

7.0 Environmental Effects and Mitigation

7.1 DETERMINATION OF SIGNIFICANT ENVIRONMENTAL EFFECTS

Predicted environmental effects of the Project, including any predicted impacts remaining after implementation of mitigation measures, are documented in Sections 7.2 through 9.0 of the EIA for the physical, biological, and socio-economic components of importance and interest to regulators and stakeholders. In accordance with regulatory requirements, conclusions have been made in the EIA regarding whether any potential environmental change is “significant.”

7.1.1 Assessment Parameters

Determining “significance” involves scientific analyses and interpretation of the capacity of potential post-mitigation or benefits-enhancement scenarios to be free of, or to have reduced potential for adverse effects. The following parameters were relied upon in the EIA to evaluate the significance of environmental effects:

- Nature of the effect (positive, neutral, or negative/adverse).
- Temporal boundaries (when the effect would occur and if the Project effects can be reversed):
 - Frequency of the effect (how often the effect occurs, e.g., once, sporadic, or continuous).
 - Duration of the effect (how long the effect would last, i.e., short-term, immediate-term, or long-term).
 - Reversibility of the effect (within the timeframe of the Project).
- Spatial boundaries or the geographic extent of the potential effect (area where the effect would be limited to, i.e., the Project Site, local area, regional scale, or global scale).
- Ecological/sociological context (potential effects of the Project on highly valued features [e.g., culturally or historically significant areas; protected species]).
- Uncertainty (determine if the overall effect is unknown or indefinable).

More detailed definitions of the above-mentioned terms used in the environmental assessment of the Project, are provided in Appendix H.

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7.1.2 Approach to Determining “Significance”

A systematic consideration of the above-noted parameters was relied upon for scoping the assessment of the Project’s effects and creating conclusions about their significance (Figures 7-1 and 7-2), as outlined below:

1. Define the Project.
2. Describe the effect (positive, negative, neutral) and if negative, determine if the impact is reversible (yes or no).
 - Determine whether effect is short-, intermediate- or long-term in nature.
3. Define the spatial extent of the effect:
 - Project Site, local, regional or global.
4. Define if and how the effect acts in a cumulative way with other projects or activities with respect to the spatial extent of the effect (applies to intermediate- and long-term effects occurring at local, regional or global scales).
 - It is assumed that effects, which are short-term in nature, or restricted to the Project Site, are not able to act cumulatively.
5. Define if the uncertainty associated with the assessment of the effect is acceptable.
 - If unacceptable, then the effect cannot be assessed further (and monitoring may be needed to create data needed to resolve the uncertainty).
6. Define the magnitude of the effect.
 - Is it likely that the effect will exceed an ecological or socio-cultural threshold that is identified within provincial or federal legislation, statutes or applicable regulations or guidelines? (If such a threshold is exceeded, then the effect is deemed “significant.”)

The final step was to make a professional judgment about the significance of the effect (this consideration is generally applied only to adverse effects, i.e., “impacts”). Figure 7-2 summarizes the following approach to determining whether long-term adverse effects are “significant”:

- All impacts (after the integration of any potential cumulative effects) found (or judged) to be in excess of established regulatory ecological or socio-cultural thresholds are considered to be “significant.”

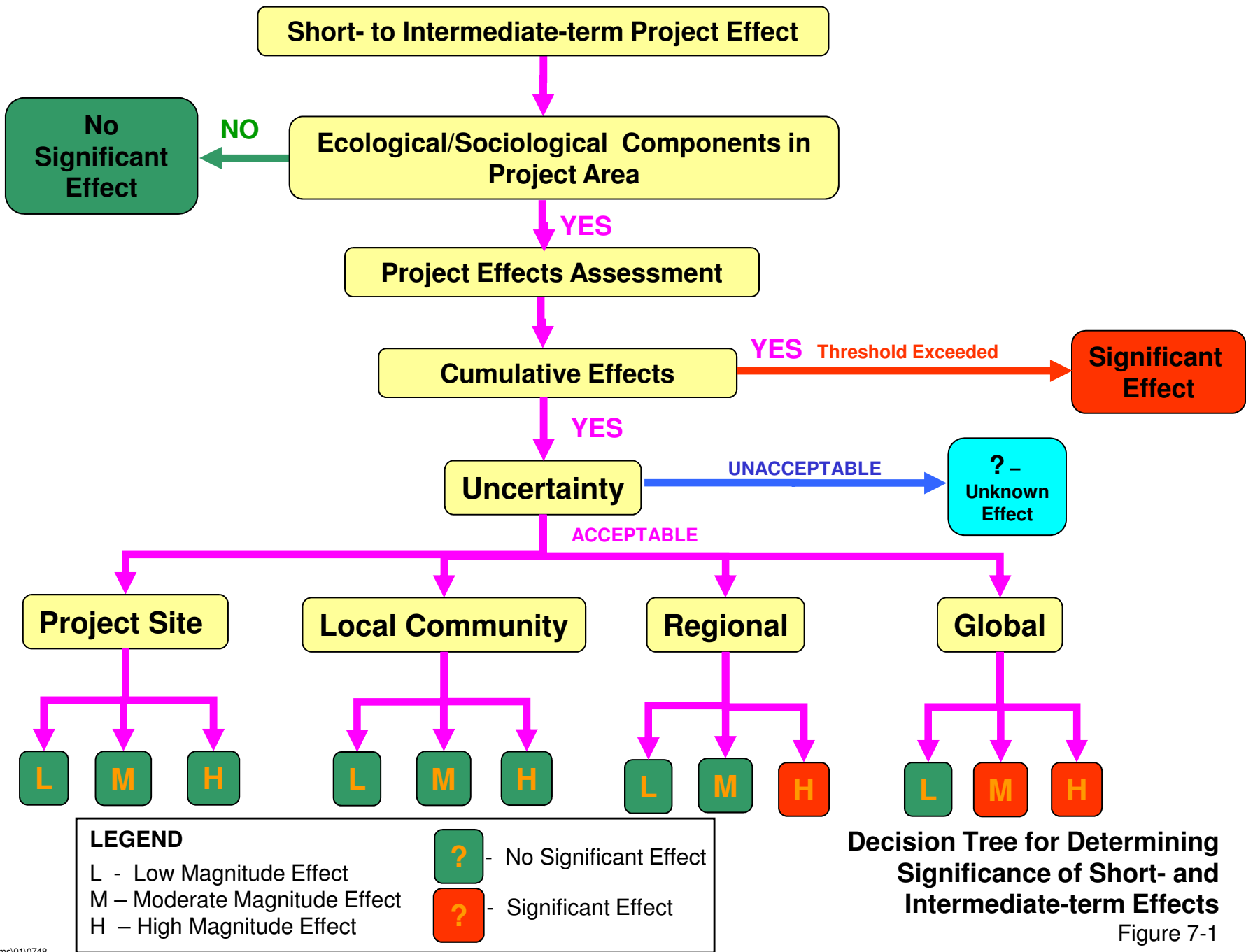
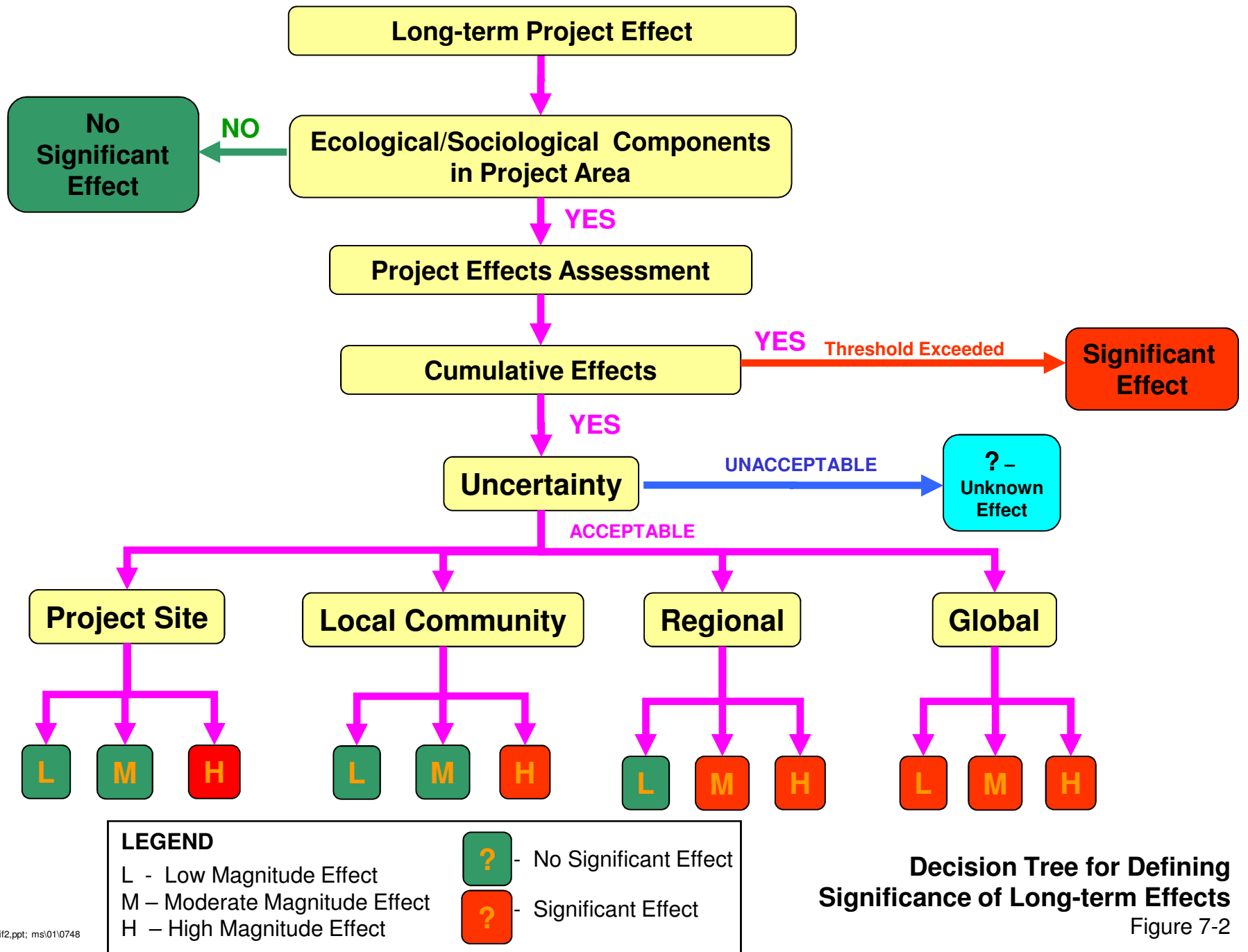


Figure 7-1



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- Irreversible Long-Term Effects:
 - All long-term irreversible effects that are global in scope are considered to be “significant” (e.g., the Project being evaluated is going to permanently alter the world).
 - All high-magnitude, long-term, irreversible effects are considered to be “significant” (e.g., the Project is going to have a permanent and obvious effect).
 - All moderate-magnitude, long-term, irreversible effects, which are regional in scope, are considered to be “significant.”

- Reversible Effects:
 - All moderate- and high-magnitude, reversible effects, which are global in scope, are considered to be “significant.”
 - All moderate-magnitude, long-term, reversible effects, which are regional in scope, are considered to be “significant.”

All other Project effects (e.g., reversible, site-specific, and short-term effects) are considered to be “not significant.”

This process of determining significance of effects considers mitigation measures and incorporates the concept of “cumulative effects” into the assessment before determining whether the effect is “significant.”

The residual effects of the Project (i.e., after mitigation) are assessed as “significant” or “not significant.” Further to this judgment, a qualitative assessment is conducted of the magnitude of the effects and whether it is positive, neutral, uncertain, or negative.

7.2 PRECONSTRUCTION PHASE

Prior to construction, Project managers, geotechnical, survey and environmental staff will visit the site, and contribute to the local economy by patronizing local hotels, restaurants and other local amenities. These positive effects are reversible, occur once, are short term and occur within the local area. The magnitude is expected to be low. The effect is positive and not significant. Pre-construction activities are not likely to result in significant cumulative physical, biological or socio-economic effects.

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7.3 CONSTRUCTION PHASE

Construction effects are expected to be primarily associated with land clearing, rock excavation, access restrictions and components of the work near water. Local wildlife in the Project Site will be temporarily disturbed or displaced to varying degrees during Project construction and some limited amount of wildlife habitat will be removed.

7.3.1 Air Quality

As indicated in Sections 7.3.1.1 to 7.3.1.3 below, the effects of rock excavation and construction activities on air quality are anticipated to be:

Reversible – effects will occur and persist only during Project construction.

Sporadic – effects will be sporadic during Project construction.

Short Term – construction-related effects on air quality will persist only during Project construction.

Confined to Project Site and/or Local Area – effects will be largely restricted to the Project Site, but may be carried (e.g., dust) just outside the Project Site.

Low Magnitude – effects are not expected to be noticeable or measurable beyond background air quality effects.

No significant adverse effects on air quality are anticipated from rock excavation and construction activities.

7.3.1.1 Particulates

During construction, potential dust emissions will be generated from various construction activities such as rock blasting, rock crushing, gravelling and delivery of construction materials. It is not expected that the dust emissions generated during the construction phase will pose any significant contribution to the atmosphere. Dust control measures will be outlined in an Environmental Protection Plan for Construction.

7.3.1.2 Odour

Odour emissions may be generated from painting and paving activities. It is expected that the overall odour emissions to the atmosphere during the construction phase will be minimal.

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7.3.1.3 Emissions

Emission effects during construction are described in Section 7.7.1.

7.3.2 Geology

Inland rock excavation and the installation of two supply wells will result in minor removals of and alterations to surficial and near surface bedrock geology to prepare building footprints, accommodate road construction and trench services.

Rock excavation will be conducted by mechanical (hydraulic impact hammer) and blasting methods to prepare building footprints, accommodate road construction and trench services. Mechanical removal by hydraulic impact hammer will be the preferred method of rock removal, followed by blasting. For a discussion of blasting effects related to fish, see Section 7.3.6. To protect the amenity value of existing cliffs and points, rock excavation will generally not occur within at least 10 m of the shoreline and will generally occur 20 m from the shoreline. There may be a requirement to excavate rock within 10 m of the shoreline for trenching the dry fire hydrant intake and/or piping associated with the supply wells. All requirements for work near water, including rock excavation, will be subject to a DFO Project Review. Where possible, roads will avoid bedrock outcroppings.

The effects of rock excavation and supply well installations on geology are anticipated to be:

Irreversible – effects of rock fracturing/excavation will be permanent.

Sporadic – effects may occur more than once during Project construction.

Long Term – construction-related effects on geology will be permanent.

Confined to Project Site – effects to geology will be restricted to the Project Site.

Moderate Magnitude – effects can be measured but are not obvious.

No significant adverse effects on geology are anticipated from rock excavation.

7.3.3 Soils

Permanent land clearing will be required within the Project area. This will involve the removal of topsoil and subsoil, where necessary, to prepare facility and road construction footprints. In some cases, for example during the construction of the soccer field and septic disposal beds, soil removal will be temporary in nature (i.e., during construction phase only) and will be replaced during surficial re-contouring. In other cases, for example in the location of building footprints and roads, soil removal will be for the duration of the operation phase of the Project.

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The topsoil within the Project area, generally consisting of a combination of a thin organic layer overlying an organic matter enriched mineral surface horizon, provides a relatively productive root zone for the establishment and maintenance of vegetation. The topsoil within the Project is dominantly fine textured (i.e., clayey), and surficial soil horizons are generally better structured than the non-structured (i.e., massive) subsurface horizons. Topsoils and upper subsoils within the Project area are prone to compaction and impact to productivity from equipment traffic and topsoil removal through other preparation activities including excavation, blasting, trenching and ditching. Maintenance of topsoil and upper subsoil integrity and productivity is important to ensure site productivity for re-vegetation following construction, through such activities as topsoil salvage, equipment traffic limitations outside of Project footprints. Salvaged topsoil from excavated facility footprints will be re-used for surface contouring and topping material within the Project area (e.g., ditches, septic disposal bed cover, etc.). These mitigation activities will be addressed within the EPP.

Exposed topsoil following land clearing will be more prone to water erosion. While the erosion risk is relatively low, due to dominantly fine surface textures and nearly-level to very gently sloping land surfaces, recommended erosion mitigation activities (e.g. straw blankets and silt fencing on exposed slopes and within surface drainage courses) will be addressed within the EPP.

The impacts of land clearing on soils are anticipated to be:

Reversible – effects will persist in the environment until Project decommissioning.

Occur Once – effects on soils will occur only during Project construction.

Intermediate Term – effects will persist until Project decommissioning and site rehabilitation.

Confined to Project Site – effects on soils will not extend beyond the Project footprint.

Low Magnitude – loss of soils, if any, will be minor and not be obvious.

No significant adverse effects on soils are anticipated from land-clearing and construction activities.

7.3.4 Hydrology and Water Quality

Initial site preparation for buildings and infrastructure will involve site clearing, grading and excavating. These activities will require the use of backhoes, front-end loaders, bulldozers and/or graders (i.e., typical heavy construction equipment). Existing grades will be maintained throughout the Site, where possible, through the use of culverts, ditches and swales.

Minimal quantities of water are anticipated to be required for construction activities. Any water required will be trucked to the Site from a regional supplier. The construction of internal roads and associated ditching is not anticipated to alter surface water movement. The completion of

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the supply well into the shallow groundwater aquifer is not expected to alter the quality, rate of movement or direction of groundwater flow as it will be under direct influence of Sylvia Lake.

Employing mitigation measures and best management practices, as outlined in an Environmental Protection Plan to be developed for the Construction Phase, will minimize the potential for adverse effects on surface water and groundwater quality.

The impacts of construction activities on surface water and groundwater resources are anticipated to be:

Reversible – effects persist until Project decommissioning.

Occur Once – water use and surface-drainage redirection (e.g., ditching) will occur only during construction.

Intermediate Term – surface-drainage redirection and well water withdrawal will exist for the duration of the Project.

Confined to Local Area – water-use and surface-drainage effects will extend beyond the Project Site.

Low Magnitude – effects on water resources and surface drainage will be minor.

No significant adverse impacts on surface water and groundwater resources are anticipated from grading and excavation.

7.3.5 Terrestrial Flora and Fauna

Anticipated effects to terrestrial flora and fauna are associated with the removal of habitat via land clearing, restriction of wildlife travel associated with temporary construction fencing and temporary avoidance of the area during Project Construction due to the presence of a workforce/equipment. Camp construction may disrupt approximately 7 ha of forested area. In addition, the importation of equipment and materials to the site may allow for the colonization of invasive and non-native vegetation species at the Project Site.

Camp construction may impact local amphibian populations through loss of foraging and/or overwintering habitat in areas adjacent to wetlands and/or low lying wetted areas. Habitat loss and/or degradation would have a small affect on amphibian populations as suitable alternate foraging and/or overwintering habitat occurs in areas outside of the camp footprint.

Land clearing associated with camp construction would result in the loss of habitat for some small mammal species (e.g., red-backed vole, red squirrel) including tree-roosting bats. Noise disturbance from heavy equipment, vehicle traffic, blasting and other human activity may cause short-term habitat avoidance by small mammals (e.g., rodents and bats) and amphibians using the Camp footprint and surrounding area. To minimize construction-related impacts to terrestrial

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mammals, land clearing would occur outside of the peak breeding period (mid-May-mid-July for most species).

During construction, other wildlife species capable of traversing greater distances (birds, mesocarnivores, ungulates) will likely adjust activity patterns to incorporate use of nearby wetlands, and wooded areas unaffected by Project construction. To minimize impacts to breeding wildlife at the Project Site (e.g. nesting birds), land-clearing activities would take place outside of the mid-May to mid-July timeframe in accordance with the *Migratory Birds Convention Act*.

The majority of effects of Project construction on terrestrial plants (flora) would persist until the site is rehabilitated during Project decommissioning, because Project facilities will replace vegetated land within the Project footprint area. Impacts of project construction on flora and fauna are anticipated to be:

Reversible – effects, such as habitat removal, persist until Project decommissioning.

Continuous – construction-related effects (e.g., presence of a workforce) will be continuous during the Construction Phase.

Intermediate Term – some elements of habitat removal will persist until Project decommissioning.

Confined to Project Site – habitat removal and construction fencing/activity will not extend beyond the Project Site.

Low to Moderate Magnitude – Effects to certain faunal species may be measurable; however, it is unlikely to impact species at a population level. Floral impacts will be obvious and readily observable from within the Project Site.

No significant adverse impacts on terrestrial flora or fauna are anticipated as a result of construction activities.

7.3.6 Aquatic Flora and Fauna

Anticipated effects to aquatic flora and fauna are related to in-stream and shoreline activities required during Project Construction. In-stream activities include the establishment of dock anchors for the three temporary Connect-A-Dock® structures, removal of aquatic vegetation in swimming areas, and the trenching and burial of the dry hydrant intake line. Shoreline activities include the clearing of riparian (bank) vegetation to accommodate shoreline facilities. There may be a need to relocate rocks or fallen logs from the beach area, to areas of similar depth. Both in-stream and shoreline activities would occur on the east side of the Project Site.

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The combined width of all proposed shoreline works is approximately 175 m, or 18% of the overall Project Site shoreline frontage. All temporary floating dock structures have a combined surface area of 460 m², with a combined dock anchor footprint of 8.9 m². The internal swimming area of the U dock is approximately 1,175 m². The size and location of the dry hydrant intake line has yet to be determined, but will be provided to DFO, when available, as part of a Project Review.

Effects associated with required in-stream or near-stream activities includes disruption of fish spawning areas, erosion and sedimentation, bank instability, removal or disturbance of structure that provides shade, cover and food and the potential for introduction of fugitive materials.

As the required work activities are not covered by an applicable Operational Statement, a project-specific review by DFO will be sought prior to Project Construction. Any project-specific mitigation measures required by DFO will be detailed in an Environmental Protection Plan for Construction Activities.

Blasting activities will be designed in accordance with applicable regulatory guidance, and are therefore not anticipated to result in aquatic faunal effects. Specific mitigation measures, including the required setback distances and charge weights will be prescribed in an Environmental Protection Plan for Construction. In addition, blasting will be undertaken by certified blasting contractors.

Mitigation measures are anticipated to include, but not be limited to, isolation of in-stream works to provide sedimentation containment and settlement; implementation of erosion control measures on land; retention of riparian vegetation, to the extent feasible; and adherence to timing windows associated with spring, summer and fall spawners (i.e., in-stream work between June 30-September 15) which are represented in the Winnipeg River System.

The potential effects to aquatic flora and fauna during Project construction are expected to be:

Reversible – effects associated with construction activities (e.g. loss of riparian habitat) will not persist beyond the decommissioning phase.

Occur Once – effects will occur once during the undertaking of each activity during construction.

Short to Intermediate Term – the majority of aquatic fauna effects will be short-term, with the exception of the loss of riparian habitat which will generally be maintained until decommissioning.

Project Site and Local Area – effects of loss of riparian habitat will be contained to the Project Site; however, disturbance effects will influence the aquatic habitat immediately adjacent to the Project Site.

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Moderate to High Magnitude – while a well-designed monitoring program may be able to detect changes to fish and fish habitat, loss of riparian habitat will be relatively obvious and observable.

Following a site-specific DFO Project Review and incorporation of mitigation measures into an Environmental Protection Plan for Construction, no significant adverse aquatic effects due to instream trenching and riparian vegetation removal are anticipated during project construction.

7.3.7 Socioeconomic Effects

7.3.7.1 Employment

The main socio-economic effect associated with the Construction Phase of the Project is job creation. Construction of the Camp is expected to occur over a 2-year period. The numbers of workers required during construction will depend on the size of crews and skill sets required at different phases of construction, but may be up to 50 workers at any one-time. Other direct beneficial economic effects include the use of local hotels, restaurants, and other amenities in the Pinawa/Seven Sisters area and beyond while construction is underway. Construction materials such as gravel, concrete, building materials and fuels will be sourced and procured locally, to the extent possible, along with other non-specialist materials such as fencing and construction machinery.

The overall positive effects of construction on local population, local/regional employment and demand for local services are anticipated to be:

Reversible – employment of construction personnel (i.e., skilled trades) will not persist beyond the Construction Phase of the Project.

Occur Once – effects will occur during Project construction only.

Short Term – effects will persist to the end of the Project construction.

Regional – effects are expected to primarily pertain to the Eastman (southeast Manitoba) and Capital (i.e. Winnipeg and surrounding RMs) regions, including First Nation communities.

High Magnitude – effects are expected to be obvious and easy to observe and describe.

Significant positive effects on the local and regional socio-economic environment are anticipated as a result of Project construction.

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7.3.7.2 Traffic

Increases in local traffic and traffic congestion due to construction and delivery vehicles (trucks) are expected. This increased traffic will be cumulative with existing local traffic but should not exceed any regulatory thresholds. Informational signs (i.e., trucks turning) will be posted to reduce the potential for increased risk.

The potential traffic-related effects of Project construction are expected to be:

Reversible – effects associated with construction traffic will not persist beyond the construction phase.

Occur Once – noise and disruption-associated traffic will be episodic.

Short Term – noise and disruption-associated traffic will be episodic.

Local and Regional Area – increased traffic is expected in the local and regional area.

Moderate Magnitude – if it were needed, a traffic-monitoring program could detect routes of movement above the existing baseline (which has likely not been established).

No significant adverse socio-economic effects due to increased traffic are anticipated during project construction.

7.3.7.3 Nuisance

As discussed in Sections 7.3.7.3.1 to 7.3.7.3.3 below, adverse noise, construction-light and vibration effects due to construction-related activities are anticipated to be:

Reversible – effects will not persist beyond the Construction Phase.

Sporadic – effects will occur during Project construction only, and be episodic.

Short Term – effects will persist to the end of Project Construction

Project Site to Local – effects are expected to occur primarily within the Project Site, but may be noticeable in the local area, depending on weather conditions (e.g., prevailing winds for noise).

High Magnitude – effects are expected to be obvious and easy to observe and describe.

No significant adverse socio-economic effects due to sound, light levels or vibrations associated with construction activities are anticipated during Project construction.

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7.3.7.3.1 Noise

Blasting, hydraulic impact hammering and rock crushing will produce noise. Sound-level data indicate construction activities may produce noise levels up to 85 dBA as measured at a distance of 240 m (Revey, 2008).

The sound-intensity level experienced by the nearest receptor, the Town of Pinawa, will be less than the level generated at the construction and blast sites because sound attenuates greatly with distance in the manner described by the "Inverse Square Law", (Anonymous, 2009; Murphy *et al.*, 2007; Table 7-1). As explained by the Inverse Square Law, sound-pressure levels reduce by 6 decibels for every doubling of distance from the noise source, in feet, as shown in the examples below.

Table 7-1: Examples of Sound Attenuation with Distance		
Distance (Feet)	Sound Pressure (decibel)	
	Blasting [†]	Dozer ^{††}
50	113	88
100	107	82
200	101	76
400	95	70
800	89	64
1600	83	58
3200	77	52
6400	71	46

[†]Source: (RBF Consulting, 2005)
^{††}Source: (Bolt, Beranek and Newman Inc., 1987)

Thus, at the distances from the nearest blasting areas to the nearest homes (approximately 2,450 feet) the incremental maximum blasting-related sound level at the nearest homes cannot reasonably be predicted to exceed 80 dBA during blasting and 52-58 dBA for general construction machinery, which is comparable to average city traffic noise and a quiet office environment, respectively (Branch and Beland, 1970). These noise levels do not take into account the presence of Porcupine Island between the Project Site and the Town of Pinawa, which is anticipated to provide noise buffering.

These sound levels should have little potential to exceed allowable limits for nearby homes during key timeframes and operations should meet the prescriptions set forth by the *Quarry Minerals Regulation (M.R. 65/92)*, which states in Part V, s.46: "No operator of a quarry shall permit a quarry to be established or operated that emits sound, **other than sound caused by**

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***blasting**, in excess of the following limits when measured at any adjacent seasonal or permanent residence:*

- (a) 45 dBA sound pressure level, during the hours between 10:00 p.m. and 7:00 a.m.; and*
- (b) 55 dBA sound pressure level during the hours between 7:00 a.m. and 10:00 p.m.”*

Blasting activities will be conducted between the hours of 9:00 a.m. and 4:00 p.m., and will not occur on weekends or statutory holidays in accordance with the *Quarry Minerals Regulation (M.R. 65/92)*.

Noise effects will be temporary, intermittent during construction, lasting only as long as construction is occurring. Construction is anticipated to last approximately two years and is expected to occur year-round.

7.3.7.3.2 Lighting

For safety and security reasons, the construction site is expected to be partially lit at times during construction, and construction equipment would also be lit if in operation during dawn, or dusk. The construction hours of operation are anticipated to be 7:00 am to 7:00 pm.

Light pollution is expected to be localized and occur for the duration of construction activities.

7.3.7.3.3 Vibration

Methods of rock excavation, including blasting and hydraulic impact hammer are anticipated to produce vibrations due to sudden dynamic loading of selected bedrock areas. It is anticipated that the vibrations that will occur will be dampened before reaching the neighbouring town of Pinawa, the nearest receptor, approximately 600 m north of the Project Site.

Figure 7-3 illustrates the typical earth vibrations due to construction activities, including the use of embedded dynamite and hydraulic hammering equipment. The threshold for damage to residential structures is extinguished at a distance of approximately 15 m with the threshold for perception of vibrations being extinguished at a distance of less than 600 m from the source. Therefore, vibrations are not anticipated to be perceptible or capable of causing damage to residential structures at a distance of 600 m.

Effects from vibration are expected to be localized and to occur only for the duration of selected construction activities.

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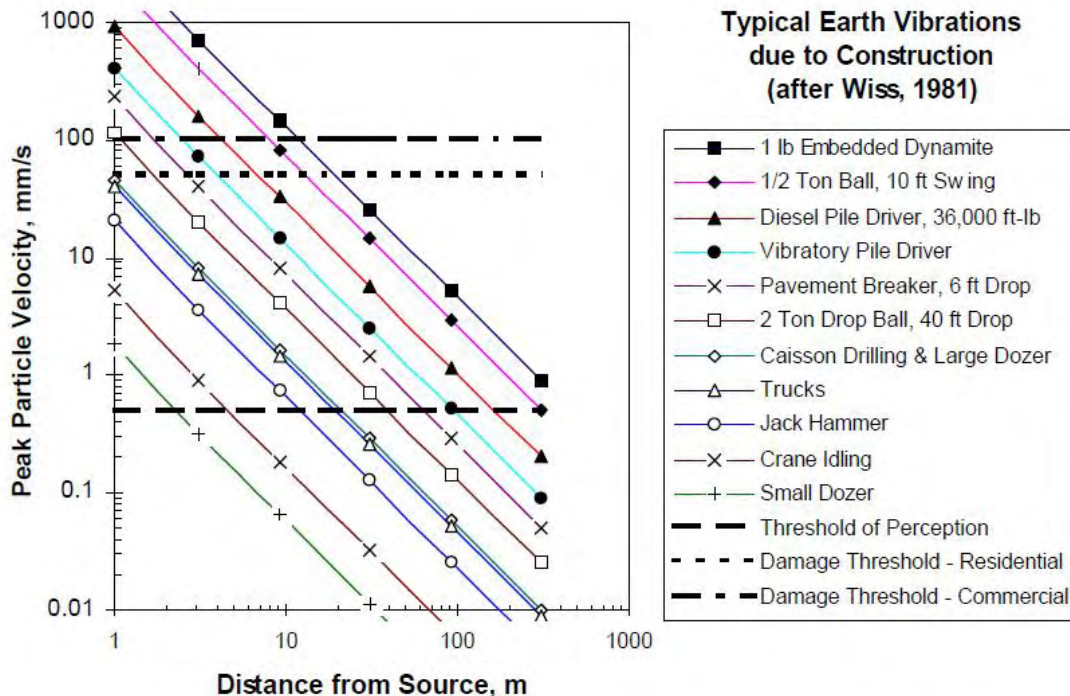


Figure 7-3: Typical Earth Vibrations due to Construction (Source: Wiss, 1981)

7.3.8 Resource Use and Recreation

Access to the Project Site will be impinged or restricted during the two-year Construction Phase to ensure the health and safety of unauthorized personnel and construction personnel, alike. Further, access may be temporarily limited in areas immediately adjacent to the Site (e.g., east shoreline/lake area) during activities, such as rock blasting, as a safety precaution.

Anticipated effects to resource users during construction include loss of access to the 17.19 ha lease area for hunting, trapping and any other resource use activities. Hunters will not be permitted to hunt, possess a loaded firearm or discharge a firearm within 300 m of the camp (i.e. a development in a provincial park), pursuant to the *Park Activities Regulation* of the *Provincial Parks Act* (Section 7.4.6.6). Effects to resource users are considered to be of low magnitude due to the abundance of adjacent lands available for continuing activities, including access to the existing distribution line used by resource users. In addition, the current RTL lineholder was very amenable to adjusting his activities to accommodate the Camp, due to its social benefit (Henschell, *pers. comm.*, 2010). THCF will attempt to contact the owner of the existing hunting blind located in the lease area regarding relocation. Signs will be posted to alert hunters that the leased Crown land is not open for hunting.

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Anticipated effects on recreation include removal of public access to the bedrock point used for “cliff jumping” / swimming, impingement of ad-hoc backcountry camp outs and restriction of trail forging (e.g. snowshoeing) through the Project Site.

Adverse effects to resource use and recreation are anticipated to be:

Reversible – access effects will not persist beyond project decommissioning.

Continuous – access effects will be continuous.

Intermediate Term – access effects will not persist beyond decommissioning.

Project Site and Local Area – effects will be limited to the Project Site and areas immediately adjacent to the Project Site.

High Magnitude – access effects will be readily observable.

No significant adverse effects to resource use and outdoor recreation are anticipated.

7.3.8.1 Heritage Resources

Heritage resources, and their associated artifacts and cultural data, are protected under *The Heritage Resources Act*. A Heritage Resource Impact Assessment (Manitoba Heritage Permit A36-10) of the Project Site, recorded neither intact cultural material nor soil strata indicative of past cultural activity. Given that the majority of the Camp development is more than 100 m from either the shoreline or the riverbank (i.e. High potential areas), there is a Low potential for significant heritage resources to be impacted.

There is potential for small isolated sites to be present well-removed from the lakeshore and riverbank which would relate to hunting and gathering forays from their encampment nearer the water, by small groups. There is also a potential for shoreline development to impact heritage resources, but these materials would no longer be *in situ* and would have been removed from original context either by erosion or ice-scouring.

During the course of construction, workers will be alert for artifacts that may be uncovered and, in the event that artifacts of potential significance are unearthed, work will cease until Historic Resources Branch authorities have been notified.

After the application of appropriate mitigative measures, as deemed necessary by the Historic Resources Branch of Manitoba Culture, Heritage and Tourism, adverse effects to heritage resources are anticipated to be:

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Not Reversible – effects to any heritage resources present at the site will be a residual effect of Project construction.

Occur Once – effects will occur during Project construction only.

Long Term – the effects of any necessary salvage archaeology will persist beyond Project construction (i.e., curation and artifact interpretation; contributions to Manitoba's cultural history).

Project Site – effects will be limited to the Project Site.

Low Magnitude – the probability of affecting significant heritage resources at the Project Site, after applying mitigative measures as described by regulatory authorities, is very low (potential impacts expected to be minor to non-existent and therefore not obvious).

No significant adverse effects to heritage resources are anticipated.

7.4 OPERATIONAL PHASE

7.4.1 Air Quality

Emission effects during the Operation Phase are discussed in Section 7.7.2.

7.4.1.1 Odour

No odour impacts are anticipated as a result of Project Operation, specifically, wastewater treatment. The MicroFAST® wastewater treatment system and associated pressurized sand mound treatment beds are not anticipated to generate any appreciable odours, with routine maintenance. These treatment systems are designed to be odourless as a function of the aerobic mode of treatment.

7.4.2 Soils

No soil impacts are anticipated as a result of Project Operation. Vehicular traffic will be limited to roadways, and pedestrian traffic will be primarily limited to internal pathways, therefore soil compaction is not anticipated to be a concern during Project operation. Soil nutrient amendments are not anticipated during Project operation. Should soil nutrient additions be deemed necessary to maintain site productivity, these will be applied sporadically and as required, and will be conducted as per product label recommendations.

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7.4.3 Hydrology and Water Quality

Anticipated effects to hydrology and water quality are described in Section 7.4.3.1 to Section 7.4.3.2 related to water withdrawals for potable water treatment system supply, landscape maintenance and dry hydrant testing/usage. Loading of nutrients and other pollutants may occur as a result of wastewater treatment disposal, landscape maintenance and snow clearing.

7.4.3.1 Water Withdrawal

The estimated Camp water demand during peak operation, based on existing, similar-sized THCF camps, is estimated to be 65,000 Lpd (0.065 dam³/day). The maximum annual water withdrawal is estimated to be approximately 23.7 dam³/year, but will likely be in the order of 15 dam³/year (assumes 21 weeks of peak demand and remaining weeks of low demand). Proposed water withdrawal rates are not anticipated to compete with other regional users due to the lack of agricultural and other water users (nearest users are within 4-5 km, with relatively small withdrawal rates [up to 500 dam³/yr] compared to users near Winnipeg [more than 4,000 dam³/yr]).

In addition to use in the event of a fire, dry hydrants need to be tested by hooking up to a pumper truck at least once per year.

THCF will apply for a Water Use License, pursuant to the *Water Rights Act*, as the peak daily water withdrawal from the supply wells which are under direct surface water influence (Sylvia Lake) are >25,000 Lpd (65,000 Lpd peak) for water treatment plant supply.

Anticipated effects to surface water as a result of water withdrawals for potable water (i.e. water treatment plant) and fire protection supply are expected to be:

Reversible – water withdrawal will eventually be replenished during the life of the Project as it is not a closed system.

Continuous – withdrawals for water treatment plant supply will be continuous during operations, with episodic increases for dry hydrant testing and, if required, use.

Intermediate Term – withdrawals will occur over the life of the Project.

Project Site and Local – water withdrawals will utilize local surface water supplies only (i.e. Sylvia Lake).

Low Magnitude – while water withdrawals can be measured through metering, they will not cause a measureable or observable effect to the overall surface water levels of the Sylvia Lake waterbody.

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No significant adverse impacts to surface water quality related to water withdrawals are anticipated during Project operation.

7.4.3.2 Nutrient Loading

Nutrient loading to surface or groundwater is not anticipated based on general Project operation activities. The operation of the onsite wastewater management system will result in nutrients, such as nitrogen and phosphorus, entering the septic disposal bed area following FAST® treatment. The system design and permitting requirements will ensure that the septic treatment and associated nutrient loads are within acceptable limits. It is anticipated that nutrient impacts to surface water will be minimal.

Routine water quality testing, including nutrient concentrations, will ensure safety of the potable water supply to the Project. Groundwater monitoring in the vicinity of the septic disposal bed area will ensure there is no long-term accumulation of nitrogen or phosphorus.

7.4.4 Terrestrial Flora and Fauna

Anticipated effects to terrestrial flora and fauna during project operation are related to temporary wildlife avoidance of the camp area during times of peak camp activity and/or the potential for some species of wildlife (e.g., black bear) to habituate to human presence as a result of their attraction to camp generated wastes. Wildlife habituation can increase the potential for human-wildlife encounters and have a negative impact on wildlife that develop a reduced sense of alertness associated with human presence. Measures to prevent wildlife habituation including Camp program curricula and the use of animal-resistant garbage receptacles will reduce the likelihood of wildlife habituation.

Harassment of wildlife by camp users may occur during operations. Camp rules and education about the wildlife in the area would help minimize the likelihood of negative treatment to wildlife present within the camp and neighboring areas.

Outdoor lights used to illuminate the camp during nighttime operations, despite dark-sky lighting design, may have both positive and negative effects on wildlife using the area. Lights often attract flying insects (e.g., moths) that in turn attract predators including common nighthawk and bats. While lights may improve foraging efficiency for some wildlife species, they may cause others to avoid the area. Movement patterns and activity of nocturnally active wildlife may change as a result of an illuminated camp area and birds may seek alternate roosting sites not affected by artificial lighting.

Camp operations are anticipated to accrue positive benefits to local terrestrial flora by increasing regeneration areas through the tree planting programs undertaken as part of the Camp curriculum.

Anticipated adverse effects to terrestrial fauna during Project operations are expected to be:

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Reversible – effects to wildlife will not occur beyond the life of the Project.

Sporadic – wildlife avoidance and opportunities for habituation will be non-continuous or sporadic during Project operation, as a result of reduced effects during non-peak seasons.

Intermediate Term – effects to wildlife will occur over the life of the Project.

Local Area – effects to wildlife are anticipated to be contained primarily within the local area.

Low to Moderate Magnitude – effects to wildlife movements may be measured with a well-designed monitoring program, if necessary.

No significant adverse impacts to wildlife related to Project operation are anticipated.

7.4.5 Aquatic Flora and Fauna

Effects to aquatic flora and fauna during the operation phase is related to the annual installation and removal of the floating dock structures, swimming, and beach and riparian area maintenance activities. Maintenance activities are generally related to the maintenance of areas of cleared aquatic and riparian vegetation, which will be established during the Construction Phase. The dock anchors will not be removed each spring and fall with the dock structures, to limit disturbance to the aquatic habitat.

Operational activities are anticipated to result primarily in disruption to fish activity and opportunities for erosion and sedimentation. Mitigation measures will be outlined in an Environmental Protection Plan for Operations. Activities will be planned within the DFO timing windows.

Anticipated adverse effects to aquatic flora and fauna during Project operations are expected to be:

Reversible – effects to wildlife will not occur beyond the life of the Project.

Sporadic – activities which result in disturbance of fish activity will be episodic to sporadic.

Intermediate Term – aquatic floral and faunal effects will occur over the life of the Project.

Local Area – effects to aquatic flora and fauna are anticipated to be contained primarily within the local area, adjacent to the Project Site on the east shoreline.

Low Magnitude – aquatic effects of operations are anticipated to be of low magnitude.

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No significant adverse impacts to wildlife related to Project operation are anticipated.

7.4.6 Socioeconomic Effects

7.4.6.1 Employment and Economic Development

In addition to the 5 full-time, 20 part-time and 100 seasonal positions (or 55 Full-time Equivalent positions) created by Project operation, it is expected that the Project will continue to create demand for local and regional goods through procurement of operational supplies. Annually, the Camp is anticipated to contribute \$2.3 million to Manitoba's GDP through operational expenditures. In addition, use of the Camp will be available to local and regional groups for use as a community resource on a planned-basis.

7.4.6.2 Municipal/Park Services

The Camp, as proposed, is designed to be as self-sufficient as possible, to reduce dependency and utilization of public or municipal services. This includes the provision of treated drinking water and fire water supply as well as on-site treatment and disposal of sanitary wastes. Snow clearing of the internal and entry roads will be conducted by Camp maintenance personnel. The Camp will contribute positive, value-added services to the Park and surrounding regions through tree planting and other enhancement activities.

Solid waste generated and temporarily stored on-site will be transferred to a licensed regional waste disposal ground. Septic tanks associated with the MicroFAST® wastewater treatment system require a pump out by a licensed wastewater hauler once every two to three years, as part of routine maintenance.

It is not anticipated that Camp operations will rely on Park services. The anticipated effect of reliance on municipal services for solid waste disposal endpoints and routine maintenance sewage effluent disposal is expected to be:

Reversible – reliance on municipal services will not occur beyond the life of the Project.

Sporadic to Continuous – use of sewage effluent disposal will be sporadic throughout the life of the Project with use of waste disposal endpoints occurring on a continuous, predictable schedule.

Intermediate Term – use of solid waste and sewage effluent endpoints will occur over the life of the Project.

Regional Area – due to the location of suitable endpoints, reliance on services will effect a regional area.

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Low to Moderate Magnitude – accumulation of solid waste at the approved regional endpoint could be measured, if needed, with a program designed for that purpose, but will not have an obvious effect on the amount of waste.

No significant adverse impacts to municipal or Park services related to Project operation are anticipated.

7.4.6.3 Noise and Light

It is anticipated that Camp operation will result in the generation of noise and light, which may result in auditory or visual impacts to day-users and Pinawa residents located across the Winnipeg River.

General outdoor activities and wilderness trips are anticipated to be a source of noise, commensurate to other outdoor activities undertaken by Park and day users. Camp programming includes the practice of *Leave No Trace* principles which are practiced on all wilderness canoeing and hiking expeditions and includes the avoidance of loud voices and noises in consideration of other visitors.

External lighting will be provided outside of buildings and along established trails within the Project Site to ensure participant and personnel safety. The use of dark sky lighting (i.e. partial to full cutoff lighting), where possible, will reduce light pollution and impacts to night sky access. In addition, direct line of sight to the Project Site from Pinawa residents along the Winnipeg River is largely blocked by Porcupine Island.

Any anticipated auditory or visual effects related to outdoor activities and lighting is expected to be:

Reversible – auditory and visual lighting effects will not occur beyond the life of the Project.

Sporadic – the occurrence and magnitude of auditory and visual effects will be sporadic during Project operation, and generally correlate periods of peak use.

Intermediate Term – auditory and visual effects will occur over the life of the Project.

Local to Regional Area – auditory and visual effects will primarily impact the local area; however, wilderness trips to other areas may impact non-local receptors.

Low to Moderate Magnitude – auditory and visual effects are expected to be of low magnitude, but auditory effects may be measured, if needed, using a well-designed program.

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No significant adverse auditory or visual impacts related to Project operation are anticipated.

7.4.6.4 Traffic

The transportation of Camp participants and personnel to and from the Camp may have an effect on traffic in the local area. THCF provides ground transportation to and from the Camp for Youth Leadership and Community Partnership Program participants. As such, transportation is arranged in the most efficient manner possible.

It is anticipated that any effects to local traffic will be of low magnitude, reversible and will occur in a patterned manner throughout Camp operation. No significant adverse effects to traffic are anticipated as a result of Project operation.

7.4.6.5 Heritage Resources

There is a potential for previously unknown heritage resources to be unearthed during outdoor activities, especially program activities, such as tree planting and wilderness trips. Camp personnel will be alert for artifacts that may accidentally be uncovered and, in the event that artifacts are discovered, activities in that area will cease until the Heritage Resources Branch is notified. Further the *Leave No Trace* principles which are central to Camp programming for outdoor activities emphasize the preservation of the past, including not touching cultural or historical structures and artifacts.

No significant impacts to heritage resources are anticipated as a result of outdoor activities during Program operation.

7.4.6.6 Resource Use and Outdoor Recreation

Effects to resource use and outdoor recreation are related to loss of access to the 17.19 ha lease area and increased recreational use (e.g. canoeing and kayaking) of Sylvia Lake near the Site. Pursuant to the *Park Activities Regulation* and associated signage to be posted, hunting activities will be required to maintain a 300 m buffer from the park lease area, which will affect 48 ha of land contiguous with the site and 49 ha of land on Porcupine Island.

THCF will coordinate with the local RTL lineholder to ensure that outdoor recreational activities outside of the lease area during fall/winter/spring operation will not overlap with trapping activities, to reduce interference and ensure the health and safety of participants.

No significant impact to resource use and outdoor recreation are anticipated as a result Project operation.

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7.5 DECOMMISSIONING

Effects during Project decommissioning are expected to be similar to the effects associated with construction. When the Project is decommissioned, construction workers would be hired to undertake decommissioning activities. This is expected to have positive effects on the socio-economic environment that are similar to the effects of construction. It is possible to decommission Project buildings, facilities and roads and regenerate natural vegetation. Decommissioning effects are expected to be reversible, short-term, positive, will occur within the Project Site and local region and be of high magnitude.

7.6 ACCIDENTS AND MALFUNCTIONS

The effects of accidents and malfunctions are primarily related to the potential for accidental spills of fuel. Hazardous material could be spilled due to failure of components (e.g. emergency backup generator) or during equipment fuelling or maintenance procedures. The seepage of hazardous materials into watercourses may potentially impact wildlife populations and habitats. The magnitude and duration of the potential effects of accidental spills are dependent upon the characteristics of the material spilled, the amount spilled, the location of the spill and the time of year the spill occurs. For example, spills occurring during the winter, under frozen ground conditions, will facilitate the recovery of spilled material and reduce the potential for any effects on soils and watercourses.

Standard environmental protection practices require potentially hazardous materials to be kept within dedicated storage areas within the Project Site. The use of dedicated areas for storage and maintenance will facilitate spill containment and will be located away from any sensitive features.

To minimize the potential effect of accidents or malfunctions on wildlife habitat, the proponent will construct and operate the Project in adherence with environmental protection practices outlined in the Environmental Protection Plan document for construction and operation.

7.7 GREENHOUSE GAS EMISSIONS**7.7.1 Construction Phase**

The Construction Phase will involve the use of a variety of diesel construction vehicles and equipment, resulting in emissions of greenhouse gases (GHGs) consistent with diesel construction equipment engine exhaust, including carbon dioxide, methane and nitrous oxide. The GHG emissions resulting from construction activity will be short-term in duration (ceasing when construction is complete) but will be continuous during the working hours through the construction phase of the Project. It is expected that GHG emissions generated in the Construction Phase of the Project will be essentially continuous during the construction period,

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negative in impact, but with negligible magnitude to the immediate area. Potential impacts associated with the construction phase-related GHG burden are considered to occur over the long term.

While GHG emissions associated with construction activities cannot be avoided with available construction vehicles and equipment, procedures will be outlined in the Environmental Protection Plan for Construction to reduce emissions, where possible. These include applying proper vehicle maintenance for more efficient engine operation as well as turning equipment off when it will not be immediately deployed. While vehicles will be properly maintained and equipment will not be operated when it is not required for use, there are situations where some construction equipment will idle in order to establish equipment warm up in order to establish suitable equipment operating temperatures.

7.7.2 Operation Phase

Camp operations involve activities, equipment and processes with potential to generate GHG emissions. These emissions result from key areas associated with the camp, including:

- GHG from Facility Stationary Combustion Sources
 - Emissions of carbon dioxide, methane and nitrous oxide from sources such as furnaces, boilers, burners.
- GHG Vehicle Exhaust Emissions
 - Emissions of carbon dioxide, methane and nitrous oxide from camp fleet and service vehicles supporting the camp during operation.
- GHG Emissions from Wastewater-treatment System
 - Wastewater-treatment system operation will result in the following GHG emissions:
 - Carbon dioxide, methane and nitrous oxide are generated in the combustion of diesel fuel used in standby power generators.
 - Emissions associated with the wastewater-treatment system including methane and nitrous oxide

It is anticipated that the impacts associated with these GHG emissions will be negligible in local impact, but long-term and continuous during the annual recreational season of operation for the camp.

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GHG emissions will occur as a result of camp operations; however procedures will be outlined in the Environmental Protection Plan for Operations to reduce these emissions, where possible. These include applying proper vehicle maintenance for more efficient vehicle engine operation as well as turning equipment off when it will not be immediately used. Vehicles will be properly maintained and equipment will not be operated when they are not required for use. For the wastewater-treatment system, developments in the area of greenhouse gas emissions reduction technologies will be monitored, and where possible and appropriate, additional reduction strategies will be considered.

8.0 Cumulative Effects

The most substantial cumulative effects of the Project will be positive and will result from increases in employment, demand for local goods and services and contribution to the local and provincial economy.

There is a potential for effects of the Project to be cumulative with other non-Project activities such as Park use, existing and future cottage development and regional community use. Adverse cumulative effects of the Project are not expected to exceed any regulatory thresholds. **As indicated in the following Sections 8.1 and 8.2, the expected adverse cumulative effects on the environment are judged to be not significant.**

8.1 CONSTRUCTION PHASE

Land clearing and development associated with Project construction activities will result in an incremental loss of treed communities and Park land base available for public access, development and wildlife. The loss of treed communities would be in addition to trees lost due to other past, current and future developments and natural events, such as wind blow-down events. The relatively small footprint area of the Project (<0.01% of Whiteshell Provincial Park land) is not considered to contribute significantly to the overall loss of Whiteshell Provincial Park land access and treed communities.

Some of the emissions from construction machinery associated with the Construction Phase of the Project will accumulate in the local air shed, along with emissions from other local and regional sources (e.g., traffic, emissions from other industries). However, the incremental contribution of construction-related emissions is not anticipated to result in exceedance of any regulatory threshold for emissions in the local area.

Increase in traffic associated with construction activities will contribute incrementally to the incidence of traffic-associated wildlife mortalities. Due to the relatively short-term span of construction (i.e. less than two years), cumulative adverse effects of increased construction traffic are anticipated to be minor.

8.2 OPERATION PHASE

8.2.1 Water Use

Water withdrawal requirements for Camp operations are not anticipated to compete with other current water users or have any incrementally negative effect to available water resources due to the lack of other regional users, including agricultural users.

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8.2.2 Outdoor Recreation

The participation of Camp participants and their associated counsellors in outdoor activities, including water-based recreational activities such as canoeing, are anticipated to contribute an incremental increase in the recreational use of local and regional areas. This increase is anticipated to have a minor adverse contribution to recreational opportunities which will be reversible, sporadic and affecting primarily the local area over an intermediate term. **This potential cumulative impact is judged to be not significant.**

8.2.3 Goods and Services

Operation of the Project is expected to result in an incremental increase in local and regional employment and in the use of local goods and services. This positive effect will be cumulative with the same positive effect from other projects and activities in the area, and is expected to contribute \$2.3 million annually to Manitoba's GDP which is **a significantly positive contribution** to the local economy which is also noticeable in the regional economy

9.0 Residual Effects

Following the implementation of mitigative measures inherent in the Project design and Operational programming (e.g., dark sky lighting, low flow water fixtures, *Leave No Trace* principles) as well as identified in a project-specific Environmental Protection Plan, **no significant adverse residual effects are expected due to the construction and operation of the proposed Project. Positive residual effects will relate to economic spin-offs associated with ongoing employment and continued use of local and regional goods and services during the life of the Project.**

10.0 Environmental Inspection, Monitoring and Follow-up

Prior to construction, THCF will submit an Environmental Protection Plan (EPP) supplementary to this EA to Manitoba Conservation, which will outline mitigation activities and beneficial management practices (BMPs) to be conducted during construction and operation phases of the Project life cycle in order to minimize Project-related environmental impacts. Environmental inspection and monitoring activities will be outlined within the EPP. It is anticipated that the EPP will be produced in volumes which will be submitted prior to applicable phases of the Project. For example, it is anticipated that an initial EPP volume will be submitted in early winter 2011 to address initial Project construction activities, including internal roads and services.

Prior to construction, THCF will appoint a Project Manager and General Contractor/Construction Site Manager to coordinate and supervise construction activities. An Environmental Inspector, designated by THCF, will advise the Project Manager, General Contractor/Construction Site Manager and construction staff to implement activities outlined in the EPP in order to minimize construction-related environmental impacts (e.g. adherence to mitigation measures and BMPs), as well as to ensure adherence to municipal, provincial and federal regulations and guidelines.

11.0 Conclusions

On the basis of the studies undertaken and information available to date, the proposed THCF Sylvia Lake Leadership Camp creates no basis for predicting any significant impacts to the biophysical and socioeconomic environments, while creating significant and accumulating socioeconomic benefits.

The commitment of the proponent to develop an Environmental Protection Plan (EPP) prior to construction is intended to ensure that the Project is developed, as designed, with minimal environmental effects.

On the basis of the information received to date, Stantec believes that all applicable proscriptions and requirements of the regulatory regime identified in Section 3 will be met.

12.0 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, results and discussion 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 discussion presented represents 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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