus nebulosus	Brown Bullhead	*Stizostedion vitreum*	Walleye
Noturus gyrinnus	Tadpole Madtom		

[1]List compiled from Scott and Crossman (1973) and Stewart and Watkinson (2004). Other species may exist within the study area, but their presence has not been confirmed.

5.0 Species at Risk

Currently, there are no fish species listed under the *Manitoba Endangered Species Act* (Manitoba Conservation 2010). However, of the fish species listed in Table 4-1, the following three species have been identified by the COSEWIC and/or pursuant to provisions of the SARA as 'Species at Risk':

- **Carmine Shiner:** This species has been identified as 'Threatened' by the COSEWIC. It is listed under the federal SARA and was afforded protection under the SARA as of June 2004. Carmine Shiners typically summer at midwater depths of clear, fast-flowing streams and small rivers over clean gravel or rubble substrates. They often school in riffles and pools near the confluence with larger streams and rivers. The Carmine Shiner has been found in the old Pinawa channel, but has not been found in the mainstem Winnipeg River (Stewart and Watkinson 2004).

- **Lake Sturgeon:** This species has been identified as 'Endangered' by the COSEWIC as of May, 2005, but it has not been listed under SARA. The Lake Sturgeon is found in large lakes and rivers and utilizes fast, turbulent waters for spawning, and medium current for feeding and foraging (Stewart and Watkinson 2004). Based on the habitat along the north shore of the Project Site, it can be expected that Lake Sturgeon are present within Sylvia Lake and the Winnipeg River upstream and downstream of the Project Site.

- **Chestnut Lamprey:** This species has been identified as a species of 'Special Concern' by COSEWIC, but is not listed under the SARA. Chestnut Lamprey spawn in clean, sand/gravel substrate in small streams and develop as filter-feeding larvae for several years before becoming parasitic on a variety of host fish species. It is unlikely that Chestnut Lamprey larvae would be found within Sylvia Lake; however, Chestnut Lamprey may be found parasitizing suitable host species, which are found in the Winnipeg River System.

6.0 Fish Habitat Assessment

6.1 EAST SHORE

The east shoreline provides no spawning areas for large-bodied game fish, such as Northern Pike or Walleye. There are no low-lying areas of vegetation prone to spring flooding that could support spawning of Northern Pike. There are also no areas of cobble/boulder with current to support spring spawning of Walleye or fall spawning of Lake Whitefish. The littoral zone, however, does provide potential spawning habitat for a variety of small-bodied fish, such as Stickleback, Johnny Darter, Yellow Perch and Central Mudminnow (Stewart and Watkinson 2004; Scott and Crossman 1973). The vegetated littoral zone also provides potential nursery, rearing and feeding habitat for numerous small-bodied fish and large-bodied fish species. Some examples include; Lake Chub, Yellow Perch, Fathead Minnow, Walleye, Northern Pike, Stickleback, and Tadpole Madtom (Stewart and Watkinson 2004; Scott and Crossman 1973). The littoral zone grades to deeper areas of the river, which provides opportunities for larger fish to feed, and access to areas for overwintering and movement through the area. None of the habitat along the eastern shoreline can be considered rare or critical to the maintenance of fish stocks.

Based on the preceding analysis, and using the categories provided in DFO (1998) and DFO (2010), the littoral zone along the eastern shoreline of the project site provides **Important Fish Habitat**, and is designated as H2 Habitat.

6.2 NORTH SHORE

Similar to the eastern shore, the north shore of the project site provides no spawning habitat for Northern Pike, Walleye or other large-bodied game fish. The littoral zone is almost non-existent, and where present, has a largely bedrock substrate with strong current. The exception is the western edge of the shoreline, where a small cove exists that contains abundant aquatic plants and soft-bottom sediments. As with the east shoreline, this area may also support spawning of several small-bodied fish species. The north shore provides fish passage down river as well as sufficient depth for overwintering. In some areas of the channel there is also underwater structure which may provide habitat for some species. None of the habitat along the northern shoreline can be considered rare or critical to the maintenance of fish stocks.

Based on the preceding analysis, and using the categories provided in DFO (1998), the habitat offshore of the northern shoreline of the project site provides **Important Fish Habitat**, and is designated as H1 habitat, except for the western edge of the property, which is designated as H2 habitat.

7.0 Potential for Harmful Alteration, Disruption and Destruction (HADD) of Fish Habitat from the Proposed Project

Due to the soft sediments and extensive growth of aquatic plants, the littoral zone along the eastern shoreline of the Site is susceptible to disturbance. Shoreline activities associated with the proposed development (e.g., installation of docks), have the potential to reduce fish habitat at the Site.

In contrast, due to the steep slopes and bedrock substrate, the north shore is not susceptible to disturbance. There are also no construction activities planned for this area of the Site. Therefore, there is no potential for reduction of fish habitat along the northern shore.

The proposed camp development at Sylvia Lake will require a source of drinking water. At the time of this report, it was understood that the potential potable water source was being considered, is an on-site water treatment system. Given the expected relative flows of the Winnipeg River and the influence of supply well operation on Sylvia Lake, it is unlikely the well will impact fish habitat in any way

The on-site water-treatment system would require a shallow well in proximity to the shoreline, just south of the NE bedrock point. This well would draw from water from the shallow groundwater aquifer, but would be under direct influence of the Winnipeg River system (i.e., Sylvia Lake).

The littoral zone along the Pinawa shoreline is comprised of boulder and cobble that is not susceptible to disturbance by current or fluctuations in water level.

The installation of a dry hydrant will require the installation of a suction line and intake strainer in Sylvia Lake. The suction line will require trenching and burial. Stantec understands that Tim Horton Children's Foundation has committed to follow DFO guidelines for freshwater intakes.

8.0 Summary of Key Observations

A summary of key observations from the assessment of aquatic habitat at the Site are as follows:

- No critical fish habitat was identified within that area of Sylvia Lake immediately adjacent to the proposed project site.
- East Shoreline:
  - Composed of silt/clay substrate and susceptible to disturbance
  - Important Habitat
  - H2 habitat
- North Shoreline:
  - Composed of bedrock and not susceptible to disturbance
  - Important Habitat
  - H1 along most of the shoreline, except the western edge that is H2
- Pinawa Shoreline:
  - Composed of boulder/cobble substrate
  - Important Habitat
  - H1 habitat

9.0 Closure

This report was prepared for the sole benefit of Tim Horton Children's Foundation. The report may not be relied upon by any other person or entity without the express written consent of Stantec Consulting Ltd. and Tim Horton Children's Foundation.

Any use which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted scientific practices current at the time the work was performed. The conclusions and recommendations presented represent the best judgment of Stantec Consulting Ltd. based on the data obtained from the work and on the site conditions encountered at the time the work was performed at the specific sampling, testing, and/or observation locations.

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