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REPORT ON

JUNIOR LAKE PROPERTY
ENVIRONMENTAL BASELINE STUDY
LANDORE RESOURCES CANADA INC.
ARMSTRONG, ONTARIO

Submitted to:

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February 13, 2009 08-1192-0080

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1.0 INTRODUCTION AND BACKGROUND

1.1 General

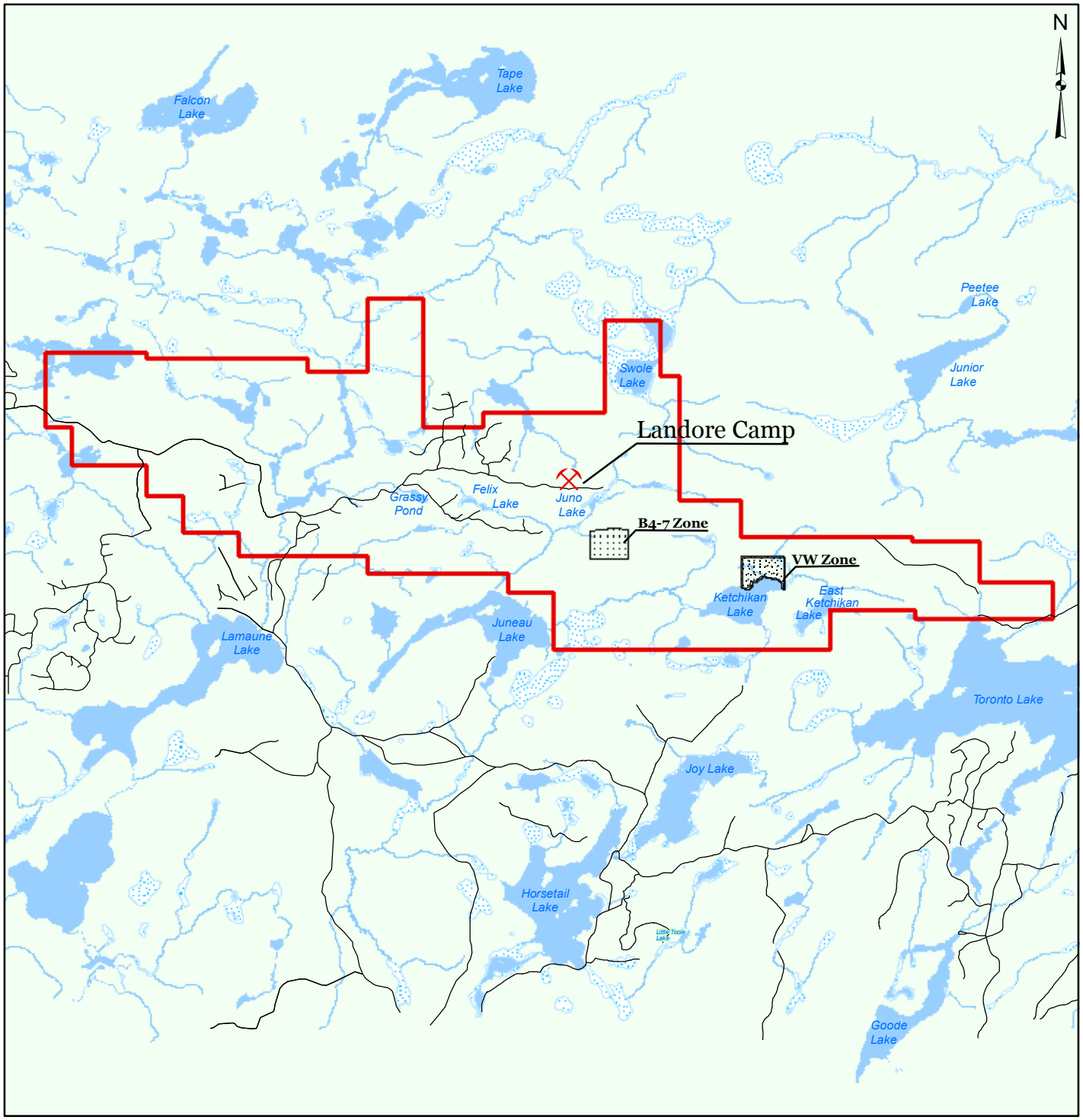
Landore Resources Canada Inc. (Landore) is currently exploring and developing a nickel, copper and platinum group elements deposit at its' Junior Lake Property in Northern Ontario (Figure 1). The Junior Lake Property is situated northeast of Lake Nipigon and approximately 105 km east of the Town of Armstrong. The nearest city is Thunder Bay, Ontario, located approximately 405 km by road to the south-southwest. Golder Associates Ltd. (Golder) was retained by Landore to prepare an environmental baseline study for a proposed mine development footprint (the Site) within the Junior Lake Property (Figure 2).

The purpose of the baseline study is to characterize existing site conditions, identify potential environmental constraints associated with the Site and to gather information that will support further exploration/operational permit applications.

1.2 Scope of Work

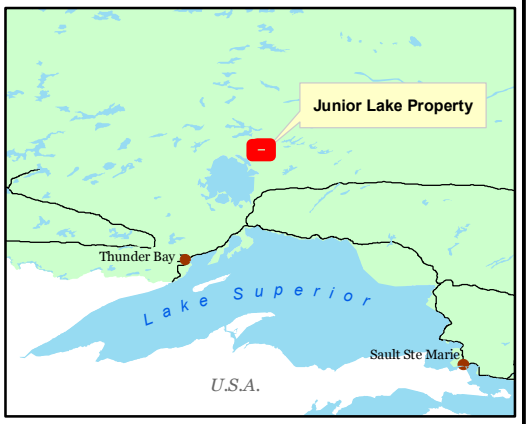
The environmental baseline study conducted by Golder included the following components:

- file review consisting of accessing and summarizing relevant information maintained by Landore, the applicable government agencies such as the Ontario Ministry of Natural Resources (MNR) and consultation with applicable agency representatives ;
- terrestrial field survey of the Site to ground-truth existing background information, identify plant communities and make supplemental observations of wildlife and wildlife habitat;
- aquatic survey (fish community, fish habitat and associated habitat variables) of selected waterbodies within the Site; and
- preparation of the environmental baseline study report, using all information obtained from the file review, consultations and field surveys.



LEGEND

- VW Zone
- Landore Camp
- Landore Property Boundary
- Roads
- Rivers
- Waterbody
- Wetland Area
- Wooded Area



REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

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SCALE 1:125,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE
KEY PLAN

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1190-0080			SCALE AS SHOWN	REV. 0
DESIGN	RM	March 2008		
GIS	RRD	March 2008		
CHECK	RM	Jan. 2009		
REVIEW	JS	Jan. 2009		

FIGURE 1

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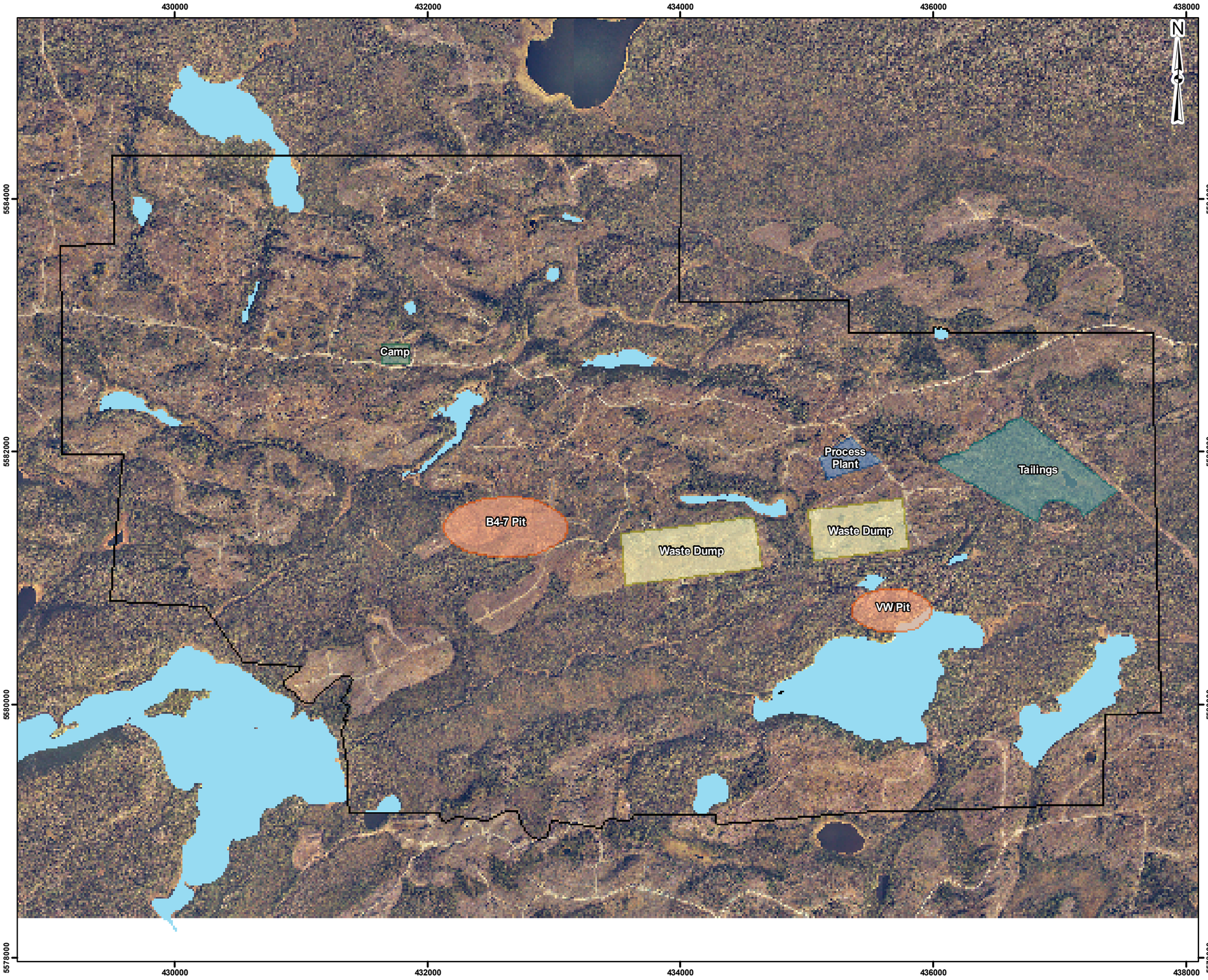

LEGEND

- Proposed Mine Development -(camp, pit, waste dump, tailings, plant)
- Proposed Mine Development Footprint
- Water

REFERENCE

Image supplied by client Landore Resources Canada Inc.
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

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SCALE 1:30,000 METRES

PROJECT
LANDORE RESOURCES BASELINE SUDY
ARMSTRONG, ONTARIO

TITLE
Environmental Baseline Study Site

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1190-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	27 Jan. 2009		
GIS	RRD	27 Jan. 2009		
CHECK	RM	27 Jan. 2009		
REVIEW	BRG	27 Jan. 2009		

FIGURE: 2

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2.0 METHODOLOGY

Resource information was obtained through requests made to the MNR Nipigon District office, from available mapping and on-line database searches and collected during the terrestrial and aquatic biological field surveys. General information was collected to determine the potential presence of the following features:

- Areas of Natural and Scientific Interest (i.e. Life Science Natural Area);
- significant wetlands;
- listed flora and fauna species;
- habitat of significant species, based on values mapping information (e.g. moose (*Alces alces*) yard), waterfowl concentration areas, important wildlife habitat, raptors, forestry information; and
- fish community and fish habitat.

The terrestrial field survey was conducted from July 22 to July 25, 2008, while the fish community/fish habitat survey was completed from August 13 to 25, 2008.

2.1 Vegetation

Using imagery provided by Landore, vegetation community boundaries were classified using the Northwestern Ontario Forest Ecosystem Classifications (FEC) (Sims et al. 1997) system and applicable Golder Technical Procedure (Golder 2005) to provide a description of the plant community characteristics, soil types and plant species found within Landore's proposed mine development footprint (Figure 2). Wetland habitats that could not be classified using the FEC system (i.e. sites without forest cover) were classified using the Northern Ontario Wetland Evaluation System (MNR 2002).

During the terrestrial field survey, ground-truthing of plant community boundaries was conducted to confirm the accuracy of plant community mapping.

Ecosite classification is based on modal descriptions of site conditions. As a result, a surveyed site may not contain all the species that commonly occur under similar conditions. To determine the vegetation type, Golder biologists selected a 10 m by 10 m (0.01 ha) plot that was representative of each plant community. Observations describing species presence within the canopy, subcanopy, understorey and ground layer vegetation were applied to the FEC key to determine the vegetation type.

Soil profiles were determined using a soil auger, and field descriptions of soil types were recorded to a maximum depth of 120 cm. Observations were recorded for texture, moisture regime, depth of organics, depth to bedrock, and depth of mottling and gley soil. Mottling

appears in mineral soils as spots or blotches of different colour or shades of colour interspersed with the dominant color and indicates a fluctuating water table (Brady 1990). Gley soil is mineral soil developed under conditions of poor drainage resulting in reduction of iron and other elements and is observed as grey and blue colours (Brady 1990).

2.2 Wildlife

Existing wildlife information was obtained through a literature review, discussions with agency representatives from the MNR (Ray Tyhuis, pers. comm. 2008), and searches of available databases. Incidental wildlife observations were also recorded during the 2008 field survey and accompanied habitat information recorded during the vegetation surveys. Species type, location, habitat type and observed activity were recorded for each incidental wildlife observation.

2.3 Species at Risk

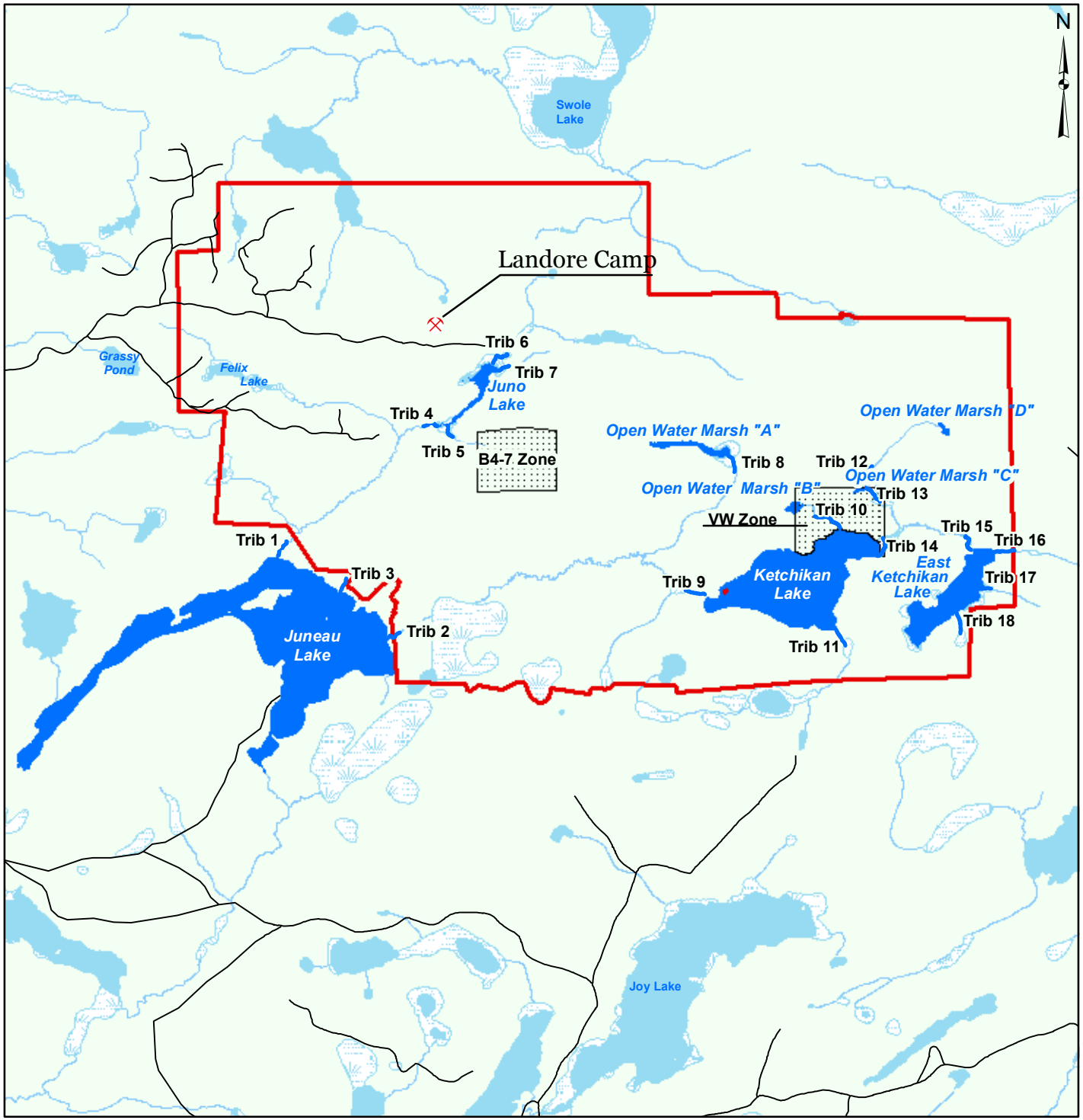
The potential presence of federally and provincially significant or listed species was determined by searching the Natural Heritage Information Centre (NHIC) (2008), Species at Risk in Ontario (SARO) (2008), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (2008), the federal *Species at Risk Act* – Schedule 1 (SARA) (2008) databases and available range information.

2.4 Fish and Fish Habitat

2.4.1 Fish Community

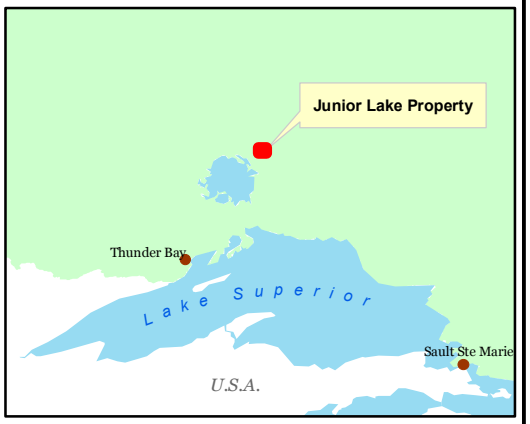
Fish sampling locations were selected on waterbodies and watercourses with potential to be affected by future mining activities to characterize fish community diversity and relative abundance. They included the following waterbodies: Juneau Lake, Juno Lake, East Ketchikan Lake, four waterbodies designated as Open Water Marsh (OWM) "A", "B", "C", "D" and associated tributaries (Tribs 1 to 18) connecting these lakes and OWMs (Figure 3). All sample locations were geo-referenced (UTM coordinates referenced to NAD 83) with a portable Garmin™ GPS unit. Due to dry conditions no fish community data were recorded in Tribs 3, 5 and 18. The fish community surveys followed Golder's Technical Procedure (Golder 1997a) and were conducted under an MNR permit to collect fish for scientific purposes (license number 1047258).

A variety of fish sampling techniques were employed during the fish community survey. Nordic (gill) nets (30 m long) ranging in mesh size from 5 to 55 mm were used to capture small bodied fish species. Experimental gill nets (122 m long) consisting of 35 to 115 mm mesh were also deployed where they could fish efficiently (i.e. at depths greater than 2 m).



LEGEND

- VW Zone
- Landore Camp
- Proposed Footprint Boundary
- Roads
- Sampled Tribs
- Sampled Lakes
- Rivers
- Waterbody
- Wooded Area
- Wetland Area



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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

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SCALE 1:60,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE
Aquatic Sampling Locations

Golder Associates Sudbury, Ontario

PROJECT No. 08-1190-0080			SCALE AS SHOWN	REV. 0
DESIGN	RM	March 2008		
GIS	RRD	March 2008		
CHECK	RM	Jan. 2009		
REVIEW	JS	Jan. 2009		

FIGURE 3

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Approximately 100 to 200 m of channel or shoreline were electrofished in each of the tributaries and along the shorelines of Juno Lake and OWM "A" using a Smith Root™ LR-24 backpack electrofisher. Typically, the electrofishing crew made three complete passes of the entire tributary segment, sampling habitat along both channel margins and mid-channel. Minnow traps (gee style) were also baited and deployed at different sample sites within each tributary segment or lake/OWM. Species identification of the fish captured was carried out in the field. All fish captured were identified and live released.

During the fish community survey, the following information was recorded:

- number and type of fish species caught;
- method of capture;
- sampling effort (h,s);
- weight (g);
- fork length (mm); and
- external health (evidence of parasites, lesions, body condition).

2.4.2 Fish Habitat

Fish habitat mapping followed Golder's Technical Procedure for watercourse and lake habitat features (Golder 1997b). Shoreline habitat information was collected in the area that encompassed each lake and OWM fish community sample location. Habitat features were mapped within each tributary reach (approximately 100 to 200 m in length). Typical observations included the following categories: shoreline slope; shoreline vegetation; location of stream inlets; stream class (channel unit); substrate type and presence of emergent/floating/submerged vegetation; debris; estimates of available fish cover; and potential barriers to fish migration [i.e. beaver (*Castor canadensis*) activity]. Spot measurements of flow velocity and corresponding depth were recorded at set distances of ¼ , ½ and ¾ channel width across selected tributary channel units. Flows were measured using a Marsh-McBirney flow meter (Flo-Mate 2020™).

2.4.3 Supporting Environmental Data

Supporting field data was collected in the field as part of the fish community and habitat survey and included the following parameters: air temperature, water transparency (Secchi depth – lakes only), water temperature, dissolved oxygen (DO), pH and conductivity. One metre profile measurements of water temperature, DO, pH and conductivity were also recorded in the deepest portion of Juneau Lake. Bathymetry data for Juneau and East Ketchikan Lakes were also collected to illustrate lake bottom morphology.

A series of surface water discharge measurements were also completed by Golder staff in August 2008. Discharge locations were selected at tributaries where measurable flow was observed. Discharge measurement data was collected and calculated according to Golder Technical Procedure (Golder 1997c) using a Marsh-McBirney flow meter (Flo-Mate 2020™) and the velocity-area method.

3.0 RESULTS AND DISCUSSION

The Site is situated within the Lake Nipigon Boreal Shield Ecoregion, that surrounds Lake Nipigon and extends westward from the north shore of Lake Superior to Lake St. Joseph in northwestern Ontario. The following sections provide an overview of this ecoregion, and specific environmental characteristics related to the Site.

3.1 Climate

The ecoregion is classified as having warm summers and cold, snowy winters. Climate normals for the period of 1971 to 2000 for the Site area were obtained from Environment Canada (2008). The Geraldton A site (Station ID 6042716) is located 100 km southeast of the Site but was assumed to be representative of conditions at the Site. According to these data, the average annual temperature is 0.3°C and total precipitation is approximately 740 mm each year, of which approximately 28% falls as snow. The prevailing winds for the Site are from the west and have an average wind speed of 11.4 km/h (Environment Canada 2008). Appendix A includes the relevant monthly climate data for the Site.

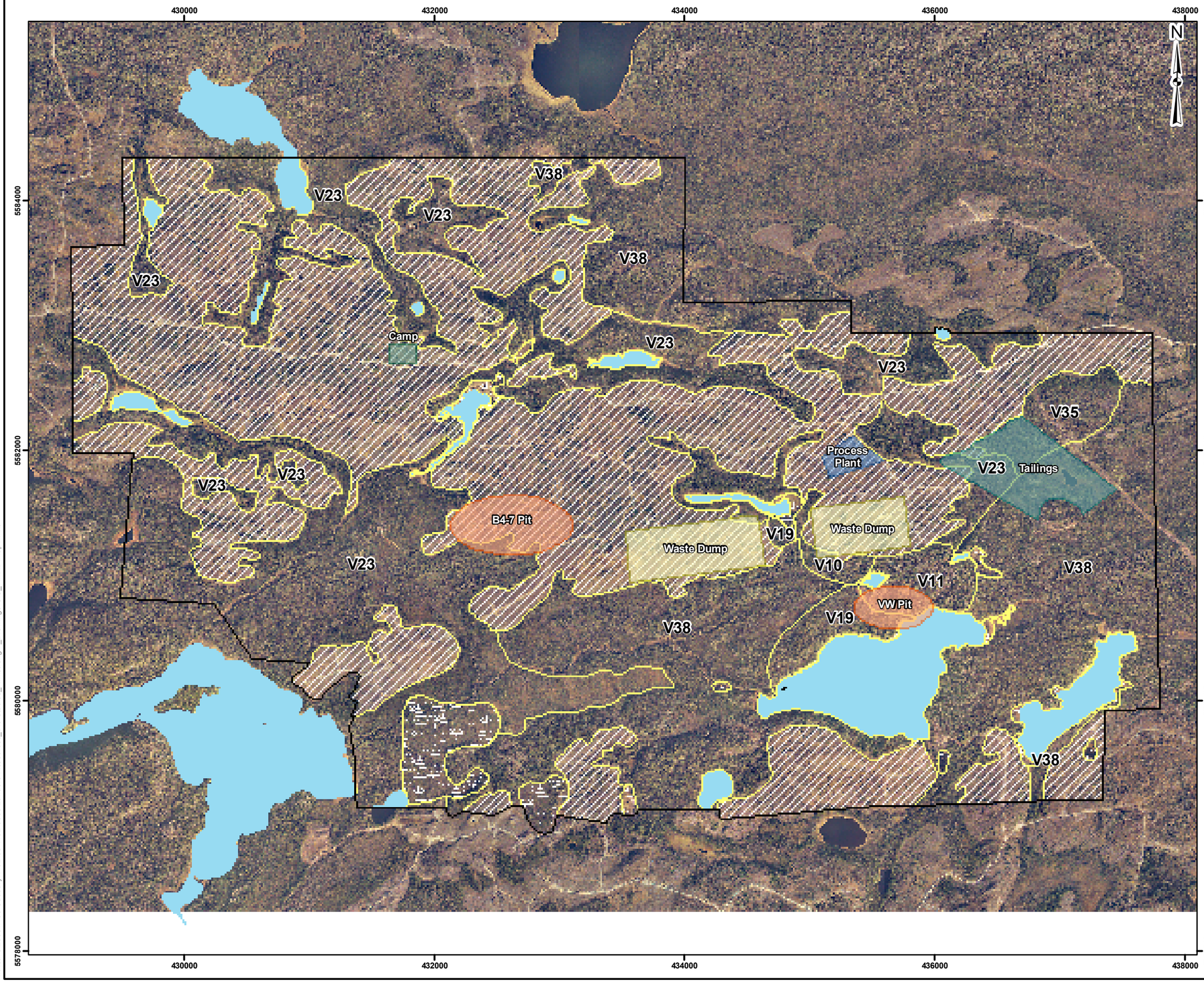
3.2 Geology

The ecoregion is underlain by the acidic, Archean bedrock of the Canadian Shield. Hummocky bedrock outcrops covered with thin acidic morainal deposits and fluvial and lacustrine silts and sands dominate the landscape. Dystric Brunisolic soils dominate the western half, and Humo-Ferric Podzolic soils dominate the eastern half of the ecoregion. Significant inclusions are Gleysolic, Fibrisolic, Mesisolic, and Gray Luvisolic soils on limited areas of finer-textured deposits, some of which are peat-covered (Environment Canada 2005).

3.3 Vegetation

Characteristic vegetation within the ecoregion is mixed forest, characterized by stands of white (*Picea glauca*) and black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), jack pine (*Pinus banksiana*), trembling aspen (*Populus tremuloides*), and white birch (*Betula papyrifera*). Dry sites are dominated by jack pine with secondary quantities of black spruce while wet sites contain larch (*Larix laricina*) and black spruce with a groundcover of moss and lichen.

Observations recorded during the July 2008 field survey, indicated that the upland vegetation cover within the Site boundary is dominantly black spruce with associates of trembling aspen, white birch and jack pine. Lowland vegetation cover included black spruce swamp with balsam fir and larch. Based on the FEC system, six vegetation communities were identified (Figure 4), in addition to historically deforested sections, which were labelled as “cultural” (Table 1).



LEGEND

- V10 — Trembling Aspen - Black Spruce - Jack Pine - Low Shrubs
- V11 — Trembling Aspen - Conifer - Blueberry - Feathermoss
- V19 — Black Spruce - Mixedwood - Herb Rich
- V23 — Tamarack (Black Spruce) - Speckled Alder - Labrador Tea
- V35 — Black Spruce - Speckled Alder - *Sphagnum*
- V38 — Black Spruce - Leather Leaf - *Sphagnum*
- Cut - Cultural (Cutover Area)
- Marsh
- Water
- Proposed Mine Development -(camp, pit, waste dump, tailings, plant)
- Proposed Mine Development Footprint

REFERENCE

Image supplied by client Landore Resources Canada Inc.
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

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SCALE 1:30,000 METRES

PROJECT
LANDORE RESOURCES BASELINE SUDY
ARMSTRONG, ONTARIO

TITLE
Vegetation Communities

Golder Associates Sudbury, Ontario

PROJECT No. 08-1190-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	27 Jan. 2009		
GIS	RRD	27 Jan. 2009		
CHECK	RM	27 Jan. 2009		
REVIEW	BRG	27 Jan. 2009		

FIGURE: 4

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TABLE 1
FOREST ECOSYSTEM CLASSIFICATION SUMMARY
AUGUST 2008

Vegetation Type	Soil Type	Description
V10 Appendix B; Photo 1	SS9	**Trembling Aspen – Black Spruce – Jack Pine / Low Shrub** The canopy and subcanopy were dominated by trembling aspen, black spruce, white birch and jack pine, which provided 10 to 25% and 25 to 50% cover within each layer, respectively. Shrubs observed within the understorey include black spruce, speckled alder (*Alnus incana*) and balsam fir. The ground layer was observed to include red raspberry (*Rubus idaeus*), bush honeysuckle (*Diervilla lonicera*) and Canada blue-joint (*Calamagrostis canadensis*). Other species observed within the ground layer include plume moss (*Ptilium crista-castrensis*), Canada mayflower (*Maianthemum canadense*), twinflower (*Linnaea borealis*), bunchberry (*Cornus canadensis*), Shreber's moss (*Pleurozium schreberi*), creeping snowberry (*Gaultheria hispidula*), oak fern (*Gymnocarpium dryopteris*), naked miterwort (*Mitella nuda*), smooth gooseberry (*Ribes hirtellum*), sedge species (*Carex* sp.), and blue-bead lily (*Clintonia borealis*). These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a rapidly drained fibric organic soil with a dry moisture regime. The depth of the organics was approximately 24 cm and the depth to bedrock was 24 cm. No mottles or gleying were observed.
V11 Appendix B; Photo 2	S2 / SS2	**Trembling Aspen – Conifer / Blueberry / Feathermoss** The canopy and subcanopy were dominated by trembling aspen, black spruce, white birch, yellow birch (*Betula alleghaniensis*), and jack pine, which provided 5 to 10% cover within each layer. Shrubs observed within the understorey include black spruce, white birch, trembling aspen and bush honeysuckle. The ground layer was observed to include low-sweet blueberry (*Vaccinium angustifolium*), wild sarsaparilla (*Aralia nudicaulis*), bunchberry, dwarf raspberry (*Rubus pubescens*) and Shreber's moss. Other species observed within the ground layer include twinflower, plume moss, velvet leaf blueberry (*Vaccinium myrtilloides*), running ground-pine (*Lycopodium clavatum*), stiff clubmoss (*Lycopodium annotinum*), cow-wheat (*Melampyrum lineare*), Canada mayflower, swamp red currant (*Ribes triste*), false Solomon's-seal (*Maianthemum racemosum*), violet species (*Viola* sp.), goldthread (*Coptis trifolia*), blue-bead lily and starflower (*Trientalis borealis*). These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a rapidly drained silty fine sand with a moderately dry moisture regime. The depth of the organics was 5 cm and the depth to bedrock was approximately 20 cm. No mottles or gleying were

Vegetation Type	Soil Type	Description
		observed.
V19 Appendix B; Photo 3	S4 / SS3 / SS9	**Black Spruce Mixedwood / Herb Rich** The canopy and subcanopy were dominated by black spruce, trembling aspen, jack pine, and white birch, which provided 5 to 10% cover within each layer. Shrubs observed within the understorey include white birch, black spruce, mountain ash (*Sorbus decora*), willow (*Salix* sp.) and trembling aspen. The ground layer was observed to include Shreber's moss, creeping snowberry, bunchberry, low-sweet blueberry, Labrador tea (*Ledum groenlandicum*), woodland horsetail (*Equisetum sylvaticum*), and prickly rose (*Rosa acicularis*). Other species observed within the ground layer include velvet-leaf blueberry, Canada mayflower, twinflower, plume moss, sphagnum moss (*Sphagnum* sp.), goldthread, blue-bead lily, bush honeysuckle, cow-wheat, dicranum moss (*Dicranum* sp.), and reindeer lichen (*Cladina rangiferina*). These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was variable, with two soil types dominating. Substrate was observed to be either a moderate to well-drained silty fine sand with a fresh to moderately dry moisture regime or a rapidly drained fibric organic soil with a dry moisture regime. The depth of the organics was approximately 17 cm and the mean depth to bedrock was 45 cm. No mottles or gleying were observed.
V22 Appendix B; Photo 4	S12S	**Cedar (inc. Mixedwood) / Speckled Alder / *Sphagnum*** The canopy and subcanopy were dominated by eastern white cedar (*Thuja occidentalis*), larch and black spruce, which provided 5 to 10% and 25 to 50% cover within each layer, respectively. Shrubs observed within the understorey include eastern white cedar, speckled alder, and willow. The ground layer was observed to include Shreber's moss, sphagnum moss, and sedges. Other species observed within the ground layer include stair-step moss (*Hylocomium splendens*), naked miterwort, twinflower, bunchberry, lungwort (*Mertensia paniculata*), violet species, dwarf raspberry, mnium species (*Mnium* sp.), Canada mayflower, inland sedge (*Carex interior*), and fowl manna grass (*Glyceria striata*). These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a very poorly drained fibric organic soil with a moderately wet moisture regime. The depth of the organics exceeded 120 cm and the depth to bedrock was also greater than 120 cm. No mottles or gleying were observed.
V23 Appendix B; Photo 5	S12S	**Tamarack (Black Spruce) / Speckled Alder / Labrador Tea** The canopy and subcanopy were dominated by larch and black spruce, which provided 5 to 10% and 10 to 25% cover within each layer, respectively. Shrubs observed within the understorey include larch, black spruce, willow, red osier

Vegetation Type	Soil Type	Description
		dogwood (*Cornus stolonifera*), and speckled alder. The ground layer was observed to include three-leaved Solomon's-seal (*Maianthemum trifolium*), sphagnum moss, marsh-marigold (*Caltha palustris*), creeping snowberry, dwarf raspberry, Labrador tea, and plume moss. Other species observed within the ground layer include bunchberry, naked miterwort, soft-leaved sedge (*Carex disperma*), violet species, starflower, twinflower, small cranberry (*Vaccinium oxycoccos*), swamp red currant. These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a very poorly drained fibric organic soil with a moderately wet moisture regime. The depth of the organics was greater than 120 cm and the depth to bedrock exceeded 120 cm. No mottles or gleying were observed.
V35 Appendix B; Photo 6	S12S	**Black Spruce / Speckled Alder / *Sphagnum*** The canopy and subcanopy were dominated by black spruce and larch, which provided 2 to 5% and 5 to 10% cover within each layer, respectively. Shrubs observed within the understorey include speckled alder and black spruce. The ground layer was observed to include Labrador tea, sphagnum moss, creeping snowberry and bunchberry. Other species observed within the ground layer include lingonberry (*Vaccinium vitus-idaeus*), plume moss, woodland horsetail, Shreber's moss, hairy Solomon's-seal (*Polygonatum pubescens*), twinflower, soft-leaved sedge, low-sweet blueberry, cloudberry (*Rubus chamaemorus*), dicranum moss, Canada mayflower, goldthread, velvet-leaf blueberry, reindeer lichen, leatherleaf, three-leaved Solomon's-seal, sheathed sedge (*Carex vaginata*) and dwarf raspberry. These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a very poorly drained fibric organic soil with a moderately wet moisture regime. The depth of the organics was approximately greater than 120 cm and the depth to bedrock exceeded 120 cm. No mottles or gleying were observed.
V38 Appendix B; Photo 7	SS2 / SS9 / S12S	**Black Spruce / Leatherleaf / *Sphagnum*** The canopy and subcanopy were dominated by black spruce, larch, willow, and serviceberry (*Amelanchier* sp.), which provided 10 to 25% cover within each layer. Shrubs observed within the understorey include speckled alder, black spruce, Labrador tea, willow, and sweetgale (*Myrica gale*). The ground layer was observed to include Labrador tea, sphagnum moss, Shreber's moss, sheathed sedge, creeping snowberry, low sweet blueberry, reindeer lichen, star reindeer lichen (*Cladina stellaris*), cloudberry, alpine bulrush (*Trichophorum alpinum*) and purple pitcher plant (*Sarracenia purpurea*). Other species observed within the ground layer include three-leaved Solomon's-seal, small cranberry, dicranum moss, bunchberry, velvet-leaf

Vegetation Type	Soil Type	Description
		blueberry, woodland horsetail, ligonberry, goldthread and bog laurel (*Kalmia polifolia*). These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to range from a very rapidly drained to very poorly drained fibric organic soil with a dry to moderately wet moisture regime. The depth of the organics ranged from 8 cm to >120 cm and the depth to bedrock ranged from 8 cm to >120 cm. No mottles or gleying were observed.
Cultural Appendix B; Photo 8	S3	**Cultural** The canopy and subcanopy were dominated by trembling aspen, white birch, black spruce, speckled alder and green alder (*Alnus viridus*). Shrubs observed within the understorey include black spruce, larch, willow, speckled alder, green alder, mountain ash, white birch, Labador tea, bunchberry, willow, pin cherry (*Prunus pensylvanica*), and bristly sarsaparilla (*Aralia hispida*). The ground layer was observed to include dwarf raspberry, violet species, water horsetail (*Equisetum fluviatile*), low sweet blueberry, Shreber's moss, fireweed (*Epilobium angustifolium*), meadow horsetail (*Equisetum pratense*), velvet-leaf blueberry, bunchberry and bush honeysuckle. Other species observed within the ground layer include fringed knowtweed (*Fallopia cilinode*), Canada mayflower, Canada blue-joint, creeping snowberry, red-stemmed aster (*Symphyotrichum puniceum*), sphagnum moss, common cattail (*Typha latifolia*) and bunchberry. These species were observed to be evenly distributed throughout the ground layer with no strong dominance exhibited. Soil within the Site was observed to be a rapidly drained silty fine sand with a moderately fresh moisture regime. The depth of the organics was approximately 4 cm and the depth to bedrock exceeded 120 cm. No mottles or gleying were observed.

3.4 Wildlife

Characteristic wildlife of the region includes moose, black bear (*Ursus americanus*), lynx (*Felis lynx*), snowshoe hare (*Lepus americanus*), wolf (*Canis lupus*) and caribou (*Rangifer tarandus caribou*) (Environment Canada 2005). Supporting wildlife information in the form of incidental observations were recorded during the 2008 field survey (Table 2).

TABLE 2
INCIDENTAL WILDLIFE OBSERVATIONS
AUGUST 2008

Scientific Name	Common Name	Associated Vegetation Habitat	SRank	Status
Alces alces	moose	Cultural (Cut area)	S5	Secure
Falcipennis canadensis	spruce grouse	V38	S5	Secure

Note:
SRank – Species ranking
S5 – Secure in Ontario

3.5 Species at Risk

Based on the review of available species range information, there is potential for nine federally listed species and five provincially listed species (all listed by SARO and tracked by the NHIC) to occur in the region containing the Site. Table 3 describes the species listed by COSEWIC, SARA-Schedule 1, SARO and the NHIC, based upon known site conditions, known habitat preferences and availability, and species range information.

Although none were observed during the site survey, woodland caribou (*Rangifer tarandus caribou*) are known to occupy areas in the vicinity of the Site (Ray Tyhuis, pers. comm. 2008). Although there are currently no protection areas in the region, caribou are susceptible to forest disturbance. Intensive activity can impact habitat suitability and may be disruptive to caribou presence. Lichens form a substantial portion of caribou forage, however there was a very low cover of lichen observed at the Site. Only five species were noted during the vegetative surveys (*Cladina rangiferina, Cladina mitis, Cladina stellaris, Cladonia uncialis,* and *Usnea* sp.). These were present only occasionally on the Site. This is consistent with the history of logging activity which has taken place on the Site in the past. Logging activities damage lichens on the forest floor and alter the microclimate to impede further growth of lichens (Klein 1971). A study examining the effects of forest management on caribou winter habitat ecology in British Columbia reports that a period of at least 150 years is required to re-establish sufficient aboreal lichen biomass to sustain caribou populations in a clear-cut (Terry et al. 2000). In addition to decreases in available browse, mechanized forestry and mining activities will often result in the elimination of traditional rangelands and the creation of obstructions to seasonal movements for woodland caribou (Klein 1971). Woodland caribou often respond to human induced disturbance through avoidance, with the level of avoidance directly related to the level of human activity in an area (Dyer et al. 2001).

There is a Life Science Natural Area located north of Toronto Lake, approximately 10 km north east of the Site, which supports suitable caribou habitat (Noble 1977 in NHIC 2008). This location (Appendix B) consists of an extensive area of peatland, black spruce swamp and black spruce treed bog (Noble 1977 in NHIC 2008), the favoured habitat for woodland caribou (Rettie and Messier 2000).

TABLE 3
POTENTIAL SITE OCCURRENCE FOR SPECIES AT RISK

SPECIES AT RISK (Listed by COSEWIC, SARA and COSSARO)								
Species Specifics		**Listed by:**				**Habitat**	**Potential for Species to Occur Within the Site**	
Scientific Name	**Common Name**	**COSEWIC**	**SARA (Sch. 1)**	**COSSARO**	**NHIC (SRank)***		**Potential**	**Rationale**
Puma concolor couguar	eastern cougar	data deficient	not listed	endangered	SH	Habitat is essentially the same as that of their primary prey. Prefers rocky cliffs, ledges, vegetated ridgetops, or other areas that provide cover for undetected surveillance of prey; stream courses and ridgetops are frequently used as travel corridors and hunting routes; riparian vegetation along streams provides cover for mountain lions traveling in open areas (SARA 2008).	Low	The forest within the Site is composed of extensive cleared sections providing very little cover. No eastern cougar were observed during the field survey.
Gulo gulo	wolverine	special concern	endangered	threatened	S2	The wolverine needs vast undisturbed areas to maintain viable populations because it has a low reproductive rate, low population density, and large home range. It inhabits a variety of treed and treeless areas at all elevations including the northern forested wilderness, the alpine tundra of the western mountains, and the arctic tundra. The wolverine is most abundant where large ungulates are common (SARA 2008).	Low	The forest within the Site boundary is composed of large sections of disturbed habitat not conducive to the habitat requirements of wolverines. No wolverine were observed during the field survey.
Canis lupus lycaon	eastern wolf	special concern	special concern	special concern	SC	The eastern wolf inhabits deciduous and mixed forests in the southern part of its range, and mixed and coniferous forests further north (SARA 2008).	Moderate	The vegetation within the Site consisted largely of coniferous forests, a preferred habitat of the eastern wolf. No eastern wolf were observed during the field survey.
Rangifer tarandus caribou	woodland caribou	threatened	threatened	threatened	S3?	Many subpopulations of the woodland caribou boreal population show a preference for peatlands; they generally avoid clear cuts, shrub-rich habitat, and aspen-poplar dominated sites. The most common tree species in preferred habitats are black spruce, white spruce, and tamarack (SARA 2008).	Low	The landscape within the Site is composed of large sections of cleared forest and regenerated aspen stands not conducive to the habitat requirements of woodland caribou. No woodland caribou were observed during the field survey.
Falco peregrinus anatum	peregrine falcon	special concern (April 2007)	threatened	threatened	S2S3B,SZN	Nests are usually scrapes made on cliff ledges on steep cliffs, usually near wetlands - including artificial cliffs such as quarries and buildings; prefers to hunt in open habitats such as wetlands, tundra, savannah, sea coasts and mountain meadows, but will also hunt over open forest (SARA 2008).	Low	No cliffs exist within the Site, making it an unlikely region for peregrine falcons to nest; open areas are a result of disturbance and do not represent optimal hunting grounds for peregrines. No peregrine falcons were observed during the field survey.
Asio flammeus	short-eared owl,	special concern	special concern (Sch. 3)	special concern	S3S4B,SZN	Prefers extensive stretches of relatively open habitat; primarily a bird of marshland and deep grass fields (SARA 2008).	Low	While there existed large sections of cleared land within the Site, very little of it consisted of the marshland or deep grassy fields. No short-eared owls were observed during the field survey.
Coturnicops noveboracensis	yellow rail	special concern	special concern	special concern	S4B,SZN	Found in marshes dominated by sedges, true grasses, and rushes, where there is little or no standing water, and where the substrate remains saturated throughout the summer; can be found in damp fields and meadows, on the floodplains of rivers and streams, and in the herbaceous vegetation of bogs (SARA 2008).	Low	There were no graminoid marshes present within the Site, nor were any yellow rails observed during the field survey.

***Notes:**
SC – exists only in a cultivated state in Ontario; introduced population not yet fully established or self-sustaining
SH – Possibly Extirpated (Historical) in Ontario
S1 – Critically Imperilled in Ontario
S2 - Imperilled in Ontario
S3 - Vulnerable in Ontario
S3? – Rank Uncertain
S4 – Apparently Secure
S4B – Apparently Secure Breeding Pair

SPECIES AT RISK (Listed by COSEWIC, SARA and COSSARO)								
Species Specifics		**Listed by:**				**Habitat**	**Potential for Species to Occur Within the Site**	
Scientific Name	**Common Name**	**COSEWIC**	**SARA (Sch. 1)**	**COSSARO**	**NHIC (SRank)***		**Potential**	**Rationale**
Melanerpes erythrocephalus	redheaded woodpecker,	threatened (April 2007)	special concern (Sch. 3)	special concern	S3B,SZN	Found in thinly treed deciduous forests, woodland and field edges, but also inhabits areas with dead trees, urban parks, farmyards and marsh; also occurs along rivers and roads with a few large trees (SARA 2008).	Low	The forests within the Site were composed primarily of densely populated coniferous stands and did not represent the typical habitat used by the redheaded woodpecker. No redheaded woodpeckers were observed during the field survey.
Chlidonias niger	black tern	not at risk	not listed	special concern	S3B,SZN	Builds floating nests in loose colonies in shallow marshes, especially in cattails [Royal Ontario Museum (ROM) 2006].	Low	There were no graminoid marshes present within the Site. No black terns were observed during the field survey.
Aquila chrysaetos	golden eagle	not at risk	not listed	endangered	S1B,SZN	The golden eagle is extremely sensitive to disturbance during the breeding season. In forested areas, nesting territories of golden eagles usually contain large openings such as burns, bogs, marshes, and meadows. Although nests are located on cliff ledges, nests on trees are common in some regions (ROM 2008).	Low	The habitat within the Site is highly disturbed in some locations, making it an unlikely nesting area for golden eagles. The area within the Site lacks grassy meadows or cliff ledges representative of the habitat preferred by golden eagles. No golden eagles were observed during the field survey.
Haliaeetus leucocephalus	bald eagle (N. Ontario)	not at risk	not listed	special concern	S4B,SZN	Requires large continuous areas of mixed or deciduous woods with about 30% to 50% canopy cover around the shores of large rivers or lakes; Nesting bald eagles are associated with lakes and rivers; usually selects the tallest living trees for nests (above the canopy and that offer a clear approach from all directions); requires tall, dead, partially dead or living trees near the nest for perching (Land Information Ontario 2007).	Low	The habitat was a mosaic of treed and logged sections not representative of the continuous woods required by the bald eagle; no large bodies of water were present on or near the Site. No bald eagles were observed during the field survey.
Pelecanus erythrorhynchos	American white pelican	not at risk	not listed	endangered	S2B,SZN	Pelicans nest in colonies, sometimes at quite high densities, on isolated islands in freshwater lakes of central and western North America (ROM 2008).	Low	The waterbodies present within the Site were small and did not contain habitat suitable to support American white pelicans. No American white pelicans were observed during the field survey.
Coregonus zenithicus	shortjaw cisco	threatened	threatened (no schedule)	threatened	S2	Shortjaw ciscoes inhabit the deep waters (55 to 144 m) of large lakes. They usually spawn in areas where the water is approximately half the depth of the waters they usually inhabit (SARA 2008).	Low	The waterbodies present within the Site were small and did not have the depth required to support shortjaw cisco populations. No shortjaw ciscos were observed during the field survey.
Danaus plexippus	monarch	special concern	special concern	special concern	S4	Found in Ontario wherever there are milkweed plants for its caterpillars and wildflowers for a nectar source; often found on abandoned farmland and roadsides, but also in city gardens and parks (ROM 2008).	Low	No milkweed plants were identified within the Site, although other species of wildflowers such as goldenrod and aster species were present. No monarch butterflies were observed during the field survey.

***Notes:**
SC – exists only in a cultivated state in Ontario; introduced population not yet fully established or self-sustaining
SH – Possibly Extirpated (Historical) in Ontario
S1 – Critically Imperilled in Ontario
S2 - Imperilled in Ontario
S3 - Vulnerable in Ontario
S3? – Rank Uncertain
S4 – Apparently Secure
S4B – Apparently Secure Breeding Pair

3.6 Fish and Fish Habitat

3.6.1 Fish Community

Effort and Catch Summary

Fishing effort and catch data is summarized by waterbody in Table 4. Thirteen species were captured during the aquatic survey of the selected lakes, OWMs and tributaries (Figure 3). All species captured have been grouped in Table 5, following Scott and Crossman (1973) with complete catch summary information presented in Table 6.

TABLE 4
FISHING EFFORT AND CATCH SUMMARY
AUGUST 2008

Waterbody	Method	Effort Summary			No. Fish	Total
		No. of Sets	Trap or Net (h)	Electrofishing (s)	Captured/Observed	
Lakes and OWMs						
Juneau Lake	Minnow trap	3	142.9	0	11	30
	Nordic gill net	2	11.1	0	3	
	Experimental gill net	2	10.5	0	16	
Juno Lake	1	0	0	0	0	0
East Ketchikan Lake	Minnow trap	3	133.9	0	1	9
	Nordic gill net	1	5.4	0	2	
	Experimental gill net	1	5.4	0	6	
OWM "A"	Minnow trap	3	21.3	0	2	5
	Electrofishing	-	-	108	3	
OWM "B"	Minnow trap	3	35.5	0	0	0
	Nordic gill net	1	6.3	0	0	
OWM "C"	Minnow trap	3	143.8	0	540	540
OWM "D"	Minnow trap	3	43.8	0	0	0
	Nordic net	1	8.1	0	0	
Tributaries						
Trib 1	Electrofishing	0	0	960	2	2
Trib 2	Electrofishing	0	0	866	1	1
Trib 3	2	0	0	0	0	0
Trib 4	Electrofishing	0	0	486	9	9
Trib 5	3	0	0	0	0	0
Trib 6	Electrofishing	0	0	768	14	14
Trib 7	Electrofishing	0	0	95	2	2
Trib 8	Electrofishing	0	0	283	18	18
Trib 9	Electrofishing	0	0	1485	50	50
Trib 10	Electrofishing	0	0	235	4	4
Trib 11	Electrofishing	0	0	271	6	6
Trib 12	Electrofishing	0	0	170	59	59
Trib 13	Electrofishing	0	0	226	21	21
Trib 14	Electrofishing	0	0	750	15	15
Trib 15	Electrofishing	0	0	809	13	13
Trib 16	Electrofishing	0	0	372	17	17
Trib 17	Electrofishing	0	0	191	0	0
Trib 18	3	0	0	0	0	0

Notes: 1. Insufficient water depth to utilize sampling gear
2. Tributary assessed at mouth, but main channel dry
3. Tributary channel dry, no assessment completed

TABLE 5
FISH COMMUNITY SPECIES COMPOSITION
AUGUST 2008

Group	Species
Pikes (family Esocidae)	northern pike (*Esox lucius*)
Suckers (family Catostomidae	white sucker (*Catostomus commersoni*)
Minnows (family Cyprinidae)	lake chub (*Couesius plumbeus*) northern redbelly dace (*Phoxinus eos*), finescale dace (*Phoxinus neogaeus*), pearl dace (*Margariscus margarita*) blacknose shiner (*Notropis heterolepis*) dace sp. (*Phoxinus* sp.)
Cods (family Gadidae)	burbot (*Lota lota*)
Perches (family Percidae)	yellow perch (*Perca flavescens*) walleye (*Sander vitreus*) Iowa darter (*Etheostoma exile*)
Sticklebacks (family Gasterosteridae)	brook stickleback (*Culaea inconstans*)
Sculpins (family Cottidae)	sculpin (*Cottus* spp.)

TABLE 6
FISH COMMUNINTY CATCH SUMMARY
AUGUST 2008

Waterbody	Species	Life Stage				Total
		Fry	Juvenile	Adult	Unknown	
Juneau Lake	northern pike	0	0	2	3	5
	whitesucker	0	2	4	1	7
	yellow perch	0	11	0	0	11
	walleye	0	1	4	2	7
	Total	0	14	10	6	**30**
East Ketchikan Lake	northern pike	0	0	7	0	7
	yellow perch	0	1	1	0	2
	Total	0	1	8	0	**9**
OWM "A"	finescale dace	0	0	0	2	2
	Iowa darter	0	0	1	1	2
	brook stickleback	0	0	1	0	1
	Total	0	0	2	3	**5**
OWM "C"	white sucker	0	0	0	7	7
	northern redbelly dace	0	0	0	50	50
	finescale dace	0	0	0	91	91
	pearl dace	0	0	0	382	382
	brook stickleback	0	0	0	10	10
	Total	0	0	0	540	**540**
Trib 1	northern pike	0	1	0	0	1
	blacknose shiner	0	0	0	1	1
	Total	0	0	0	1	**2**
Trib 2	burbot	0	1	0	0	1
	Total	0	1	0	0	**1**
Trib 4	northern pike	0	2	0	0	2
	Iowa darter	0	0	0	7	7
	Total	**0**	**2**	**0**	**7**	**9**
Trib 6	northern pike	0	5[1]	8	0	13
	Iowa darter	0	1	0	0	1
	Total	**0**	**6**	**8**	**0**	**14**
Trib 7	northern pike	0	2[1]	0	0	2
	Total	0	2	0	0	**2**
Trib 8	finescale dace	0	4	0	4	8
	pearl dace	0	0	0	1	1
	Iowa darter	0	0	3	0	3
	brook stickleback	1	3	2	0	6
	Total	**1**	**3**	**5**	**5**	**18**
Trib 9	northern pike	0	2	0	0	2
	whitesucker	0	5[2]	0	0	5
	burbot	0	6	0	0	6
	yellow perch	0	2[2]	0	0	2
	Iowa darter	0	0	23	12	35
	Total	**0**	**15**	**23**	**12**	**50**
Trib 10	sculpin sp.	1	0	3	0	4
	Total	1	0	3	0	**4**
Trib 11	lake chub	0	0	0	3	3
	brook stickleback	0	0	1	2	3
	Total	**0**	**0**	**0**	**0**	**6**
Trib 12	dace sp.	0	0	0	33	33
	brook stickleback	0	0	0	26	26
	Total	**0**	**0**	**0**	**59**	**59**
Trib 13	finescale dace	0	0	0	3	3
	pearl dace	0	0	0	11	11
	brook stickleback	0	0	0	7	7
	Total	**0**	**0**	**0**	**21**	**21**
Trib 14	white sucker	0	0	0	1[1]	1
	yellow perch	0	0	0	1[1]	1
	Iowa darter	0	0	12	0	12
	brook stickleback	0	0	1	0	1
	Total	**0**	**0**	**13**	**2**	**15**
Trib 15	northern pike	0	2	0	0	2
	pearl dace	0	0	0	5	5
	burbot	0	1	0	0	1
	yellow perch	0	1	0	0	1
	Iowa darter	0	0	0	4	4
	Total	**0**	**4**	**0**	**9**	**13**
Trib 16	northern pike	0	0	0	2[1]	2
	pearl dace	0	0	0	5	5
	Iowa darter	0	0	0	5	5
	brook stickleback	0	0	0	5	5
	Total	**0**	**0**	**0**	**0**	**17**

Notes: 1. observed, not captured.
2. one observed, not captured.

Catch summary data indicates that fish communities are relatively simple, consisting of small numbers of species. Community composition varied slightly between each of the waterbodies sampled. Lakes such as Juneau and East Ketchikan had combinations of common sport fish such as northern pike, yellow perch and walleye present. A similar composition of northern pike, yellow perch and walleye was also recorded in Ketchikan Lake, a connecting lake between East Ketchikan and Juneau lakes (Golder 2008).

OWMs "A" and "C" had similar communities consisting of dace, brook stickleback and Iowa darter. Fish communities in small tributaries tended to reflect the waterbodies to which they are connected.. Fish such as northern pike, white sucker, dace (northern redbelly, finescale, pearl), yellow perch, Iowa darter and brook stickleback inhabited both tributaries, lakes and OWMs.

Of all the species encountered, northern pike was the most common species captured in sampling locations during the aquatic survey.

Fish Community Metrics

The live release of all captured fish precluded internal examinations for maturity status but given the range of sizes and weights recorded, fish sampled represented both mature and immature individuals (Table 7). Fish health, based on external observations, was generally regarded as good, with limited observations of lesions, tumours and parasites being recorded.

TABLE 7
FISH COMMUNITY METRICS
AUGUST 2008

Waterbody	Species	n	Fork Length (mm)				Weight (g)			
			Min.	Max.	Mean	SD	Min.	Max.	Mean	SD
Juneau Lake	northern pike	5	410	575	504	81	400	1250	895	412
	whitesucker	5	310	461	424	65	450	1450	1140	404
	yellow perch	10	41	95	65	23	-	-	-	-
	walleye	7	75	378	290	69	75	500	264	163
East Ketchikan Lake	northern pike	7	456	615	533	62	60	700	190	279
	yellow perch	2	62	144	103	58	-	-	-	-
OWM "A"	finescale dace	3	48	68	56	11	1.4	4	2	1
	Iowa darter	2	50	51	51	1	1.4	1.5	1	0.1
	brook stickleback	1	50	50	-	-	1.2	1.2	-	-
OWM "C"	white sucker	5	25	128	98	42	11.6	27.6	20	6
	northern redbelly dace	29	45	59	51	3	0.7	2.6	2	0.4
	finescale dace	31	43	75	58	8	0.9	5.1	3	1
	pearl dace	24	46	86	65	14	0.7	6.2	3	2
	brook stickleback	10	49	63	55	5	1	2.5	2	0.5
Trib 1	northern pike	1	98	98	-	-	7.4	7.4	-	-
	blacknose shiner	1	30	30	-	-	0.2	0.2	-	-
Trib 2	burbot	1	185	185	-	-	-	-	-	-
Trib 4	northern pike	2	120	131	126	8	13.4	17.1	15	3
	Iowa darter	7	44	58	126	0	0.7	1.5	1	0.3
Trib 6	northern pike	8	90	104	96	5	3.9	8.4	6	1
	Iowa darter	1	28	28	-	-	-	-	-	-
Trib 8	finescale dace	8	20	58	37	15	0.1	3.3	1	1
	pearl dace	1	60	60	-	-	2.4	2.4	-	-
	Iowa darter	3	51	62	56	6	1	2.4	2	1
	brook stickleback	6	0.1	64	40	13	0.1	2.5	1	1
Trib 9	northern pike	2	74	102	88	20	2.7	9.5	6	5
	whitesucker	4	100	150	115	24	12.9	48.8	23	17
	burbot	6	61	151	108	40	2.3	22.6	12	10
	yellow perch	1	113	113	-	-	22	22	-	-
	Iowa darter	20	46	58	53	4	0.8	1.8	1	0.3
Trib 10	sculpin sp.	4	22	64	52	20	0.2	3	2	1
Trib 11	lake chub	3	31	65	42	20	0.5	3.5	2	2
	brook stickleback	3	32	40	37	4	0.5	0.8	1	0.2
Trib 12	dace sp.	21	10	18	13	2	0.1	0.2	0.1	0.0
	brook stickleback	17	15	56	29	13	0.1	1.4	0.5	0.4
Trib 13	finescale dace	3	47	53	50	3	1.5	2.1	2	0.3
	pearl dace	11	42	84	61	13	1.6	6.8	3	2
	brook stickleback	7	35	55	41	7	0.1	1.2	1	1
Trib 14	Iowa darter	12	44	53	48	3	1.2	1.9	2	0.2
	brook stickleback	1	60	60	-	-	2.1	2.1	-	-
Trib 15	northern pike	2	79	81	80	1	2.5	3.2	3	0.5
	pearl dace	5	62	100	84	14	1.9	10.4	6	3
	burbot	1	164	164	-	-	30	30	-	-
	yellow perch	1	70	70	-	-	4.6	4.6	-	-
	Iowa darter	4	31	52	43	11	0.1	0.6	0	0.2
Trib 16	pearl dace	5	58	95	81	14	2.5	10.5	7	3
	Iowa darter	5	45	62	54	7	1.4	2.3	2	0.4
	brook stickleback	5	46	65	54	7	1.3	3.2	2	1

Note:
Numbers of fish weighed and measured at each sample location may be less than catch summary results presented in Table 6.

3.6.2 Fish Habitat

Supporting Habitat Data

Surface water quality data recorded during the aquatic field program were collected to assist in describing habitat characteristics associated with the fish communities sampled (Table 8).

TABLE 8
SUMMARY OF SURFACE WATER QUALITY FIELD DATA
AUGUST 2008

Waterbody	Date	Air Temperature (°C)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	pH (unitless)	Conductivity (µS/cm)	Secchi Depth (m)
Juneau Lake	20&21-Aug	15-25	20-22	8.1-8.8	6.6-7.3	82-106	1.8
Juno Lake	11-Aug	16	17	6.0	7.7	121	-
East Ketchikan Lake	23-Aug	17	19	8.9-10.9	6.5-7.5	82-86	2.0 (bottom)
OWM "A"	15-Aug	19	21	8.0-8.5	6.8-6.9	108-111	0.8 (bottom)
OWM "B"	16-Aug	23	21	8.7-9.2	6.4-6.8	59	<1
OWM "C"	18-Aug	12	18	8.4-8.6	6.7-7.2	100-102	-
OWM "D"	19-Aug	12	19	6.5-7.8	6.7-7.1	51-57	1.3 (bottom)
Trib 1	21-Aug	21	20	8.4	7.1	127	-
Trib 2	21-Aug	21	19	9.1	7.1	100	-
Trib 3	19-Aug	22	9	6.2	6.8	294	-
Trib 4	14-Aug	26	-	6.4	7.9	163	-
Trib 5	14-Aug	Channel dry					
Trib 6	14-Aug	21	16	3.7	6.74	111	-
Trib 7	14-Aug	20-22	15-16	8.4-10.5	6.3-6.5	99-171	-
Trib 8	15-Aug	23-24	23	7.2	7.2	104	-
Trib 9	17-Aug	22	22	9.6	7.2	98	-
Trib 10	16-Aug	26	8.2	11.6	6.8	90	-

Waterbody	Date	Air Temperature (°C)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	pH (unitless)	Conductivity (µS/cm)	Secchi Depth (m)
Trib 11	16-Aug	26	19	6.6	6.6	94	-
Trib 12	18-Aug	10	15	8.9	7.1	116	-
Trib 13	18-Aug	18	20	7.6	6.9	101	-
Trib 14	17-Aug	23	20	7.2	6.4	102	-
Trib 15	24-Aug	10	16	10.2	7.0	77	-
Trib 16	24-Aug	17	16	9.3	6.4	94	-
Trib 17	24-Aug	20	17	10.5	6.5	99	-
Trib 18	24-Aug	Channel dry					

Surface water temperature significantly below ambient air temperature were recorded in Tribs 3 (inflow tributary to Juneau Lake) and in Trib 10, an inflow tributary to Ketchikan Lake, also located within one of the mineral deposits (VW zone) suggesting that groundwater sources are present in this area. Surface water temperatures reflected ambient air temperature in all other waterbodies. DO, pH and conductivity measurements were also all within similar ranges. Secchi depth (water transparency) for lakes and OWMs were low with values ranging from <1.0 to 1.8 m, likely due to the breakdown of natural organic compounds (i.e. tannins) from the surrounding forest community that impart a heavy "tea stained" colour to the water.

A temperature-oxygen profile was completed for Juneau lake, the only waterbody deep enough to thermally stratify (Table 9). A thermocline existed at the 5 to 8 m depth. Water from the middle of the thermocline and below, within the hypolimnion, contained low levels of dissolved oxygen. These depths are unlikely to support fish during the summer months. Water temperatures recorded in the epilimnion (i.e. above the thermocline), and recorded Secchi depth (Table 8) are typical of warm water lakes.

TABLE 9
WATER QUALITY PROFILE FOR JUNEAU LAKE
AUGUST 2008

Depth (m)	Parameter			
	Water Temperature (°C)	Dissolved Oxygen (mg/L)	pH (unitless)	Conductivity (µS/cm)
0	20	8.8	6.6	82
1	20	8.9	6.9	82
2	20	8.9	6.7	82
3	20	8.8	6.7	81
4	20	8.7	6.7	81
5	***19***	***8.5***	***6.6***	***80***
6	***17***	***4.0***	***6.7***	***72***
7	***14***	***2.2***	***6.6***	***68***
8	***12***	***1.5***	***6***	***66***
9	11	0.8	5.6	64
10	10	0.2	5.6	66
11	9	0.1	5.7	75

Note:
Bold & Italicized = Thermocline, August 2008

Discharge measurements were calculated for each of the unnamed tributaries during the aquatic survey (Table 10). Flows recorded during the August period were low, resulting in corresponding low discharges. Tribs 5 and 18 were dry at the time of the survey and were not assessed as a result.

TABLE 10
DISCHARGE SUMMARY FOR TRIBUTARIES

Waterbody	Description	Date	Channel Width (m)	Mean Depth (m)	Discharge (m^3/s)
Trib 1	inlet to Juneau Lake	21-Aug	4.8	0.43	0.006
Trib 2	inlet to Juneau Lake	21-Aug	4.2	0.63	0.048
Trib 3	inlet to Juneau Lake	19-Aug	1.0	0.05	0.000
Trib 4	outlet to Juno Lake	14-Aug	1.6	0.11	0.015
Trib 5	inlet to Juno Lake	14-Aug	Channel dry		
Trib 6	inlet to Juno Lake	14-Aug	2.1	0.15	0.003
Trib 7	inlet to Juno Lake	14-Aug	1.5	0.04	0.000
Trib 8	outlet to OWM "A"	15-Aug	1.2	0.42	0.000
Trib 9	outlet to Ketchikan Lake	17-Aug	3.4	0.20	0.085
Trib 10	inlet to Ketchikan Lake	16-Aug	1.5	0.07	0.003
Trib 11	inlet to Ketchikan Lake	16-Aug	1.8	0.11	0.000
Trib 12	outlet to OWM "D"	18-Aug	0.5	0.05	0.000
Trib 13	outlet to OWM "C"	18-Aug	0.7	0.09	0.001
Trib 14	inlet to Ketchikan Lake	17-Aug	2.8	0.68	0.001
Trib 15	outlet to E. Ketchikan Lake	24-Aug	1.9	0.30	0.011
Trib 16	inlet to E. Ketchikan Lake	24-Aug	2.6	0.42	0.000
Trib 17	inlet to E. Ketchikan Lake	24-Aug	2.8	0.20	0.000
Trib 18	inlet to E. Ketchikan Lake	24-Aug	Channel dry		

Fish Habitat Summary

Figures 5 to 23 illustrate fish habitat features observed for the waterbodies that were surveyed on the Site. Habitat information for tributaries (Table 11) has further been summarized by transects that were taken across representative channel units in each channel segment assessed. Each lake and OWM and its' associated tributaries (inlets and/or outlets) have been grouped together for discussion purposes

TABLE 11
TRIBUTARY HABITAT SUMMARY

Location	Channel Unit Type	Wetted Width (m)	Bankfull Width (m)	Unstable Bank (% length)		Cover For Fish (% Area)										Substrate		Depth and Velocity					
						Total Fish Cover			Substrate	Woody Debris	Inundated Vegetation	Depth/ Turbulence	Overhanging Vegetation	Undercut bank	Root wad	Dominante	Subdominante	1/4 Wetted Width		1/2 Wetted Width		3/4 Wetted Width	
				LDB	RDB	Fry	Juv.	Adult										Depth	Velocity	Depth	Velocity	Depth	Velocity
Trib 1	FL	3.8	6.0	0	0	20	10	10	0	5	30	0	0	0	0	Si	n/a	0.55	0.00	0.76	0.01	0.23	0.00
	FL	4.2	7.0	0	10	20	10	0	0	5	30	0	5	5	0	Si	n/a	0.42	0.00	0.85	0.01	0.35	0.01
	FL	3.5	7.0	0	10	20	20	10	0	5	10	0	5	5	0	Si	n/a	0.38	-0.01	0.67	0.02	0.48	0.00
Trib 2	FL	4.5	6.5	15	5	30	20	5	0	15	30	10	5	5	10	Si	n/a	0.60	0.00	0.75	0.01	0.95	0.00
	FL	5.5	8.0	10	10	30	20	5	0	25	30	0	5	5	10	Si	n/a	0.80	0.00	0.95	0.01	0.50	0.00
	FL	6.0	12.0	0	10	10	0	0	0	0	10	0	0	0	0	Si	n/a	0.85	0.00	1.10	0.01	0.80	0.00
Trib 3	FL	0.5	1.5	0	0	20	0	0	0	15	0	0	10	5	0	Si	Sa	0.04	0.00	0.04	0.00	0.02	0.00
	FL	0.3	1.5	0	0	20	0	0	0	25	0	0	25	10	0	Si	n/a	0.02	0.00	0.06	0.01	0.06	0.01
	FL	0.3	1.0	0	0	20	0	0	0	30	0	0	15	5	5	Si	n/a	0.04	0.00	0.10	0.01	0.07	0.01
Trib 4	P3	1.0	1.0	0	0	100	80	0	0	25	0	0	100	0	0	Si	Sa	-	-	-	-	-	-
	FL	1.5	4.0	0	0	0	0	0	0	5	0	0	0	0	0	Si	Sa	0.10	0.11	0.12	0.09	0.12	0.13
Trib 6	FL	2.1	4.1	20	40	20	5	0	10	0	20	0	0	0	0	Si	Bo	0.08	0.00	0.12	0.01	0.14	0.01
	FL	1.9	3.5	15	15	15	10	0	0	0	15	0	0	0	0	Si	Bo	0.06	0.00	0.10	0.01	0.08	0.00
	FL	1.8	3.4	15	10	20	5	0	0	0	20	0	0	0	0	Si	-	0.02	0.00	0.15	0.02	0.06	0.02
Trib 7	FL	0.5	1.5	0	0	100	0	0	0	5	10	0	10	0	0	Si	-	-	-	0.04	0.07	-	-
Trib 8	FL	1.2	1.5	0	0	20	20	10	0	5	10	0	10	5	0	Si	-	0.12	0.00	0.52	0.01	0.62	0.00
	FL	0.5	1.0	0	0	25	10	0	0	25	0	0	10	0	0	Si	Co	0.10	-	0.08	-	0.06	-
	FL	0.5	0.8	0	0	10	10	0	0	30	0	0	20	0	0	Si	-	0.06	-	0.08	-	0.04	-
Trib 9	FL	8.0	14.0	0	0	20	0	0	0	10	0	0	0	0	0	Si	Gr	0.40	0.00	0.50	0.02	0.40	0.00
	RF	3.4	6.0	0	0	80	0	0	20	5	0	0	0	0	0	Co	Gr	0.20	0.12	0.25	0.21	0.20	0.12
	P3	8.0	14.0	0	0	20	40	10	0	10	15	10	0	5	0	Si	Gr	0.70	0.00	0.85	0.00	0.20	0.00
	FL	8.0	14.0	0	0	15	0	0	0	5	0	0	0	0	0	Si	Gr	-	-	-	-	-	-
	P3	10.0	15.0	0	0	30	30	10	0	0	20	10	0	0	0	Si	-	-	-	-	-	-	-
Trib 10	FL	0.9	2.9	0	0	25	0	0	0	20	0	0	0	0	5	Si	Sa	0.08	0.03	0.12	0.03	0.06	0.02
	FL	1.5	3.1	0	0	25	0	0	0	20	0	0	10	0	0	Si	Gr	0.06	0.00	0.10	0.01	0.04	0.01
	FL	1.9	4.2	0	0	25	0	0	0	20	0	0	10	0	0	Si	Gr	0.06	0.00	0.10	0.01	0.04	0.01
	R3	2.1	3.8	0	0	20	10	10	0	30	0	0	10	0	10	Gr	Si	0.04	0.03	0.08	0.10	0.07	0.09
	R3	1.0	4.3	0	0	20	10	10	0	40	0	0	10	0	0	Gr	Si	0.07	0.09	0.10	0.17	0.08	0.12
	R3	1.2	4.5	0	0	30	10	10	0	40	0	0	10	0	0	Gr	Si	0.05	0.04	0.08	0.12	0.06	0.08
Trib 11	BG	1.5	2.0	0	0	0	0	20	20	0	0	0	0	0	0	Bo	Co	0.13	0.00	0.12	0.22	0.14	0.03
	FL	1.3	1.5	20	20	20	20	0	0	5	0	0	15	0	0	Si	-	-	-	-	-	-	-
	FL	1.3	1.5	0	0	10	0	0	0	5	0	0	10	0	0	Si	-	-	-	-	-	-	-
Trib 12	FL	0.8	1.8	30	0	10	0	0	0	5	10	0	0	5	0	Si	Bo	0.04	0.00	0.06	0.03	0.03	0.01
	RF	0.5	1.5	50	50	0	0	0	0	0	0	0	0	0	0	Gr	Co	0.01	-	0.02	-	0.02	-
	FL	0.8	1.5	100	100	30	0	0	0	5	20	0	0	5	0	Si	-	-	-	-	-	-	-
	FL	1.2	2.8	75	100	50	0	0	0	0	60	0	0	0	0	Si	-	-	-	-	-	-	-
	FL	22.0	4.5	0	0	10	0	0	0	0	2	0	0	0	0	Si	-	-	-	-	-	-	-
Trib 13	FL	0.5	1.5	0	0	10	10	0	0	0	5	0	0	0	0	Si	Sa	0.08	0.01	0.12	0.01	0.16	0.00
	FL	5.0	20.0	0	0	10	10	0	0	5	5	0	0	0	0	Si	-	0.15	0.00	0.21	0.02	0.04	0.01
	FL	1.0	3.5	0	0	10	10	0	0	0	5	0	0	0	0	Si	-						
Trib 14	FL	3.5	6.5	0	0	15	30	10	0	0	25	10	0	5	0	Si	-	0.65	0.00	0.76	0.02	0.70	0.00
	FL	4.0	6.5	0	0	10	40	20	0	0	10	10	0	5	0	Si	-	6.00	0.01	0.95	0.01	0.45	0.01
	FL	4.0	6.5	0	0	15	30	0	0	0	30	0	0	5	0	Si	-	0.80	0.00	0.80	0.01	0.65	0.00
Trib 15	FL	3.3	5.5	0	0	15	0	0	20	0	0	0	10	0	0	Bo	Co	0.04	0.15	0.06	0.21	0.02	-
	FL	2.5	5.0	0	0	20	0	0	25	5	0	0	0	0	0	Bo	Co	0.08	0.23	0.10	0.08	0.12	0.10
	FL	3.5	6.5	0	5	0	0	0	0	0	0	0	0	0	0	Si	-	0.10	0.00	0.30	0.00	0.15	0.00
Trib 16	FL	2.5	2.5	0	0	20	20	0	0	0	10	0	0	0	0	Si	-	0.30	0.01	0.50	0.01	0.25	0.01
	FL	1.8	1.8	0	0	10	20	10	0	0	15	0	5	5	0	Si	-	0.20	0.00	0.35	0.02	0.20	0.00
	FL	1.5	1.5	0	0	25	15	5	0	5	5	0	10	0	0	Si	-	0.10	0.01	0.30	0.02	0.15	0.01
Trib 17	FL	2.8	2.8	0	0	5	10	0	10	0	5	0	5	0	0	Si	Bo	0.15	0.00	0.25	0.00	0.20	0.00

Note:
n/a = not available Bo = boulder BG – boulder garden Co = cobble FL = flat Gr = gravel P3 = shallow pool RF = riffle R3 = low velocity run Sa - sand Si = silt

Juneau Lake

Juneau Lake (Figure 5) lies just outside of the Site property boundary, but receives drainage from lakes and tributaries located within the Site. Given it's proximity to the Site and its' potential to be affected by future mining activity due to its' catchment, Juneau Lake was considered of interest as part of this aquatic survey.

Juneau Lake has a surface area of approximately 223 ha and over 15 km of shoreline. Lake morphology consists of open water with one large island located in the northern portion of its' main basin. The lake has one narrow arm that extends in a northeast to southwest orientation and a main basin that is open. Bathymetry mapping (Figure 4) indicates that the narrow arm is the deepest portion of the lake with depths of at least 14 m. Tribs 1, 2 and 3 (Figure 5) function as inlets to Juneau Lake that drain small catchments within or adjacent to the Site. Additional inlets, not included as part of this survey, are located along the west and south sides of the lake. A single outlet is located southeast of the main basin of the lake.

Shoreline areas and the littoral zone, along the northeast boundary of the lake adjacent to Tribs 1, 2 and 3 were visually assessed to a depth of approximately 2 m. Water transparency limited visibility in some locations, likely due to the breakdown of organic compounds (i.e. tannins) from the surrounding forest community that impart a heavy "tea stained" colour to the water.

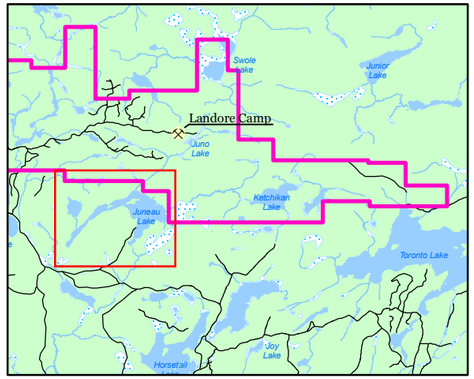
The shoreline surrounding Juneau Lake consists of shallow, to steeply sloped land dominated by a mixed forest community consisting of black spruce, jack pine and white birch. Shoreline vegetation dominated by shrubs such as speckled alder extends to the water's edge with varying amounts of woody debris and deadfall extending into the lake. The shoreline and adjacent littoral zone includes areas dominated by bedrock, boulder, cobble and emergent macrophytic vegetation such as bulrush (*Scirpus* sp.). Within the littoral zone of Juneau Lake, boulder/cobble was the predominate substrate type observed followed by sand. Deeper portions of the lake not directly observed are inferred to consist primarily of finer grained substrates (i.e. silts, sands). Low dissolved oxygen and slightly acidic pH measurements recorded in the hypolimnion also suggests that substrates in the deeper portion of the lake consist of decomposing organic material (i.e. organic muck).

Tribs 1 and 2 (Figures 6 and 7) were assessed upstream from their confluence with Juneau Lake for distances of approximately 200 and 150m, respectively. The dominate channel unit in each tributary was a low gradient flat that ranged in depth from 0.2 to 1.1 m and had wetted widths that varied between 3.5 to 6.0 m. Channel banks in the segments assessed were stable. Spot measurements of flow velocity were minimal (<0.02 m/s) and calculated discharge rates were low at 0.006 and 0.048 m^3/s for Tribs 1 and 2, respectively. The predominate substrate observed in both tributaries was silt. Submergent/inundated vegetation (i.e. wild celery (*Vallisneria americana*)) was observed as the main habitat feature providing cover for fish in Trib 1 while a combination of submergent vegetation (wild celery) and woody debris were habitat cover features

in Trib 2. There were no visible barriers to fish migration noted in the assessed portions of either tributary.

LEGEND

- MT- Minnow Trap
- Secchi / Temperature profile
- GNN - Gill Net Nordic
- GNE - Gill Net Experimental
- Ba/Co - bare (no vegetation)/cobble
- Bo -boulder
- Bo/Co - boulder/cobble
- Br - bedrock
- Co - cobble
- Sa - sand
- EV - emergent vegetation
- CF - coniferous forest
- MF - mix forest
- - woody debris
- - Bathymetry (m)
- - Contours (m)
- - flow direction



REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

300 0 300
SCALE 1:15,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Juneau Lake

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RM	07 Jan.2009		
GIS	RRD	07 Jan.2009		
CHECK	RM	07 Jan.2009		
REVIEW	JS	02 Feb.2009		

FIGURE: 5

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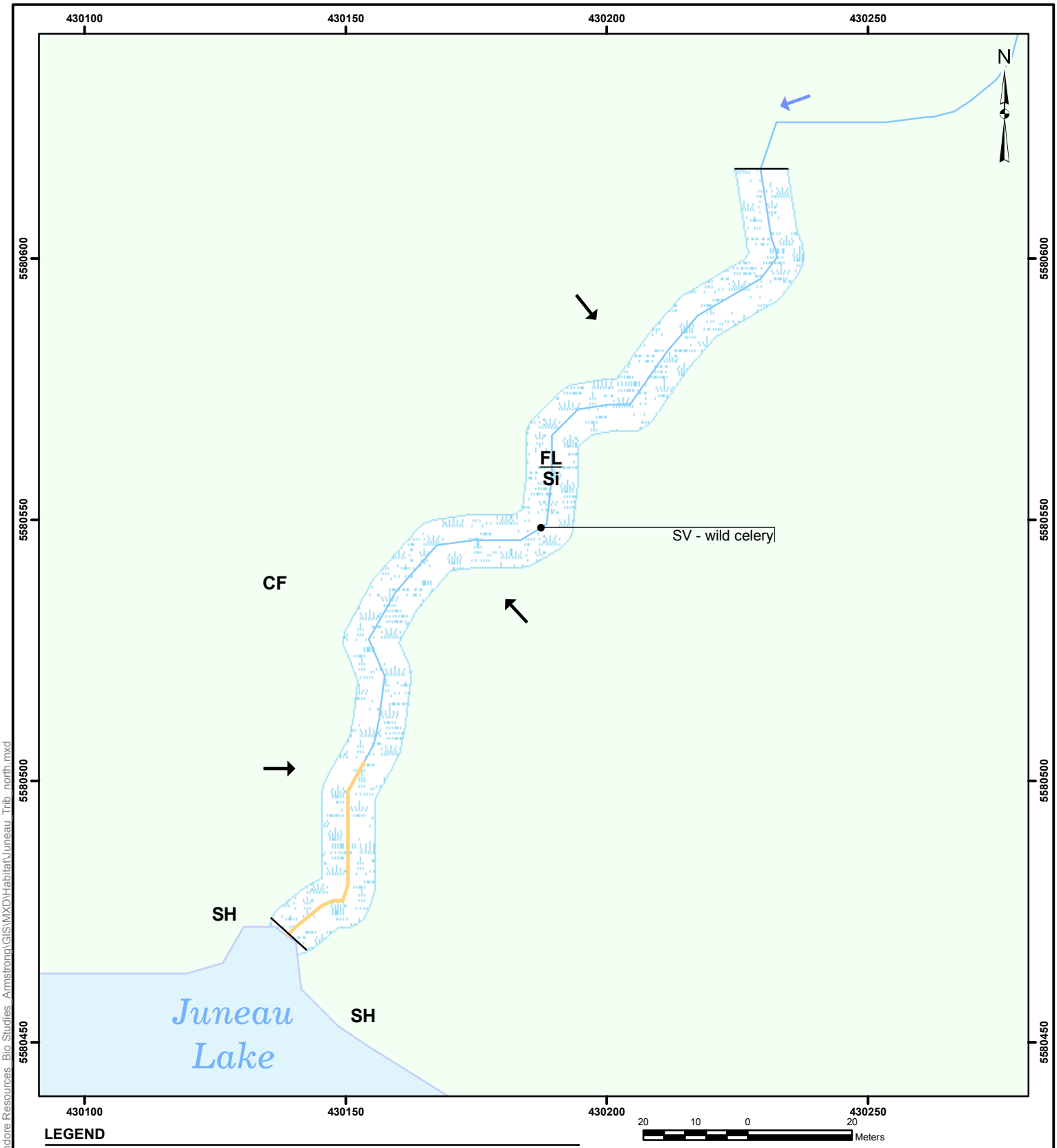

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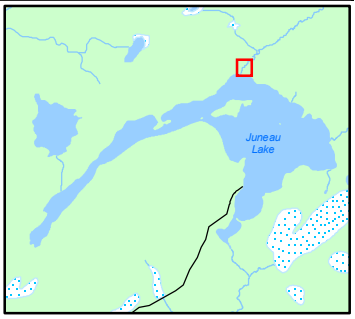
1:1,000 METRES

Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

LEGEND

- back pack electrofishing
- FL - flat
- Si - silt
- SH - shrubs (alder)
- CF - coniferous Forest
- SV - submergent vegetation
- bank slope, shallow (0%-5%)
- flow direction
- contour line (m)



REFERENCE

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PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Trib 1

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	20 Jan. 2009		
GIS	RRD	20 Jan. 2009		
CHECK	RM	20 Jan. 2009		
REVIEW	JS	20 Jan. 2009		

FIGURE: 6

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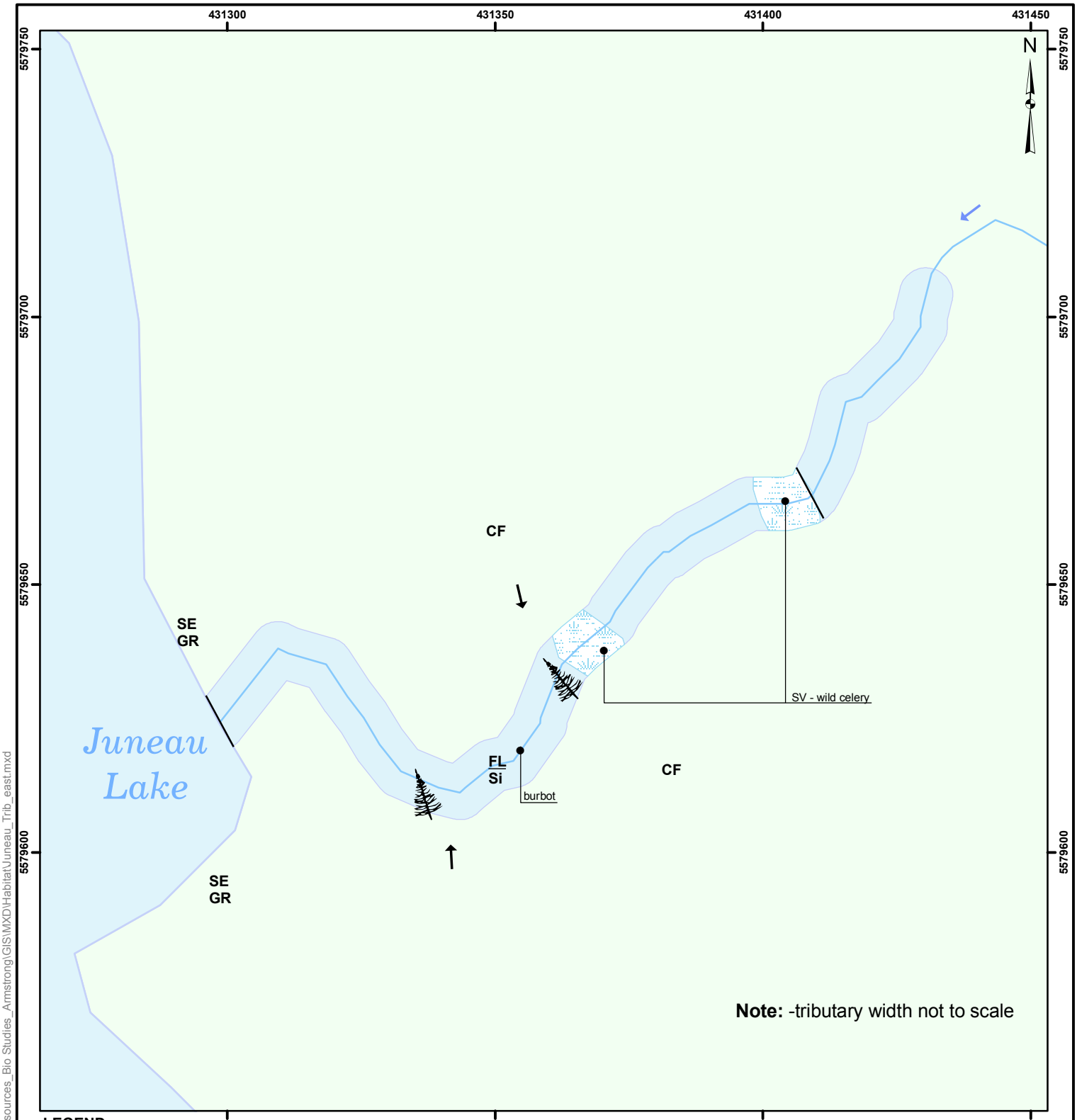
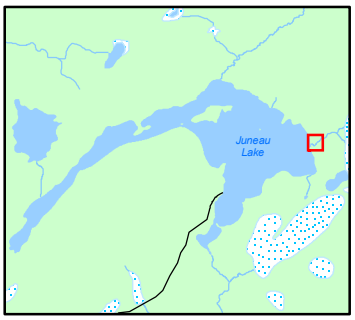


LEGEND

- defined channel unit boundary
- back pack electrofishing
- FL - flat
- Si - silt
- GR - grasses
- SE - sedge
- SV - submergent vegetation
- CF - coniferous Forest
- bank slope, shallow (0%-5%)
- flow direction
- contour line (m)
- woody debris



20 10 0 20 Meters

1:1,000 METRES

Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

REFERENCE

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PROJECT: LANDORE RESOURCES INC. JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE: **Trib 2**

Golder Associates Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	20 Jan. 2009		
GIS	RRD	20 Jan. 2009		
CHECK	RM	27 Jan. 2009		
REVIEW	JS	02 Feb. 2009		

FIGURE: 7

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Trib 3 could not be sampled for fish due to its' small size, that limited use of available sample gear, but general observations on its' characteristics have been included for completeness. Trib 3 was observed to originate from a groundwater up welling, located approximately 50 m upstream from Juneau Lake. Water temperature in this tributary measured approximately 9°C. Flow was recorded at 0.01 m/s, but at this slow velocity rate, discharge was calculated as zero. The channel was typically shallow (0.01 to 0.07 m deep), and narrow (approximately 0.3 m wide) and consisted of silt substrate with woody debris and overhanging vegetation providing the main cover types available to fish that may utilize this tributary. No fish were observed anywhere in the channel and there were no barriers to fish migration and potential use of this tributary by fish residing in the lake.

Juno Lake

Juno Lake (Figure 8) has a surface area of approximately 7.5 ha and approximately 2.8 km of shoreline. Trib 4 functions as the outlet from Juno Lake, while Tribs 5, 6 and 7 function as inlets (Figure 9).

Juno Lake consists of a central basin and long, narrow arm whose main fetch is oriented in a northeast to southwest direction. Water levels were extremely low in Juno Lake during the aquatic survey. The maximum depth was 0.2 m.

The shoreline surrounding Juno Lake is relatively flat and dominated by a forest community consisting of black spruce and trembling aspen. Beyond the immediate shoreline of Juno Lake, the forest has been commercially harvested, but a buffer (approximately 30 m) of vegetation does exist between the lake and this harvested area. Riparian vegetation consisted of a mixture of shrubs (speckled alder, Labrador tea) and sedges (family Cyperaceae).

Most of the substrate within the littoral zone was visible, despite waters being stained or "tea" coloured. Silt was the predominate substrate type observed, although a small portion of the northeast shoreline consisted of boulder. Aquatic macrophyte vegetation within Juno Lake was confined to the immediate shoreline and consisted primarily of emergent sedges. A portion the central basin contained floating vegetation. The shallowness of Juno Lake, combined with the soft, thick substrate composing the lake bottom made deployment of fish sampling gear impractical.

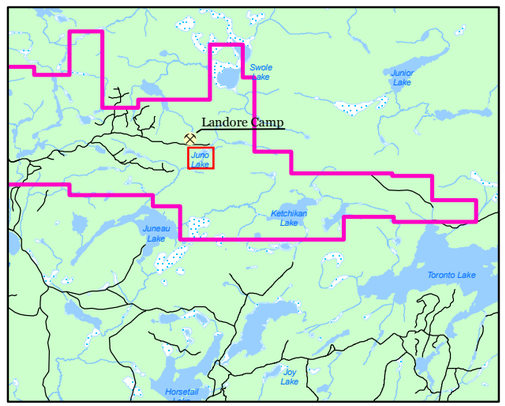
LEGEND

- Bo - boulder
- Si - silt
- FV - floating vegetation
- EV - emergent vegetation
- SE - sedge
- CF - coniferous forest
- - bank slope, shallow (0-5%)
- - flow direction
- -contour lines (m)

CF
Trib 6
Trib 7
EV - sedge *(Carex sp.)*
FV
0.20 m
Bo
FV - unknown
CF
Si
EV - sedge *(Carex sp.)*
Trib 4
Trib 5
370
360
350
340
340
N

431800 431900 432000 432100 432200 432300 432400 432500 432600

5582500 5582400 5582300 5582200 5582100 5582000 5581900



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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

60 0 60
SCALE 1:3,000 METRES

Note: -tributary width not to scale

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Juno Lake

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	2 Feb. 2009		

FIGURE: 8

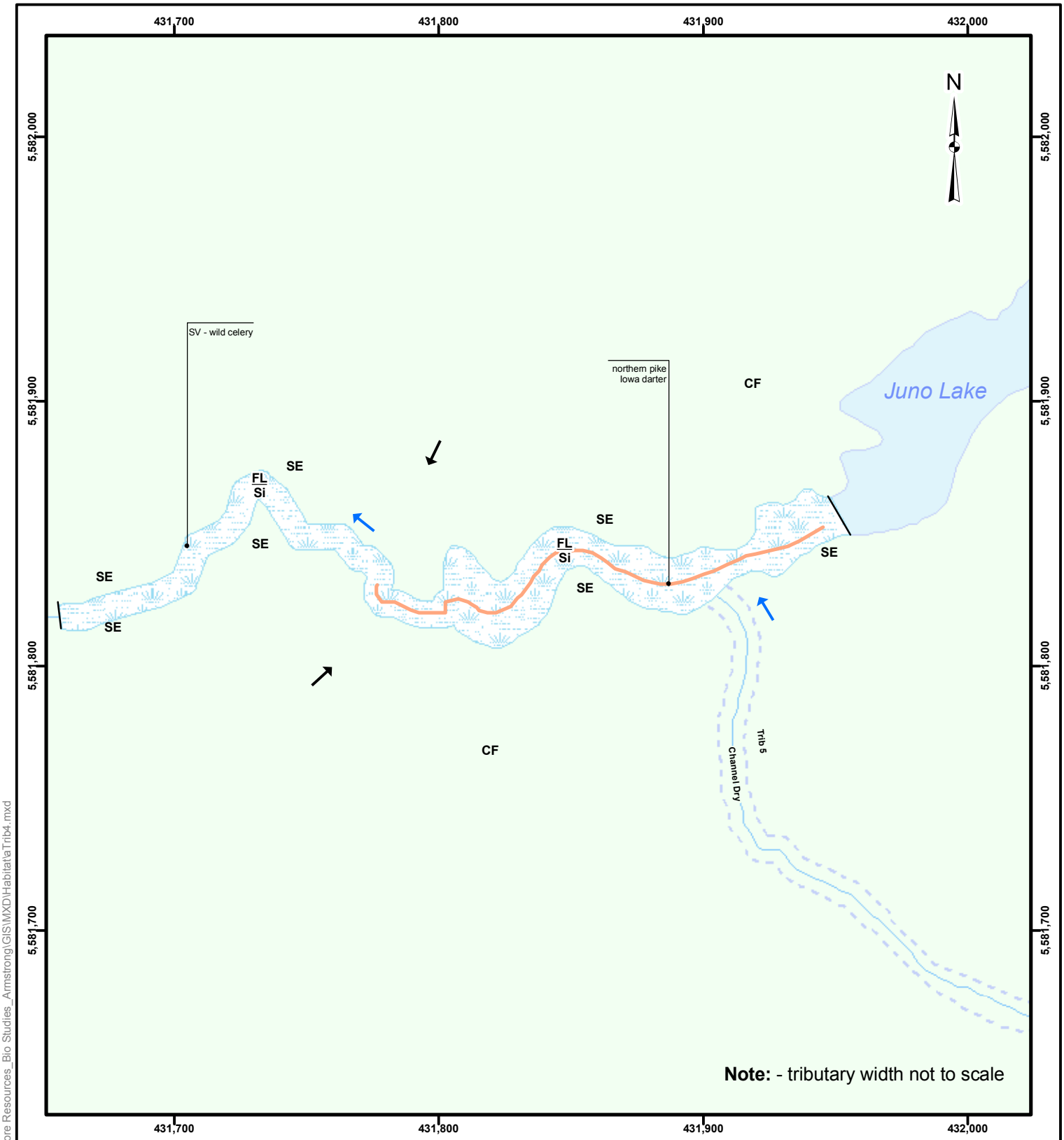
N:\Active\2008\1190 Sudbury\1192\08-1192-0080 Landore Resources_Bio Studies_Armstrong\GIS\MXD\HabitatfaJuno_.mxd

Trib 4 (Figure 9) was assessed from the outlet of Juno Lake downstream for a distance of approximately 250 m. The predominate channel unit observed was flat with a depth of ≤0.1 m and a wetted width of approximately 1.0 m. Representative measurements of flow velocity near the outlet were measured at approximately 0.1 m/s with a calculated discharge rate of 0.015 m^3/s. The predominate substrate observed was silt while submergent/inundated vegetation (i.e. wild celery) was the predominate instream vegetation type. Instream and overhanging bank vegetation (i.e. sedges) were observed as a main habitat features providing cover for fish in Trib 4. The channel gradient in this segment was low and apart from the low water levels observed, there were no visible barriers to fish migration noted in the portion of Trib 4 assessed.

Trib 5, an inlet to Juno Lake located adjacent to Trib 4 (Figure 9) was observed to be dry during the aquatic survey and was not assessed further.

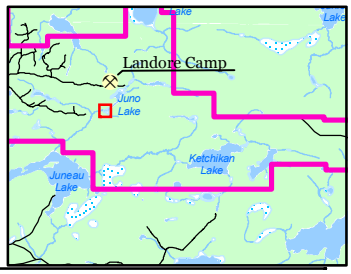
Tribs 6 and 7 (Figure 10), located on the north eastern portion of Juno Lake, were assessed from the lake to distances of approximately 250 and 150 m upstream, respectively. Representative flows in Trib 6 were relatively slow (0 to 0.02 m/s) and resulted in a low (0.003 m^3/s) calculated discharge rate. The main channel unit in Trib 6, classified as flat, was relatively shallow (0.01 to 0.14 m deep), and was typically 2 m wide. Silt and minor amounts of boulder were the main substrate types. Minor amounts of slow velocity run and shallow pool (≤1 m deep), each consisting of silt substrate and having shallow depth were also noted. Submergent/inundated vegetation (i.e. wild celery) in Trib 6 was identified as the main cover type available to fish in this tributary. Trib 6 also contained a large proportion of unstable bank in the segment that was assessed, indicating that stream flow may be high at times. There were no barriers to fish migration and potential use of this tributary by fish within the reach assessed. What appeared to be a third inlet tributary, to the east of Trib 6, was initialely assessed but discovered to be a blind channel that ended approximately 20 m upstream from Juno Lake. Not further assessment of this channel was completed.

Flow measurement from Trib 7 was slow (0.07 m/s) and resulted in a nil calculated discharge rate. Trib 7 was classified as a flat with silt being the predominate substrate type. Channel width and depth in Trib 7 were characterized as narrow (≤0.5 m) and shallow (≤0.04 m). Overhanging vegetation in Trib 7 was identified as the main cover type available to fish in this tributary. The gradient within the segment assessed was low and there were no barriers to fish migration or potential use of this tributary by fish observed.



LEGEND

- defined channel unit boundary
- Backpack electrofishing
- FL - flat
- Si - silt
- SE - sedge *(Carex sp.)*
- SV - submergent vegetation
- CF - coniferous forest
- bank slope, shallow (0-5%)
- flow direction



50 0 50

SCALE 1:2,000 METRES

PROJECT

LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE

Trib 4

REFERENCE

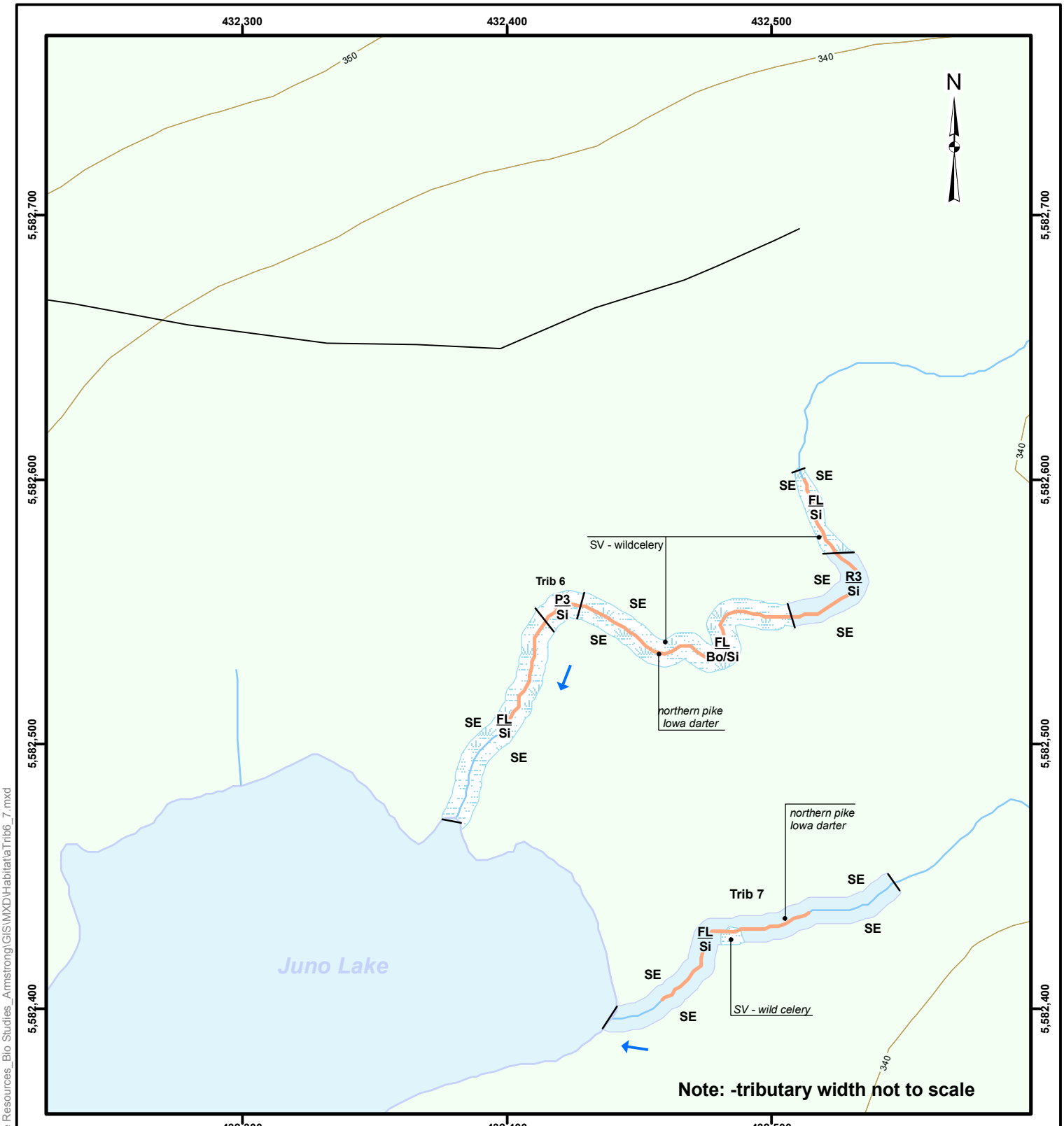
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN / REV. 0
DESIGN	RRD	26 Jan. 2009	
GIS	RRD	26 Jan. 2009	
CHECK	RM	26 Jan. 2009	
REVIEW	JS	1 Feb. 2009	

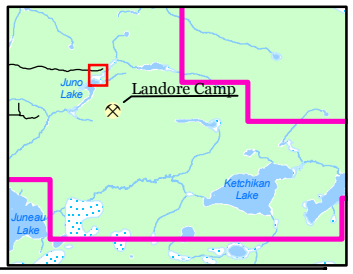
FIGURE: 9

N:\Active\2008\1190 Sudbury\1192\08-1192-0080 Landore Resources_Bio Studies_Armstrong\GIS\MXD\HabitatTrib4.mxd



LEGEND

- defined channel unit boundary
- Backpack electrofishing
- FL - flat
- P3 - low quality pool habitat
- R3 - lowest quality/depth
- Bo - boulder
- Si - silt
- SE - sedge *(Carex sp.)*
- SV - submergent vegetation
- CF - coniferous forest
- bank slope, shallow (0-5%)
- flow direction



50 0 50

SCALE 1:2,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE
Trib 6 and 7

REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	2 Feb. 2009		

FIGURE: 10

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East Ketchikan Lake

East Ketchikan Lake (Figure 11), lies along the southeast boundary of the Site. East Ketchikan Lake has a surface area of approximately 33 ha and 3.5 km of shoreline. Trib 15 functions as an outlet while Tribs 16, 17 and 18 function as inlets.

Lake morphology consists of open water with one large island located in the northern portion of the lake. The main fetch is oriented in a northeast to southwest direction. Bathymetry mapping (Figure 11) indicates the lake is comprised of two shallow basins of approximately 3.5 m depth, located in the central and southeast portions of the lake. A spot measurement in the central basin indicated a maximum depth of 3.7 m.

The shoreline surrounding East Ketchikan Lake consists of shallow to steeply sloped land dominated by a mixed forest community consisting of black spruce, jack pine and white birch. Along the shallow sloped sections of the lake, riparian vegetation consists of a mixture of grasses (family Poaceae), sedges (family Cyperaceae) and shrubs, while trees and shrubs dominate the more steeply sloped sections of shoreline.

The littoral zone of the lake was visually assessed to a depth of at least 2 m. The water was dark stained or "tea" coloured. Within East Ketchikan Lake, boulder/cobble was the predominate substrate type observed, followed by silt and bedrock (Figure 11). Aquatic vegetation consisted of various species of submergent, floating (i.e. floating leaf pondweed – *Potamogeton natans*) and emergent (sedge) vegetation. The southeastern shoreline also had areas of large exposed boulders. Deeper portions of the lake not directly observed were inferred to consist primarily of finer grained substrates (i.e. silts, sands) or decomposing organic material (i.e. organic muck).

East Ketchikan Lake has one outlet, Trib 15, and two inlets, Tribs 16 and 17 (Figures 12 to 14). Each was assessed from East Ketchikan Lake for distances of approximately 200, 150 and 100 m, respectively. Trib 18, located on the southern shore of the lake (Figure 11) was dry at the time of the aquatic survey and not assessed further.

The dominate channel unit in each assessed tributary was flat with observed depths that ranged from 0.02 to 0.35 m and wetted widths that varied from 1.5 to 3.5 m. Each tributary assessed had a low gradient. Representative flow measurements in Trib 15 ranged from 0.0 to 0.23 m/s. Discharge was calculated to be 0.011 m^3/s. Tribs 16 and 17 were observed to have slow (0.0 to 0.01 m/s) flow velocities that resulted in no measurable discharge. The predominate substrate observed in all tributaries was either silt or boulder. Instream cover for resident fish is provided by course substrate and submerged/inundated (i.e. wild celery) or emergent (i.e. sedge) vegetation in Tribs 15, 16 and 17. Banks slopes of each segment assessed were stable. There were no visible barriers to fish migration noted in the tributaries assessed.

436400 436600 436800 437000 437200 437400 437600 437800

5580600 5580400 5580200 5579800 5579600

N

LEGEND

- MT - Minow Trap
- GNN - Gill Net Nordic
- GNE - Gill Net Experimental
- Bo - boulder
- Bo/Co - boulder/cobble
- Br/Bo - bedrock/cobble
- Si - silt
- FV - floating vegetation
- SV - submergent vegetation
- EV - emergent vegetation
- CF - coniferous forest
- x - exposed boulder
- - bank slope, shallow (0-5%)
- - bank slope, intermediate (6%-30%)
- - bank slope, steep (31%-70%)
- - flow direction
- - contour line (m)

EV -sedge (*Carex sp.*)

Trib 15

Trib 16

Trib 17 (Stream channel dry)

Trib 18 Stream channel dry

SV -*unknown sp.*

northern pike

3.7 m

GNE

GNN

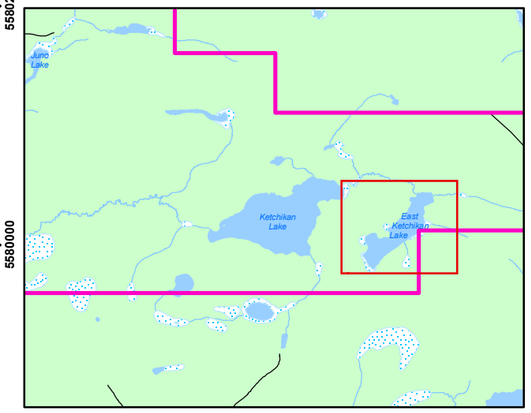
MT

FV -floating leaf pondweed

yellow perch

northern pike
yellow perch

Bo/Co Br/Bo Si Bo CF



REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

100 0 100
SCALE 1:5,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
East Ketchikan Lake

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0	
DESIGN	RRD	26 Jan. 2009	**FIGURE: 11**		
GIS	RRD	26 Jan. 2009			
CHECK	RM	26 Jan. 2009			
REVIEW	JS	02 Feb. 2009			

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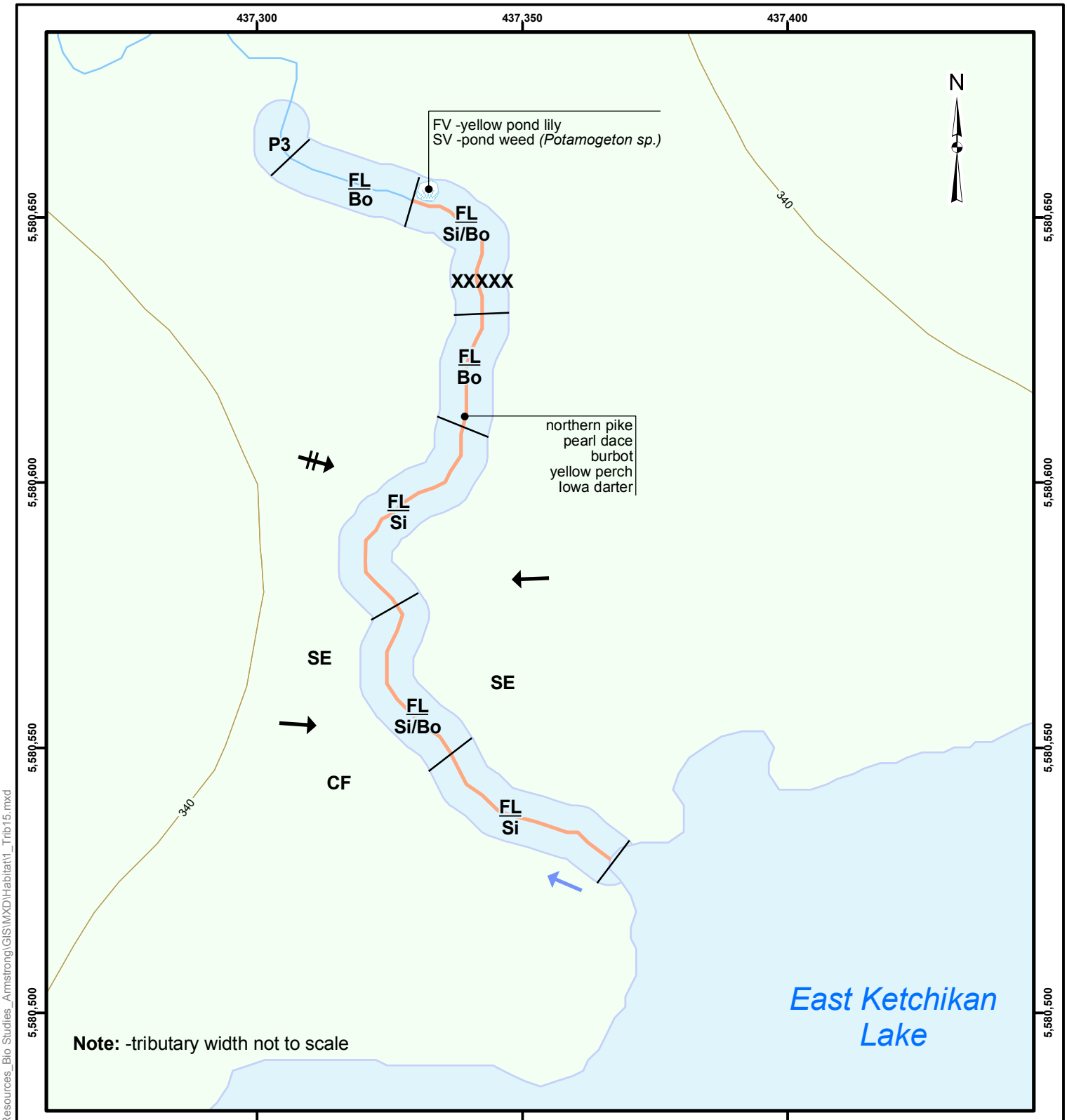
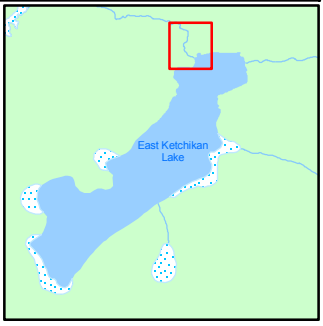


LEGEND

- defined channel unit
- Back pack electrofishing
- FL - flat
- P3 - low quality pool habitat
- Bo - boulder
- Si - silt
- FV - floating vegetation
- SV -submergent vegetation
- CF - coniferous forest
- SE - sedge
- XXX - beaver dam
- bank slope, shallow (0-5%)
- bank slope, steep (31%-70%)
- flow direction



30 0 30

SCALE 1:1,000 METRES

Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

REFERENCE

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PROJECT

LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE

Trib 15

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	02 Feb. 2009		

FIGURE: 12

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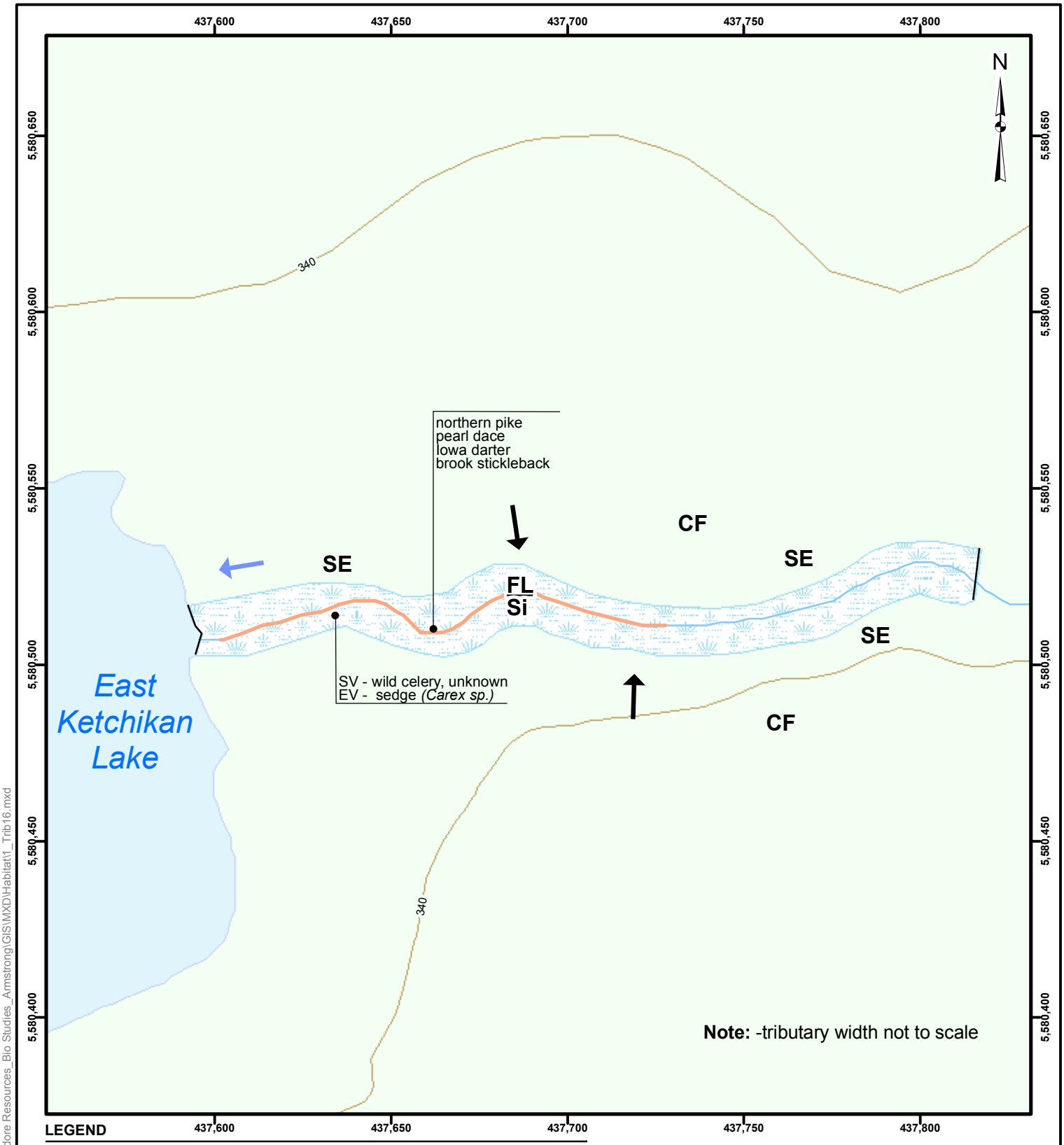
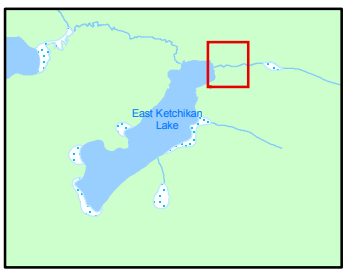


LEGEND

- —— - defined channel unit boundary
- ~~~ - Fish Sampling Location
- FL - flat
- Si - silt
- SE - sedge
- EV - emergent vegetation
- SV - submergent vegetation
- CF - coniferous forest
- ⟵ - bank slope, shallow (0%-5%)
- ⟵ - flow direction



Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

25 0 25
SCALE 1:1,500 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE
Trib 16

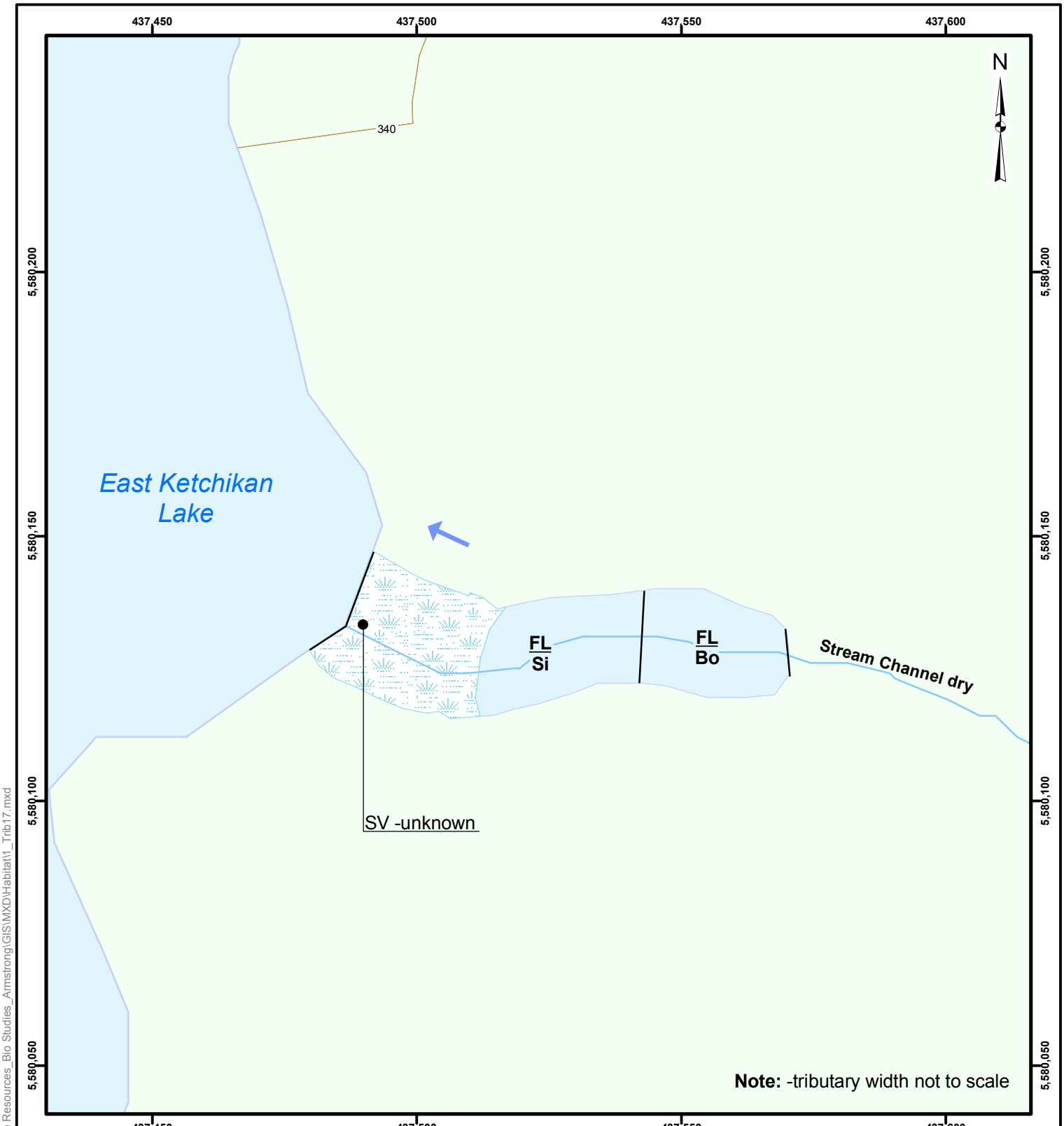
Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	20 Jan. 2009		
GIS	RRD	20 Jan. 2009		
CHECK	RM	20 Jan. 2009		
REVIEW	JS	?? Aug. 2005		

FIGURE: 13

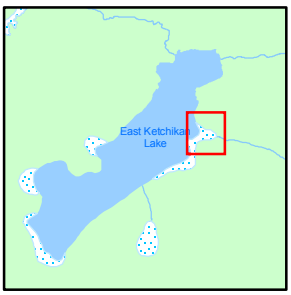
REFERENCE

N:\Active\2008\1190 Sudbury\1192\08-1192-0080 Landore Resources_Bio Studies_Armstrong\GIS\MXD\Habitat\1_Trib16.mxd



LEGEND

— - defined channel unit boundary
FL - flat
Bo - boulder
Si - silt
SV - submergent vegetation
← - flow direction
~ - contour line (m)



25 0 25
SCALE 1:1,000 METRES

REFERENCE

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PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Trib 17

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	02 Feb. 2009		

FIGURE: 14

N:\Active\2008\1190 Sudbury\1192\08-1192-0080 Landore Resources_Bio Studies_Armstrong\GIS\MXD\Habitat\1_Trib17.mxd

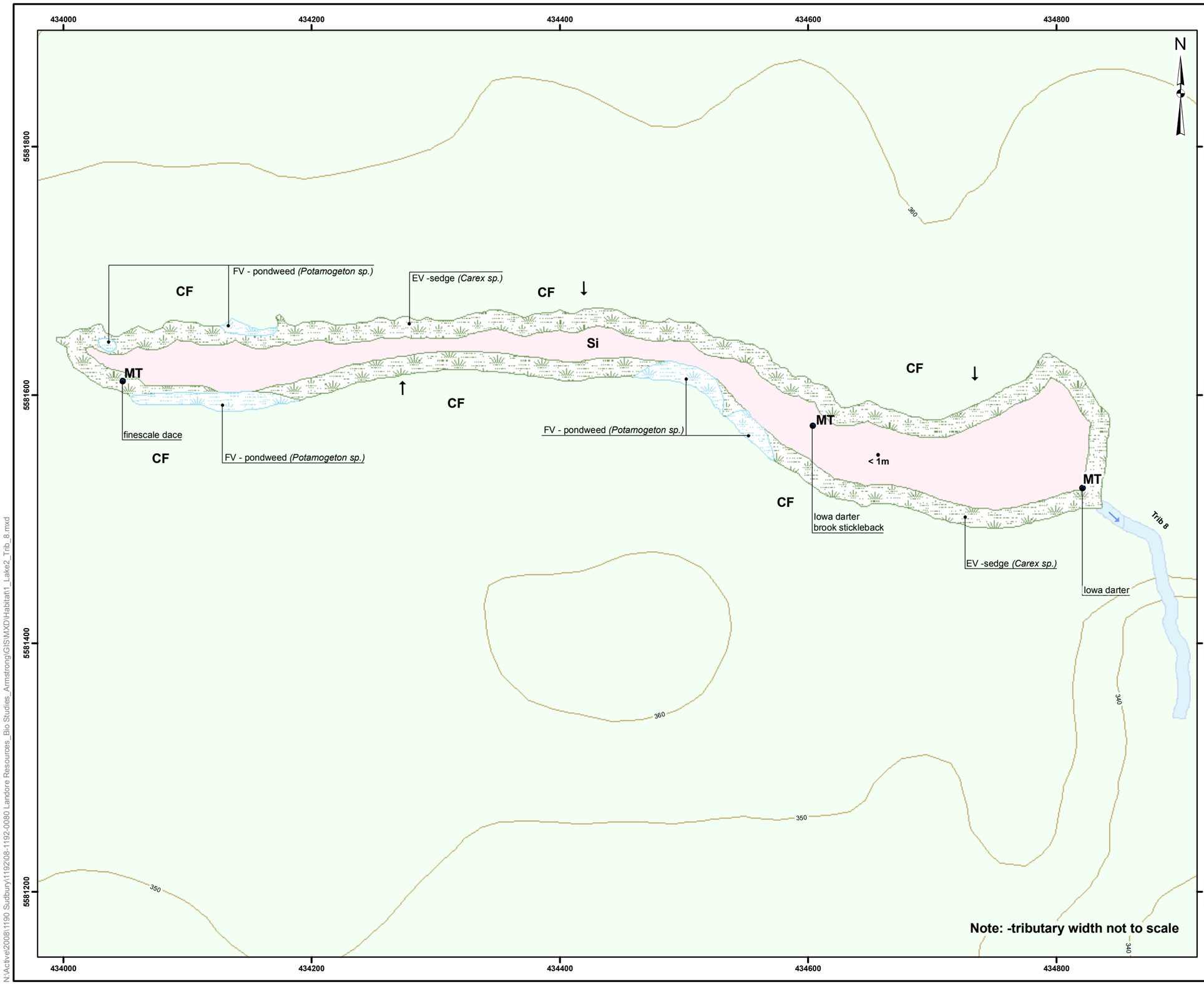
Open Water Marsh (OWM) "A"

OWM "A" (Figure 15), has a surface area of approximately 5.6 ha and a shoreline of approximately 2 km. Trib 8 is the only outlet from the marsh. No tributary inlets to OWM "A" were observed during the aquatic survey and no sources of groundwater were observed.. Water temperatures were similar to air temperature, suggesting that water contained within OWM "A" originates from surface water run-off.

The shoreline surrounding OWM "A" consists of shallow (flat) land dominated by a mixed forest community consisting of black spruce, jack pine, trembling aspen and low shrubs. Riparian vegetation consists of sedge spp.

The entire littoral zone of the marsh was visually assessed, despite poor water clarity that was best described as stained or "tea" coloured. Within OWM "A", silt was the predominate substrate type observed. Aquatic vegetation within OWM "A" consisted of floating pondweed and emergent (sedge) vegetation, that was concentrated adjacent to the marsh shoreline.

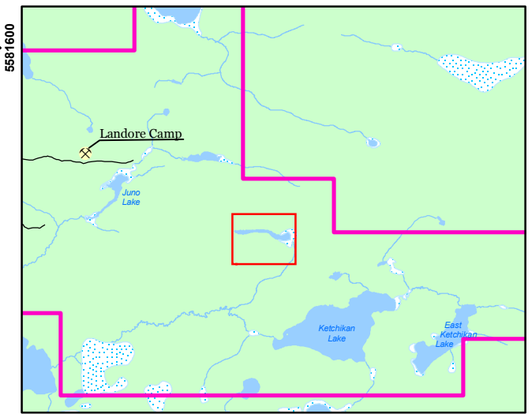
Trib 8, the only outlet for OWM "A", located on the eastern side of the marsh, was assessed for a distance of approximately 170 m downstream of the marsh (Figure 16). The dominate channel unit in the tributary was a low gradient flat, although portions assessed also included boulder garden. Observed depths within Trib 8 ranged from 0.04 to 0.6 m with wetted widths varying from 0.5 to 1.2 m. Bank slopes were stable and slow (0.0 to 0.01 m/s) flow velocities were recorded that resulted in a nil calculated discharge rate. The predominate substrate observed for Trib 8 was silt, but boulder and cobble were also present. A mixture of in-stream woody debris, overhanging vegetation and submerged vegetation (i.e. wild celery) was observed as a main habitat features providing cover for fish in Trib 8. There were no visible barriers to fish migration noted in the channel section assessed.



LEGEND

- MT - Minnow Trap sampling location
- Si - silt
- FV - floating vegetation
- EV - emergent vegetation
- CF - coniferous forest
- - bank slope, shallow (0%-5%)
- - flow direction
- - contours (m)

Note: - tributary width not to scale



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50 0 50
SCALE 1:3,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Open Water Marsh "A"

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	06 Jan. 2009	**FIGURE: 15**
GIS	RRD	06 Jan. 2009	
CHECK	RM	06 Jan. 2009	
REVIEW	JS	02 Feb. 2009	

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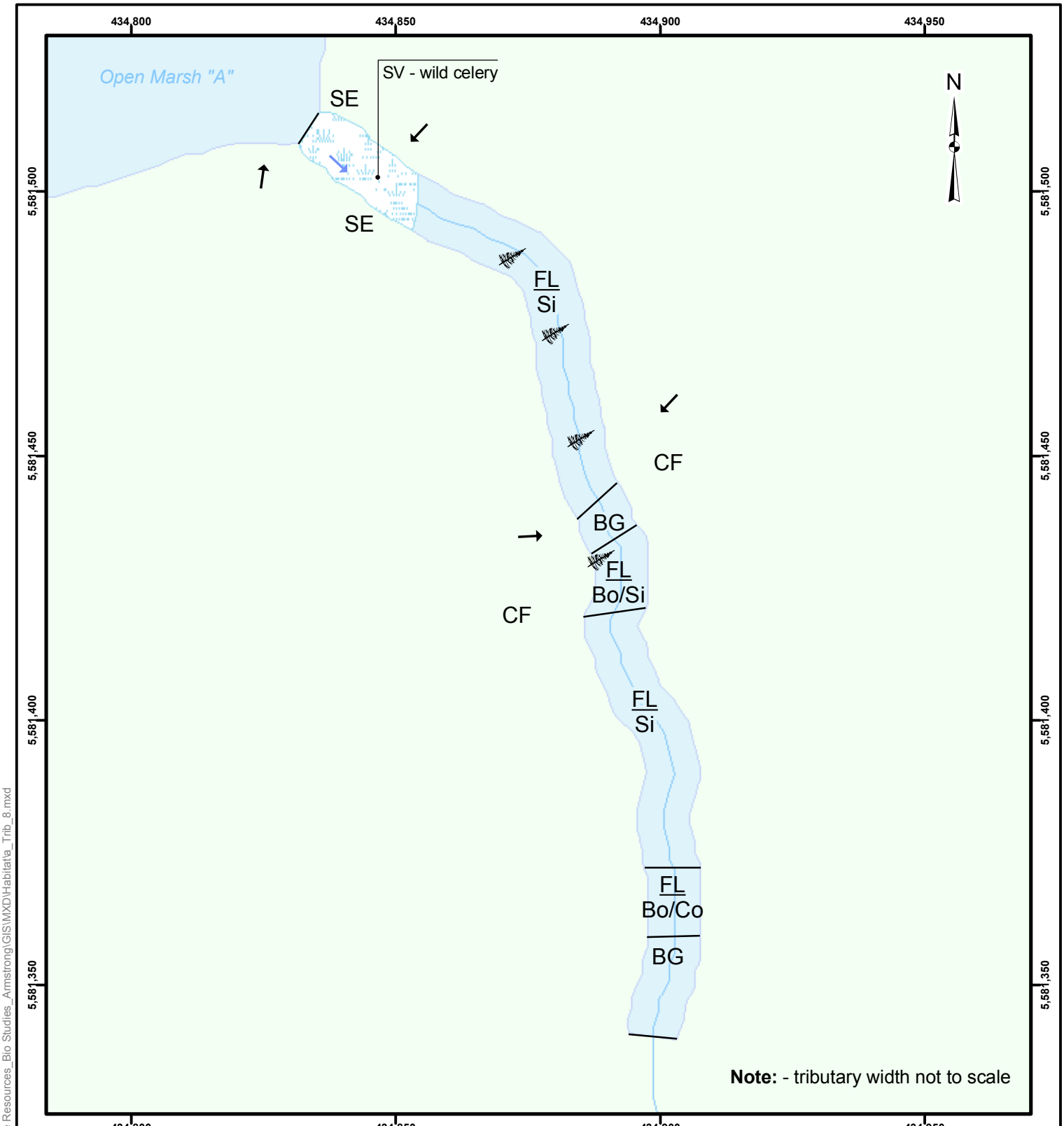
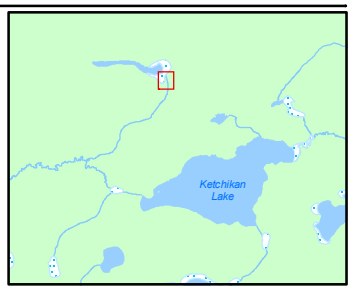


LEGEND

- — - defined channel unit boundary
- ~ - back pack electrofishing
- FL - flat
- Bo - boulder
- BG - boulder garden
- Si - silt
- SE - sedge
- CF - coniferous forest
- ← - bank slope, shallow (0%-5%)
- ← - flow direction



30 0 30

SCALE 1:1,000 METRES

PROJECT

LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE

Trib 8

REFERENCE

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Golder Associates
Sudbury, Ontario

PROJECT No.08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	02 Feb 2009		

FIGURE: 16

N:\Active\2008\1190 Sudbury\1192\08-1192-0080 Landore Resources_Bio Studies_Armstrong\GIS\MXD\Habitat\a_Trib_8.mxd

Open Water Marsh OWM "B"

OWM "B" (Figure 17) is part of the upper headwater for the Ketchikan Lake watershed. OWM "B" has a surface area of approximately 1.6 ha and approximately 0.6 km of shoreline. Trib 10 connects OWM "B" to Ketchikan Lake but appears to be an ephemeral connection as the outlet to OWM "B" was dry during the aquatic survey, and as a result, was not assessed. There were no tributary inlets observed associated with OWM "B".

The shoreline surrounding OWM "B" consists of intermediate to steeply sloped land dominated by black spruce and low shrubs. Woody debris and fallen trees were prevalent around most of the marsh.

Water depth in the marsh was typically <2 m. A spot measurement towards the centre of the marsh indicated that the maximum depth is 3 m deep. A visual assessment of the majority of the marsh bottom was completed although water clarity, measured at <1 m, limited direct observations in some locations. Silt was the predominate substrate type observed. Aquatic macrophytes within OWM "B" consisted of a combination of submerged vegetation (Richardson's pondweed - *Potamogeton richardsonii*), floating vegetation (floating-leaved pondweed - *Potamogeton natans* and yellow pond lily - *Nuphar variegatum*) and emergent vegetation (sedge spp. and rushes - *Juncus* sp.) that was concentrated along the western portion of OWM "B".

435400 435450 435500 435550 435600 435650

5581100 5581050 5581000 5580950 5580900

N

FV - floating-leaved pondweed
SV - Richardson's pondweed

MT

CF

Trib 10

340

dry channel

EV - rushes *(Juncus sp.)*

GNN

3m

CF

EV - sedge *(Carex sp.)*

Si

CF

MT

MT

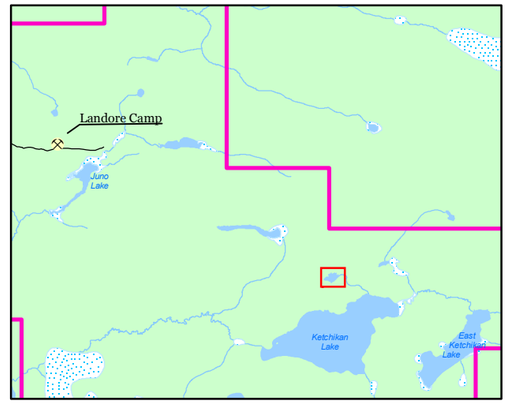
CF

FV - yellow pond lily

Note: - tributary width not to scale

LEGEND

- MT - Minnow Trap
- GNN - Gill Net Nordic
- Si - clay/silt
- EV - emergent vegetation
- FV - floating vegetation
- SV - submergent vegetation
- CF - coniferous forest
- - bank slope, intermediate (6%-30%)
- - bank slope, steep (31%-70%)
- - outflow
- - beaver lodge
- - woody debris
- - dry channel



REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 16

20 0 20
SCALE 1:1,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Open Water Marsh "B"

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	26 Jan. 2009	**FIGURE: 17**	
GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	02 Feb. 2009		

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Open Water Marsh "C"

OWM "C (Figure 18) has a surface area of approximately 0.9 ha and 0.5 km of shoreline. There is one inlet to OWM "C", (Trib 12) and one outlet (Trib 13), that connects OWM "C" indirectly to Ketchikan Lake through Trib 14. One additional inlet tributary was located along the southeast corner of OWM "C" but was assessed as dry.

The shoreline surrounding OWM "C" had a shallow slope and was dominated by a forest community consisting of black spruce and low shrubs. The riparian zone surrounding OWM "C" was ringed by a mixture of grasses (family Poaceae) and forbs.

The marsh was shallow (≤1 m deep) with a spot measurement taken from the centre of the marsh recorded as 0.75 m deep. A visual assessment of bottom substrates throughout the marsh was completed. Silt was the predominate substrate type observed with floating (i.e. pondweed) and emergent (i.e. sedge) vegetation comprising the main aquatic vegetation observed.

Trib 12 (Figure 18) was assessed upstream from OWM "C" for a distance of approximately 300 m. The dominate channel unit was flat, with a small section of low gradient riffle located below a breached beaver dam. The tributary was shallow (<0.1 m deep) and narrow (<1 m wetted width). Representative measurements of flow velocity were slow (≤0.03 m/s) and resulted in a nil calculated discharge rate, although portions of the channel bank assessed were noted as unstable, suggesting that faster flows may occur. The predominate substrate observed was silt with gravel and cobble subdominant. Submergent/inundated vegetation (i.e. wild celery) was observed as the main habitat feature providing cover for fish in Trib 12 with woody debris and undercut bank also noted. There were no visible barriers to fish migration noted in the segment of tributary assessed.

Trib 13 (Figure 18) was assessed downstream from OWM "C" for a distance of approximately 240 m. The segment assessed consisted of a channel unit composed of low gradient flat with flow previously controlled by a series of now inactive beaver dams. The predominate substrate was silt, with some sand also observed. Wetted channel width varied throughout the segment from <0.5 to 5.0 m. Representative flow velocities were slow (≤0.02 m/s), and resulted in a low calculated discharge rate of 0.001 m^3/s. Minor amounts of submerged/inundated vegetation and in stream woody debris comprised the main habitat features providing cover for fish, but in general this section of tributary was open and provided little cover. Apart from the presence of former beaver activity, there were no visible barriers to fish migration noted in the portion of tributary assessed.

436100 436200 436300 436400 436500

5581400 5581300 5581200 5581100

N

Trib 12

GR/FB

CF

FL
Si

former beaver pond

XXXXX

RF
Gr/Co

Bo

Si

0.75m

MT

FV - pondweed *(Potamogeton sp.)*

EV - sedge *(Carex sp.)*

Dry Channnel

FV - wild celery

EV - sedge *(Carex sp.)*

GR

Sa

Trib 13

SE

SH

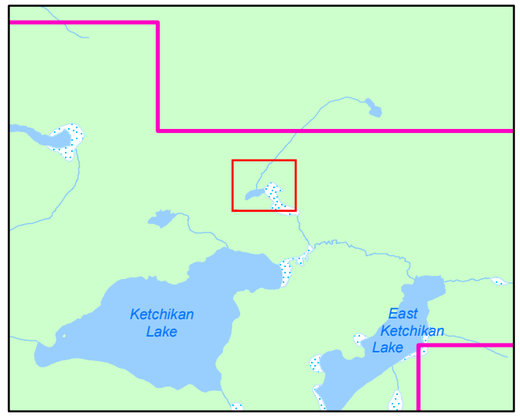
350

340

Note: - tributary width not to scale

LEGEND

- MT - Minnow Trap
- - defined channel unit boundary
- Back pack electrofishing
- FL - flat
- RF - riffle
- Bo - boulder
- Co - cobble
- Gr - gravel
- Sa - sand
- Si - silt
- GR/Fb - grasses / forbes
- EV - emergent vegetation
- FV - floating vegetation
- SE - sedge
- SH - shrubs (alder)
- CF - coniferous vegetation
- - beaver lodge
- XXX - beaver dam
- - former beaver pond
- - woody debris
- - dry channel
- - contour lines (m)
- - bank slope, shallow (0-5%)
- - bank slope, intermediate (6%-30%)
- - flow direction



REFERENCE

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20 0 20
SCALE 1:1,500 METRES

PROJECT: LANDORE RESOURCES INC. JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE: **Open Water Marsh "C" & Tribs 12 &13**

Golder Associates Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	06 Jan. 2009		
GIS	RRD	06 Jan. 2009		
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REVIEW	JS	03 Feb. 2009		

FIGURE: 18

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Open Water Marsh "D"

Open Water Marsh "D" (Figure 19), lies outside but adjacent to the Site property boundary. However, given its' proximity to potential mine development activity, OWM "D" was included as part of the 2008 aquatic survey.

OWM "D" is located in a headwater area within the Ketchikan Lake watershed. OWM "D" has a surface area of approximately 0.9 ha and 0.5 km of shoreline. There is an apparent outlet on the northwestern end of OWM "D" but no defined channel could be readily located in this area and as a result this segment was not assessed further. There were no tributary inlets observed associated with OWM "B".

The shoreline surrounding OWM "D" had a shallow slope and was dominated by black spruce and low shrubs. The riparian zone surrounding OWM "D" was ringed by sedge.

Water depth in the marsh was typically $\leq$2 m. A maximum depth of 1.3 m was recorded in the southeastern portion of the marsh. A visual assessment of bottom substrates was completed in the marsh. Silt was the predominate substrate type observed. Aquatic macrophytes within OWM "D" consisted of various combinations of submerged (i.e. pondweed) and floating (i.e. floating-leaved pondweed) vegetation.

436950 437000 437050 437100 437150 437200

5581900 5581850 5581800 5581750 5581700

N

350

SV - pondweed *(Potamogeton sp.)*

Inferred flow direction

Trib 12

MT

SV - pondweed *(Potamogeton sp.)*

MT

Si

CF

EV - sedge *(Carex sp.)*

GNN

1.3m

CF

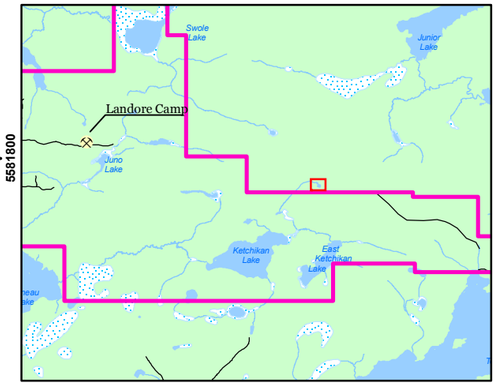
MT

FV - floating leaved pondweed

350

LEGEND

- MT - Minnow Trap
- GNN - Gill Net Nordic
- Si - silt
- EV - emergent vegetation
- FV - floating vegetation
- SV - submergent vegetation
- CF - coniferous forest
- → - bank slope, shallow (0-5%)
- - inferred flow direction
- ~ - contour lines (m)



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25 12.5 0 25

SCALE 1:1,000 METRES

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Open Water Marsh "D"

Golder Associates
Sudbury, Ontario

PROJECT No. 08-1192-0080			SCALE AS SHOWN	REV. 0
DESIGN	RRD	06 Jan. 2009	**FIGURE: 19**
GIS	RRD	06 Jan. 2009	
CHECK	RM	06 Jan. 2009	
REVIEW	JS	03 Feb. 2009	

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Ketchikan Lake

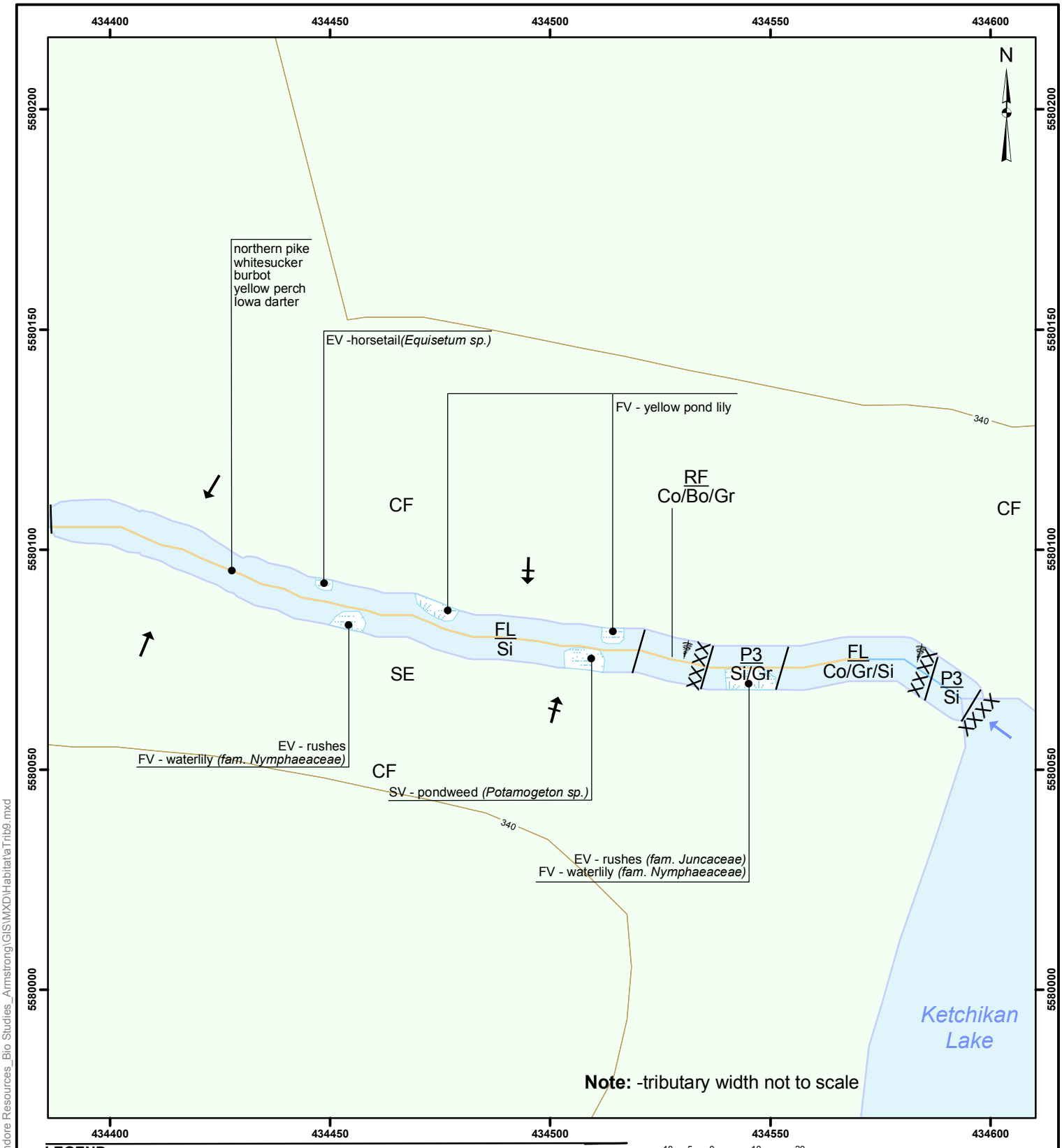
Ketchikan Lake was assessed separately in 2007 (Golder 2008). Four tributaries associated with Ketchikan Lake, one outlet (Trib 9), and three inlets (Tribs 10, 11 and 14), were assessed in 2008.

Trib 9 (Figure 20) is the outlet for Ketchikan Lake and flows westerly, reporting to Trib 8, then Trib 2, an inlet to Juneau Lake. The segment assessed (approximately 180 m downstream from Ketchikan Lake) consisted of a mixture of pool, riffle and flat channel units, defined in part by a series of inactive beaver dams. Silt, with minor components of cobble and gravel comprised the main substrate types observed. Pool units were typically ≤1 m deep, while the low gradient riffle and flats had depths that were typically ≤0.2 m and ≤0.5 m, respectively. Pools and flats had wetted widths of 8 to 10 m and riffles widths of approximately 3 m. Representative flow measurements in the flats were ≤0.02 m/s and from 0.12 to 0.20 m/s in the riffles. Discharge was calculated to be 0.085 m^3/s for Trib 9. A variety of habitat features including, substrate, water depth, woody debris and instream vegetation provide cover for fish. Three abandoned beaver dams, varying in condition, may limit fish migration in this segment.

Trib 10 (Figure 21) is an inlet located on the north side of Ketchikan Lake and was assessed for a distance of approximately 150 upstream from the lake. Unlike the upper section of Trib 10, draining OWM "B", the inflowing channel at Ketchikan Lake is well defined and was flowing during the aquatic survey. Water temperature in Trib 10 was low (~8°C) relative to water temperatures in neighbouring inlet tributaries (19°C in Trib 11 and 20°C in Trib 14) and ambient air temperatures. Flowing water and low water temperature suggest that groundwater is a main source contributor in the lower portion of the tributary. Trib 10 varied in width from 1 to 2 m and had depths that were typically ≤0.1 m. Representative flows varied between 0.01 to 0.2 m/s. and resulted in a discharge calculated to be 0.003 m^3/s. A low gradient riffle, was the predominate channel unit observed in the segment assessed, with flat comprising a minor component. Silt was the main substrate type with minor amounts of sand and gravel also present. Woody debris and overhanging vegetation were the main habitat features providing instream cover for fish. There were no visible barriers to fish migration noted in the portion of tributary assessed.

Trib 11 (Figure 22) is an inlet located along the southeast portion of Ketchikan Lake. Approximately 200 m of tributary were assessed upstream from the lake. Trib 11 varied in width from 1 to 2 m and had depths that were typically ≤0.15 m. Portions of Trib 11 had minor amounts of unstable bank, suggesting that the segment may experience faster flow at times. Representative flows recorded during the survey varied between 0.0 and 0.2 m/s but the low overall gradient of this segment resulted in a nil discharge rate estimate. Flat was the predominate channel unit observed, with one section forming a boulder garden of exposed boulder substrate. Silt, boulder and cobble were the main substrate types encountered. Substrate, overhanging vegetation and woody debris and were the main habitat features providing available cover for fish. There were no visible barriers to fish migration noted in the portion of tributary assessed.

Trib 14 (Figure 23) is an inlet located along the southeast portion of Ketchikan Lake. Trib 14 receives drainage from Trib 13 and from Trib 15. Approximately 200 m of tributary were assessed upstream from Ketchikan Lake. Trib 14 varied in width from 3 to 4 m and had depths that were typically ≤1.0 m. Representative flows were slow (0.0 to 0.01 m/s). Discharge was calculated to be 0.001 m^3/s. Low gradient flat was the only channel unit observed and silt the only substrate type encountered. Submerged/inundated vegetation (i.e. yellow pond lily), depth, and undercut bank were the main habitat features providing available cover for fish. There were no visible barriers to fish migration noted in the portion of tributary assessed.



LEGEND

- — - channel unit boundary
- Backpack electrofishing
- FL -flat
- P3 - low quality pool habitat
- RF - riffle
- Bo - boulder
- Co - cobble
- Gr - gravel
- Si -silt
- - woody debris
- EV - emergent vegetation
- FV - floating vegetation
- SV - submergent vegetation
- SE - sedge
- CF - coniferous forest
- - bank slope, shallow (0-5%)
- - bank slope, intermediate (6%-30%)
- - bank slope, steep (31%-70%)
- - flow direction
- XXXX -beaver dam

10 5 0 10 20 Meters

Scale 1:1,200

Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

REFERENCE

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PROJECT: LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE: **Trib 9**

Golder Associates
Sudbury, Ontario

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DESIGN	RRD	26 Jan. 2009		
GIS	RRD	26 Jan. 2009		
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REVIEW	JS	03 Feb. 2009		

FIGURE: 20

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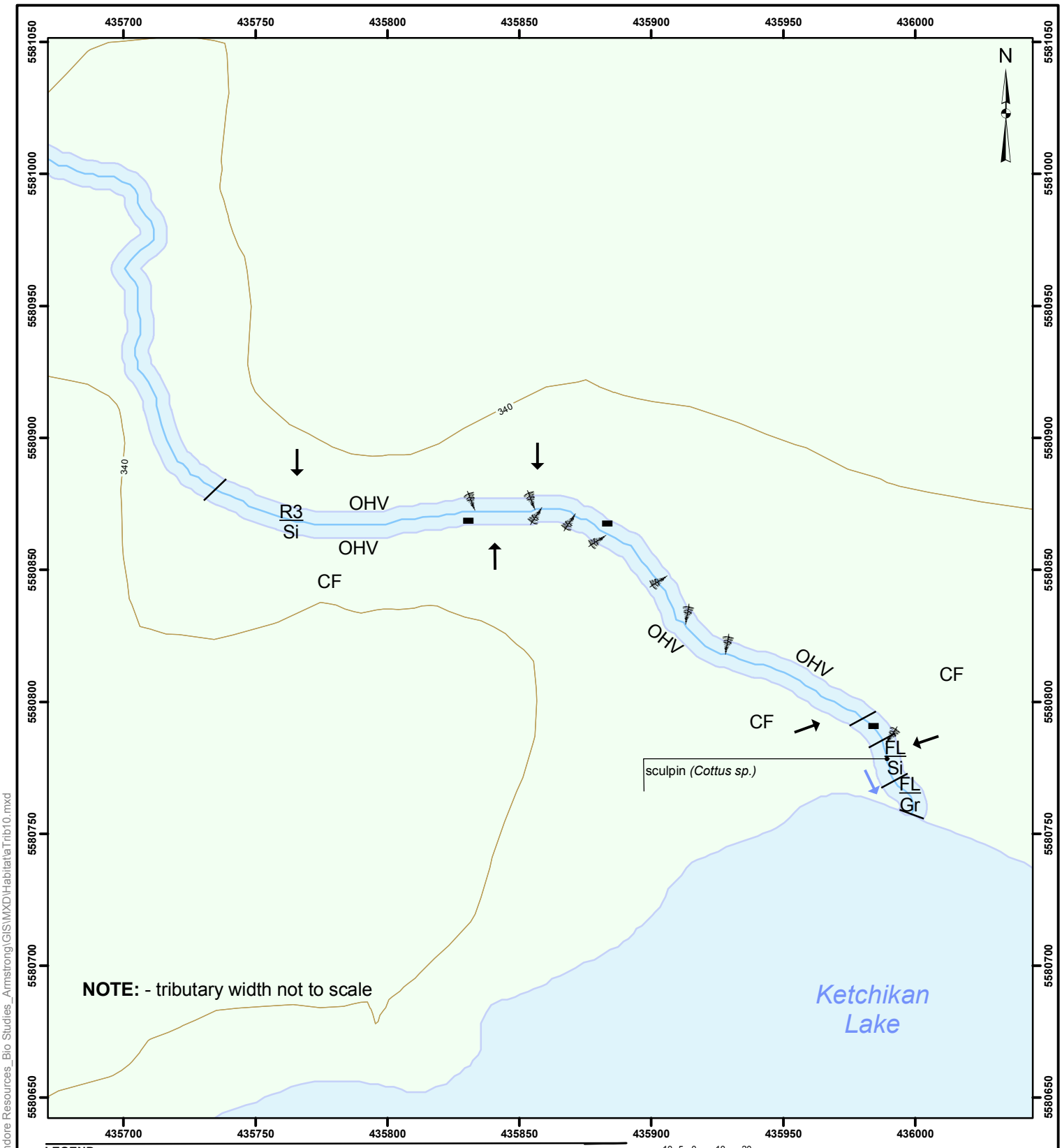

LEGEND

- — - defined channel unit boundary
- ~ Backpack electrofishing
- FL - flat
- R3 - lowest quality/depth
- Si - silt
- CF - coniferous forest
- OHV - overhanging vegetation
- - woody debris
- ▪ - root wad
- → - bank slope, shallow (0-5%)
- → - flow direction

10 5 0 10 20 Meters

Scale 1:2,000

Projection: Transverse Mercator
Datum: NAD 83
Coordinate System: UTM Zone 16

REFERENCE

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PROJECT: LANDORE RESOURCES INC. JUNIOR LAKE ENVIRONMENTAL BASELINE STUDY

TITLE: **Trib 10**

Golder Associates Sudbury, Ontario

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DESIGN	RRD	26 Jan. 2009		
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REVIEW	JS	03 Feb. 2009		

FIGURE: 21

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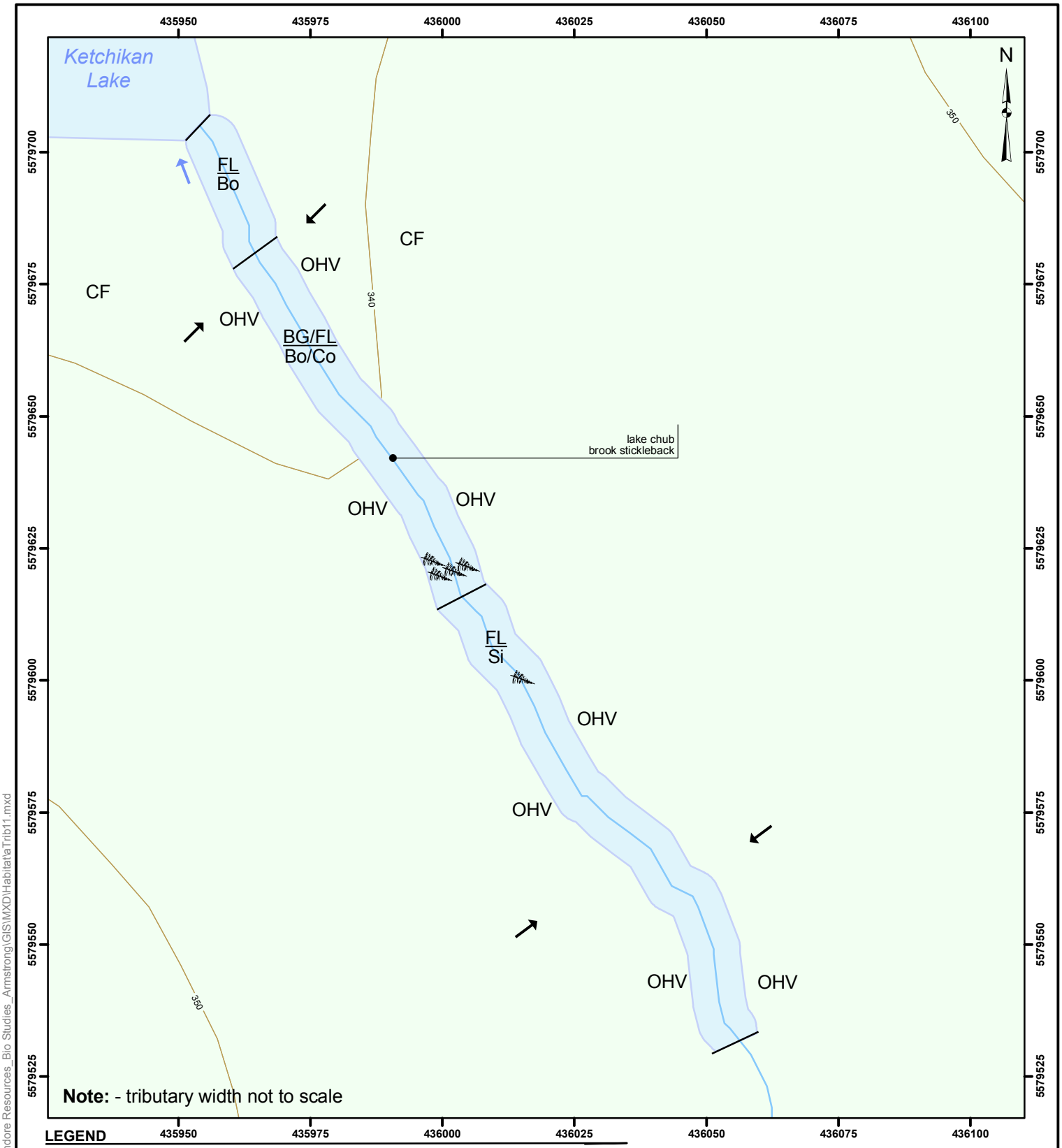

LEGEND

- defined channel unit boundary
- Backpack electrofishing
- FL - flat
- BG - boulder garden
- Bo - boulder
- Co - cobble
- Si - silt
- CF - coniferous forest
- woody debris
- bank slope, shallow (0-5%)
- flow direction

Scale 1:1,000

10 5 0 10 20 Meters

PROJECT

LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE

Trib 11

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REVIEW	JS	26 Jan. 2009		

FIGURE: 22

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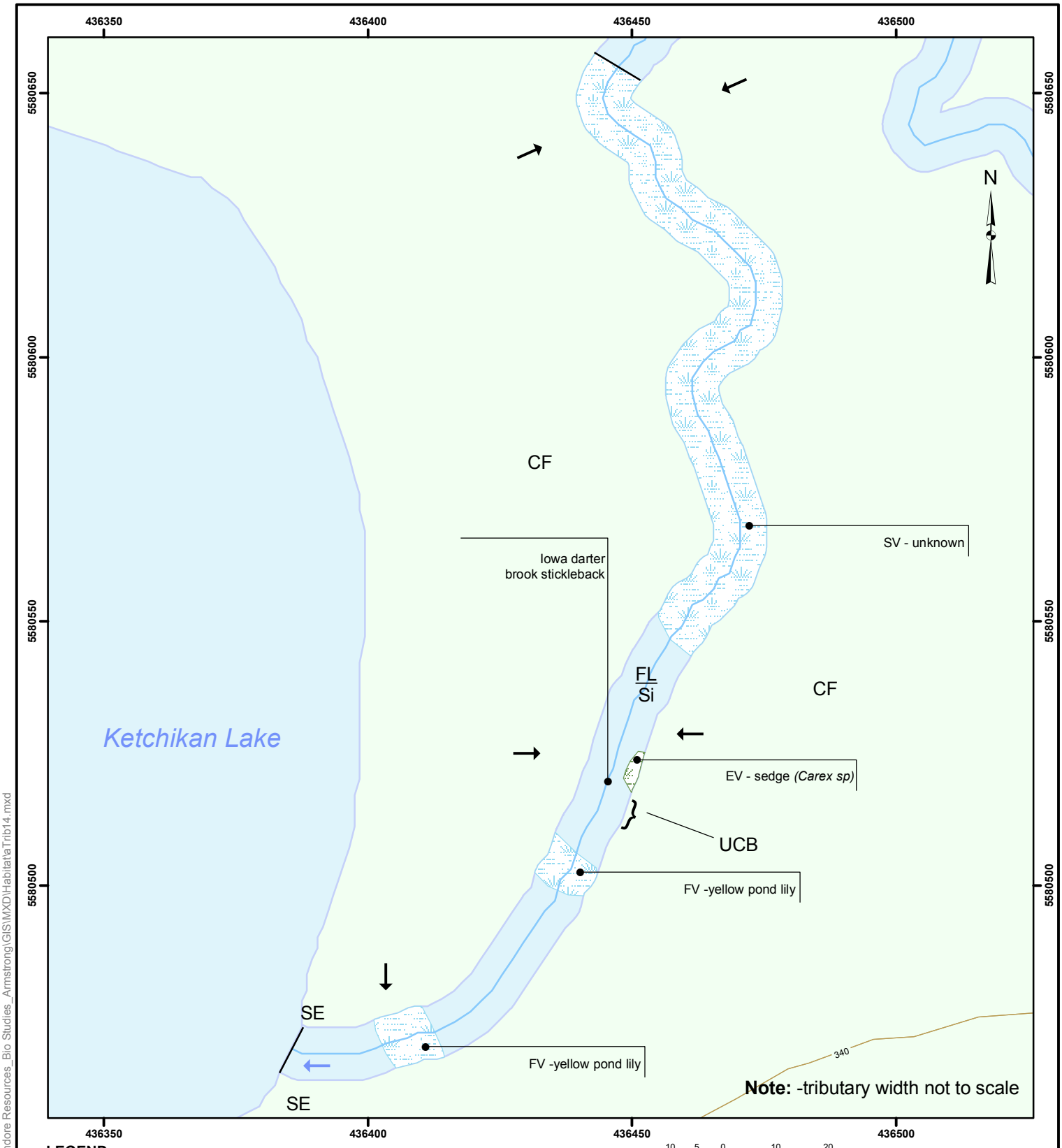
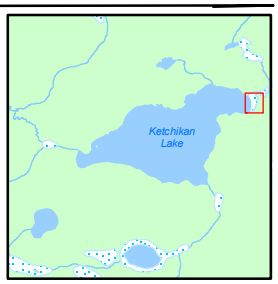


LEGEND

- defined channel unit boundary
- Backpack electrofishing
- FL -flat
- Si -silt
- EV - emergent vegetation
- FV - floating vegetation
- SV - submergent vegetation
- UCB - undercut bank
- SE - sedge
- CF - coniferous forest
- bank slope, shallow (0-5%)
- flow direction



10 5 0 10 20 Meters

Scale 1:1,000

PROJECT
LANDORE RESOURCES INC.
JUNIOR LAKE ENVIRONMENTAL
BASELINE STUDY

TITLE
Trib 14

REFERENCE

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GIS	RRD	26 Jan. 2009		
CHECK	RM	26 Jan. 2009		
REVIEW	JS	03 Feb. 2009		

FIGURE: 23

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Fish Habitat Preferences and Potential Use

Typical habitat preferences, derived from literature for the species that were captured during the 2008 aquatic survey are presented in Table 12.

TABLE 12
TYPICAL HABITAT PREFERENCES BY FISH SPECIES

Species	Habitat Preferences[1]		
	Spawning/Egg	**Nursery**	**Juvenile/Adult**
northern pike	• lacustrine; riverine • spring spawn before ice has left lakes, but just after ice has left rivers/streams • broadcast spawner over submergent vegetation, eggs adhesive	• lacustrine; riverine • larval pike remain attached to vegetation initially • Young-of-the-year (YOY) found along shoreline up to ~1 m deep near submergent/ emergent vegetation	• clear, cool to warm, weedy bays of lakes and marshes or in flowing water from headwater creeks to rivers, where water velocity is slowest such as pools, eddies and margins slow, meandering, heavily vegetated rivers • preferred water temperature range 17 to 21°C
white sucker	• lacustrine; riverine • spring spawner in shallow gravel riffle sections of streams, rapids and less frequently along lake margins • broadcast spawner, eggs adhere to substrate or submerged vegetation	• lacustrine; riverine • shallow waters of lake margins, rivers and streams, typically <5 m deep	• pools and riffles of creeks and rivers, warm shallow lakes and embayments of larger lakes usually at depths of 6 to 9 m • preferred water temperature range 22 to 26°C
lake chub	• riverine • spring spawner over coarse substrate • broadcast spawner with non-adhesive eggs deposited amongst substrate	• lacustrine; riverine • fry move from shallow margins of streams or rivers to mid-depth in slow current waters and into lakes amongst emergent vegetation	• gravel-bottomed pools and runs of creeks, rivers and along lake margins • moves to deeper waters in the summer • prefers cool water in both streams and lakes

Species	Habitat Preferences[1]		
	Spawning/Egg	**Nursery**	**Juvenile/Adult**
northern redbelly dace	• lacustrine; riverine • spring to summer spawner, non-adhesive eggs deposited within masses of filamentous algae	• lacustrine; riverine • lakes, bogs ponds and creeks, typically <2 m deep	• lakes, bogs, ponds and pools of creeks with organic substrates and aquatic vegetation
finescale dace	• lacustrine; riverine • spring spawner with eggs deposited under debris such as submerged logs on substrates of gravel, sand, and silt	• lacustrine; riverine • cool bogs lakes, ponds and creeks	• cool bogs, lakes, ponds and sluggish pools of creeks and small rivers with silty substrates and aquatic vegetation
pearl dace	• riverine • spring broadcast spawner over coarse to fine substrates • males do not build nest but defend eggs	• YOY utilize area of <5 m deep with substrates of silt, clay and detritus	• pools of cool, clear headwater streams, bogs, ponds and small lakes with sand or gravel bottoms • preferred water temperature of ~16°C
blacknose shiner	• lacustrine; riverine • spring or summer spawner over sand or gravel substrate	• lacustrine; riverine • clear vegetated lakes and pools of creeks and small rivers with sandy substrates	• clear vegetated lakes and pools of creeks and small rivers with sandy substrates
burbot	• lacustrine; riverine • winter or early spring spawner in lakes or rivers over sand to cobble substrate • eggs not adhesive, lodge into substrate	• lacustrine; riverine • nocturnal benthic feeders that occupy shallow bays, rocky shores, weed beds, and cutbanks during the day	• moderate to deep waters (to 90 m) of lakes, large, cool rivers and streams, often under rocks, among roots or in holes in the banks • preferred water temperatures range 7 to 18°C
yellow perch	• lacustrine; riverine • spring spawner in waters <10 m deep • eggs lain as large adhesive masses on submergent	• lacustrine • YOY in waters up to 10 m deep over substrates of gravel, sand, silt-clay, frequently associated with aquatic	• lakes, ponds and pools of creeks and small to large rivers with moderate aquatic vegetation and clear water, usually at depths <9 m

Species	Habitat Preferences[1]		
	Spawning/Egg	**Nursery**	**Juvenile/Adult**
	vegetation or fallen branches of lakes	vegetation	• preferred water temperature range 20 to 24°C
walleye	• lacustrine; riverine • spring spawner in rapids below impassable barriers or shoals of lakes over coarse substrates such as gravel or cobble • eggs broadcast widely and lodge within substrate	• lacustrine; riverine • YOY found in near shore habitats of <2 m in association with prey species	• lakes (at depths up to 21 m), and pools, backwaters and runs of medium to large rivers • preferred water temperature range 19 to 23°C
Iowa darter	• lacustrine • spring to early summer spawner • eggs attached within crevices of coarse substrate or on fibrous root material of undercut banks	• lacustrine • YOY inhabit areas <5 m deep with gravel, sand or silt substrate, associated with submergent vegetation	• clear, standing or slowly moving waters of lakes, pools of creeks and small to medium rivers, having rooted aquatic vegetation and organic to sand substrates • preferred water temperature range 12 to 25°C
brook stickleback	• lacustrine; riverine • spring spawner • males build nest of vegetation and debris where eggs deposited	• lacustrine; riverine • YOY prefer depths <2 m with submergent vegetation to provide cover	• vegetated lake margins, ponds, and clear, quiet to flowing pools and backwaters of creeks and small rivers • occasionally brackish water • preferred water temperature 21.3°C
sculpin	• lacustrine; riverine • spring spawners, adhesive eggs deposited on undersides of large substrate or woody debris and guarded by male	• lacustrine; riverine • YOY associated with various substrate types, in situ vegetative cover and relatively shallow depths	• cobble and gravel riffles of cool creeks, small rivers and rocky shores of lakes (<16 m deep) • preferred water temperature range 13 to 18°C

Note: 1. Habitat preference information compiled from Scott and Crossman (1973), Langhorne et al (2001) and Eakins (2008)

Additional information on habitat preferences and potential use, by species captured, follows:

Northern pike

Northern pike were captured or observed in Juneau and East Ketchikan Lake and were found in seven of the seventeen tributaries that were fished. Northern pike were found during the 2008 aquatic survey in waters that varied from 16 to 22°C.

Adult northern pike were caught in the lakes while juveniles were captured in the tributaries. Adults were captured at depths ranging from 2 to 12m. Juveniles were typically sampled in water <1m. Both conditions conform with habitat depth preferences for this species (Langhorne et al 2001). Typically, northern pike are associated with shallow littoral zone areas (<3 m) fine substrates and abundant submergent/emergent macrophyte cover as these areas provide suitable habitat for spawning, rearing and for foraging by both juvenile and adult fish (Langhorne et al 2001). Juneau Lake, East Ketchikan Lake and tributaries throughout the Site contain such suitable habitat (Appendix C; Photos 1 and 2).

White sucker

White sucker were captured or observed in Juneau Lake, OWM "C" and in Tribs 9 and 14. White sucker were sampled in waters ranging from 18 to 22°C. The majority of white suckers captured in either the OWM or tributaries, where shallow waters and silt substrates were present, were juveniles. These areas likely provide suitable habitat for fry and juveniles (Langhorne et al 2001). Adults are typically found in the bottom of rivers in water <5 m deep, and in lakes at approximate depths of 5 to 15 m (Scott and Crossman 1998 in Langhorne et al 2001). The majority of white suckers captured in Juneau Lake were adults and were associated with depths of between 8 to 12 m.

White sucker are also highly associated with in situ cover along shorelines and in streams with substrates containing large woody debris, rubble, sand, and silt-clay (Bradbury et al 1999 in Langhorne et al 2001). Juveniles prefer depths <5 m and frequently occur over rubble, cobble, sand and silt-clay substrates as well as over detritus and the pelagic zone (Bradbury et al 1999 in Langhorne et al 2001). Typical habitats associated with the presence of white sucker are presented in Appendix C; Photos 3 and 4.

Lake chub

Lake chub were only caught in Trib 11, an inlet to Ketchikan Lake on the south shore. Lake chub prefer cool to cold water (i.e. 7 to 18°C), but can tolerate a wide range of water temperatures and were captured in water exceeding this temperature range (19°C). Lake chub are associated with a range of habitat types and depths, within both lakes and riverine settings, with a preference for coarser substrates (i.e. boulder, cobbles and gravels) (Langhorne et al 2001). Spawning typically

occurs in spring over substrates that include silt, detritus, gravel, cobble or boulder (Nelson and Paetz 1992 in Langhorne et al 2001). Lake chub at Trib 11 were sampled near the mouth of Ketchikan Lake in shallow waters that were dominated by boulder and cobble (Appendix C; Photo 5), habitat suitable for spawning, rearing and foraging by various life stages of lake chub.

Northern redbelly dace

Northern redbelly dace were only captured in Open Water Marsh "C", but are a common species distributed throughout North-western Ontario. They have a preference for boggy lakes, creeks, ponds and quiet pool-like expansions streams and are often associated with detritus and silt substrates (Scott and Crossman 1998 in Langhorne et al 2001). Spawning occurs in spring with eggs deposited within masses of filamentous algae (Scott and Crossman 1973). With a preferred water temperature of 18 to 25 °C, they generally inhabit depths of <2 m, but adults do move into deeper water following a diel pattern (Lane et al 1996c in Langhorne et al 2001). Northern redbelly dace captured at OWM "C" were associated with shallow water (<1m) in the preferred temperature range (18°C) and an organic muck bottom, habitat likely suitable for foraging by juveniles and adults (Appendix C; Photo 6).

Finescale dace

Finescale dace were captured in OWMs "A" and "C" and in their associated tributaries, Tribs 8 and 13, respectively. Finescale dace have similar habitat preferences to northern redbelly dace, residing at depths up to 2 m (Lane et al 1996c in Langhorne et al 2001) in cool bog lakes, sluggish creeks (Nelson and Paetz 1992 in Langhorne et al 2001), streams and large ponds (Scott and Crossman 1998 in Langhorne et al 2001). They are often found in association with aquatic vegetation and in situ cover (Lane et al 1996 in Langhorne et al 2001). Finescale dace were captured in waters ranging from 18 to 23°C and in habitats consisting of shallow (<1 m) water, silt substrates and varying amounts of overhanging and instream cover (Appendix C; Photos 7 and 8). These conditions are likely suitable for use by finescale dace as spawning, nursery and forage habitat.

Pearl dace

Pearl dace were captured in OWM "C" and in Tribs 8, 13, 15 and 16. Pearl dace have a preferred water temperature of approximately 16°C. During the 2008 survey, pearl dace were observed in waters that ranged in temperature from 16 to 23°C. Pearl dace are one of a species association that often includes central mudminnow (*Umbra limi*), northern redbelly dace and finescale dace, characteristic of lakes, beaver ponds and bog habitats in headwater streams. Spawning is reported in the spring at depths of <1 m over gravel, sand, silt, clay detritus and hard-pan clay (McPhail and Lindsey 1970 in Langhorne et al 2001). Spawning has also been reported to occur in tributary streams or in vegetated areas along the periphery of lakes over substrates of sand, gravel, and soft organic material (Bradbury et al 1999 in Langhorne et al 2001). YOY, juveniles and

adults tend to associate with silt, clay or detritus substrates and submergent or emergent vegetation. Pearl dace captured during the aquatic survey were typically associated with shallow waters (<1 m) and silt substrates. Minor amounts of inundated and overhead cover were present in capture locations. In general, suitable habitats for all life stages of pearl dace were observed (Appendix C; Photos 9 and 10).

Blacknose shiner

Blacknose shiner were only captured in Trib 1, an inlet to Juneau Lake, located on the north side of the lake. A cool water species (18 to 25 °C), blacknose shiner was captured within this thermal regime at water temperatures measuring 20°C. Published literature for blacknose shiner is limited, despite its' wide distribution, however, various authors have suggested that spawning occurs in spring and summer over sand substrates and that there is a general habitat association with clear, shallow, weedy bays or quiet streams with sand or gravel substrates (Scott and Crossman 1973). These habitat features were associated with Trib 1 (Appendix C; Photo 11).

Burbot

One juvenile burbot was captured at Trib 2, an inlet to Juneau Lake, located to the southeast of Trib 1. Burbot have a temperature preference for cooler water (~7 to 18°C), but can tolerate a wide range of temperatures.. In lakes, burbot spawn in near shore shallows or off shore shoals, generally over a substrate of sand, gravel, or cobble, but free of silt (McPhail 1997 in Langhorne et al 2001). In flowing waters, spawning occurs in low velocity main and side channels behind depositional bars, where substrates are fine gravel, sand or fine silt (McPhail 1997 in Langhorne et al 2001). Burbot are one of the few Canadian freshwater fishes that spawn in midwinter (Scott and Crossman 1973). Larval fish inhabit the pelagic zone where they drift until their swimming ability improves and then move inshore to feed. YOY and juveniles are frequently found along rocky shores of lakes and sometimes in weedy areas of tributary streams, a preference that likely explains the presence of a juvenile in Trib 2. YOY are also known to seek shelter under cobble, debris, submerged vegetation beds and cutbanks in shallow bays and rocky shores (Scott and Crossman 1998 in Langhorne et al 2001). In lakes, adults tend to inhabit areas below the thermocline and on the bottom; adults will also inhabit turbid rivers where water temperatures rarely exceed 18°C (McPhail 1997 in Langhorne et al 2001). Habitat features associated with the presence of juvenile burbot in Trib 2 are shown in Appendix C; Photo 12.

Yellow perch

Yellow perch were captured in both Juneau and East Ketchikan Lakes and in Tribs 9, 14 and 15. Yellow perch can inhabit a variety of cool to warm water habitats from large lakes to ponds, or slow moving rivers (Nelson and Paetz 1992 in Langhorne et al 2001). This adaptability likely accounts for their wide distribution and presence in both lakes and tributaries at the Site. Yellow perch spawn in the spring and have a strong preference for submergent vegetation as well as

emergent vegetation and in situ cover (Webber 1982; Lane et al 1996a in Langhorne et al 2001). Typical habitat preferences for YOY, juvenile and adult fish include areas that contain finer substrates (i.e. gravel, sand, silt-clay) and cover from aquatic plants (Langhorne et al 2001). Juveniles in lakes typically inhabit depths <10 m while adults are found year-round throughout the water column, including depths >10 m (Lane et al 1996 in Langhorne et al 2001). Yellow perch captured in 2008 were small in size suggesting that they were juveniles. Areas where yellow perch were captured (Appendix C; Photos 13 and 14) were typically shallow (<1 m) and contained abundant submergent or inundated vegetative cover. Substrates associated with capture locations varied from silts to coarser grained cobble and boulder.

Walleye

Walleye were caught in Juneau Lake only during the 2008 aquatic survey. in 2007, walleye were also captured in Ketchikan Lake (Golder 2008). Walleye have a water temperature preference of 18 to 25°C, but can tolerate a wide range of water temperatures similar to those recorded within the epiliminion and thermocline of Juneau Lake (12 to 20°C). Walleye reach their greatest abundance in large, shallow, turbid lakes; large streams or rivers, providing they have cool water refugia (Scott and Crossman 1998 in Langhorne et al 2001). Spawning occurs in spring over boulder or coarse gravel shoals in lakes and in rocky areas in white water at the base of falls, rapids or dams (Scott and Crossman 1998 in Langhorne et al 2001). Larval walleye occupy open water or shallow embayments of lakes and rivers while YOY are typically found in near shore habitats of <2 m depth. Adults and juveniles occupy a range of depths with adults typically retreating to deeper areas in the summer, foraging into shallow waters to feed, most often around dawn and dusk, when light conditions are changing. Walleye caught in Juneau Lake were captured within a depth range of 5 to 10 m. Juneau Lake (Appendix C; Photo 15) provides suitable habitat for the various life stage of this species.

Iowa darter

Iowa darter were abundant species in OWM "A" and in Tribs 4, 6, 8, 9, 14, 15 and 16. Iowa darter have a water temperature preference of 18 to 25°C and locations where this species was captured had water temperatures within this preference range (16 to 23°C). Iowa darter prefers clear, slow-moving water, and can be found in the shallow waters of lakes and streams around aquatic vegetation and where substrates consist of organic debris, fine grained sands and silts (Scott and Crossman 1998 in Langhorne et al 2001). Tolerant of cooler waters they are intolerant of turbid, muddy waters with low visibility (Scott and Crossman 1998 in Langhorne et al 2001). Spawning occurs in spring or early summer in shallow waters in association with a variety of substrates ranging from cobble to clay, or on fibrous root material of undercut banks (Scott and Crossman 1998; Lane et al 1996 in Langhorne et al 2001). Typical habitats where Iowa darter was captured during the 2008 survey (Appendix C; Photos 16 and 17) had shallow depth (<1 m) and a high percentage of either woody debris, inundated vegetation or overhanging vegetation.

Brook stickleback

Brook stickleback were captured in OWMs "A" and "C" and in Tribs 8, 11, 12, 13, 14 and 16. Brook stickleback have a water temperature preference of 18 to 25°C and water temperatures at capture sites were within this preference range (15 to 23°C). The preferred habitats for brook stickleback are small streams, bogs or lakes where aquatic vegetation and debris are found (Nelson and Paetz 1992 in Langhorne et al 2001). Spawning habitat consists of submergent or emergent vegetation and overhead cover and may be associated with a wide variety of substrates including sand, silt-clay and sometimes gravel (Nelson and Paetz 1992; Lane et al 1996a in Langhorne et al 2001). Male brook stickleback construct nests on rooted aquatic plants or branches at depths <1 m that consist of bits of plants, algae, leaves, roots and debris with two openings (Langhorne et al 2001). When eggs hatch they are protected by the male until the YOY are capable of swimming. YOY prefer areas with submergent vegetation to provide cover. Adults occur close to, or within, aquatic vegetation and frequent areas with in situ vegetation and there is a high affinity for substrates consisting of silt, clay, sand and gravel and also for cobble and rubble (Langhorne et al 2001). Habitats where brook stickleback were captured during the 2008 survey were characterized by slow moving waters, <1 m deep and by silt substrates with large amounts of inundated vegetation and woody debris (Appendix C; Photo 18).

Sculpin spp.

Sculpin (species unknown) were captured from one site only, Trib 10 (inlet tributary to Ketchikan Lake draining from OWM "B") during the 2008 survey. Sculpin species in general have a preference for cold water (7 to 18°C) and those captured in Trib 10 were found within a portion of the tributary suspected to be influenced by groundwater inputs, based on a recorded water temperature of 8°C. Substrates in this tributary consisted of silt or gravel and sand. Woody debris and overhanging vegetation provided the main type of cover through channel reaches that were typically <0.1 m. These habitat characteristics are favoured by two species of sculpin whose range includes the Site, mottled sculpin (*Cottus bairdi*) and slimy sculpin (*Cottus cognatus*).

Mottled sculpin habitats include cool streams and lakes with a preference for sand substrates. Spawning activity occurs in spring. Eggs are deposited on the under side of rocks or ledges and guarded by the male until hatching. YOY tend to inhabit mud or organic muck bottoms in shallow depths (0.05 to 0.25m) while juveniles are generally associated with cover (i.e. debris, logs, rocks) (Scott and Crossman 1998 in Langhorne et al 2001).

Slimy sculpin have a high affinity for deep lakes, but are present in cool rocky streams as well (Langhorne et al 2001). Adults move to shallow waters of lakes and cooler streams where temperatures are optimally 5 to 10°C (Scott and Crossman 1998 in Langhorne et al 2001). Slimy sculpin spawn in spring and prefer habitats that consist of boulder, cobble and gravel, with a lesser affinity for silt and sand substrates. Cover in spawning areas may also consist of in situ vegetation. YOY and juveniles utilize habitats similar to those used by adults for spawning (Lane et al 1996b in Langhorne et al 2001).

Use of the habitat observed in Trib 10 (Appendix C; Photos 19 and 20) by either species as spawning, nursery or foraging habitat for YOYs, juveniles and adults is possible.

4.0 SUMMARY

Based on the results of the environmental baseline study, the following points can be highlighted:

- The Site has been highly disturbed in some locations by recent commercial forestry activity;
- The vegetation surveys, wildlife surveys and incidental observations did not identify any listed species within the Site boundary that would trigger a specialized study;
- Background data review indicated the potential for nine federally listed species and five provincially listed species to occur in the Site region. Based on species range information and habitat requirements eastern wolf is expected to have moderate potential to utilize the habitat within the Site;
- The potential for woodland caribou to utilize the Site may require consideration during the design/approval process;
- Waterbodies throughout and adjacent to the Site support a range of fish species. A total of thirteen species were captured (northern pike, white sucker, lake chub, northern redbelly dace, finescale dace, pearl dace, blacknose shiner, burbot, yellow perch, walleye, Iowa darter, brook stickleback, and sculpin) that includes a mixture of predator and prey species and a community that has a wide range of habitat preferences and water temperature tolerances;
- Tributary segments examined were low gradient and did not contain physical barriers related to topography. Beaver activity was present throughout the Site and may play a significant role in fish distribution and movement throughout many of the small catchments associated with the Site;
- Many of the permanent waterbodies assessed have maximum depths of <2 m and may freeze or become anoxic during winter, and may only support fish seasonally; and
- With the possible exception of OWM "D", where a distinct drainage channel could not be defined, all the assessed waterbodies support, or are connected to waterbodies that support, fish species and thus will be considered as "fish habitat" under the federal *Fisheries Act*.

5.0 IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

5.1 Standard of Care

Golder has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

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This report has been prepared for the specific site, design objective, development and purpose described to Golder by Landore Resources Canada Inc. (Landore). The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of Landore. *If the report was prepared to be included for a specific permit application or other government process (as specifically identified in the body of the report), then the applicable regulatory, municipal, or other governmental authority may use this report for the specific and identified purpose of the applicable permit review or other government process as identified in the report. No other party may use or rely on this report or any portion thereof without Golder's express written consent. Any other use of this report by others is prohibited and is without responsibility to Golder.* The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only Landore and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. Landore and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. Landore acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore Landore can not rely upon the electronic media versions of Golder's report or other work products.

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expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of Landore in the design of the specific project.

6.0 CLOSURE

The results of this investigation provide background information that can be used in assessing the feasibility of the Site from an environmental perspective. The data also contribute to the baseline against which the impacts of Site designs can be assessed.

We trust that the information presented in this report meets your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Yours very truly,

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APPENDIX A

METEOROLOGICAL DATA

GERALDTON A
ONTARIO

Latitude: 49° 46.800' N **Longitude:** 86° 55.800' W **Elevation:** 348.70 m
Climate ID: 6042716 **WMO ID:** 71834 **TC ID:** YGQ

Temperature:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Daily Average (°C)	-19.2	-15.5	-9	0.2	8.5	14.1	16.9	15.8	9.9	3.1	-6.1	-14.8		C
Standard Deviation	3.5	4	2.9	2.7	1.9	1.8	1.4	1.5	1.4	1.7	3.1	4		C
Daily Maximum (°C)	-12.4	-8.1	-1.5	7.2	15.6	20.9	23.4	22.2	15.3	7.5	-1.6	-9.3		C
Daily Minimum (°C)	-26	-22.8	-16.6	-6.8	1.4	7.3	10.4	9.4	4.3	-1.4	-10.6	-20.3		C
Extreme Maximum (°C)	5.9	16.9	16.6	25.8	32.2	**37**	34.5	33.6	30.5	24.8	15.2	10.8		
Date (yyyy/dd)	1999/31	1991/15	1995/13	1999/30	1986/28	**1995/18**	1988/07	1991/12	1983/02	2000/01	1981/01	1982/03		
Extreme Minimum (°C)	**-50.2**	-49.3	-40.4	-33	-11.3	-4.6	1.3	0	-7.8	-14.8	-36.4	-41.7		
Date (yyyy/dd)	**1996/31**	1996/01	1989/03	1982/05	1996/04	1983/08	1992/01	1989/24	1991/29	1997/27	1985/28	1993/26		
Precipitation:														
Rainfall (mm)	0.4	0.7	6.1	18.4	65	86	111.7	82.9	97.4	58.7	15	4.1		C
Snowfall (cm)	45.1	28.9	27.7	25.7	2.8	0.1	0	0	2.8	19.6	48.8	42.8		C
Precipitation (mm)	35.7	23.9	30.5	43.6	69.1	86.1	111.7	82.9	100.4	80.6	59.4	36.4		C
Average Snow Depth (cm)	40	48	43	16	1	0	0	0	0	1	9	25		C
Median Snow Depth (cm)	39	47	43	14	0	0	0	0	0	0	8	25		C
Snow Depth at Month-end (cm)	47	49	32	2	0	0	0	0	0	2	17	32		C
Extreme Daily Rainfall (mm)	3.8	4.2	20.6	37.8	41	57.4	78.8	68.8	**124.6**	48	30.2	44.6		
Date (yyyy/dd)	2002/09	2000/26	1998/28	1991/28	1991/26	1990/17	1999/14	1988/14	**1985/19**	1995/01	2001/24	1984/16		
Extreme Daily Snowfall (cm)	**56.6**	24.8	18	33	8	1	0	0	17.4	21.3	28	19.2		
Date (yyyy/dd)	**1996/18**	2001/25	1988/08	1996/30	1996/01	1982/01	1982/01+	1981/01+	1984/25	1983/14	1990/28	1986/09		
Extreme Daily Precipitation (mm)	56.2	18.8	20.6	37.8	41	57.4	78.8	68.8	**124.6**	48	34.2	57.2		
Date (yyyy/dd)	1996/18	2001/25	1998/28	1991/28	1991/26	1990/17	1999/14	1988/14	**1985/19**	1995/01	1985/02	1984/16		
Extreme Snow Depth (cm)	**137**	97	92	84	66	0	0	0	15	30	52	50		
Date (yyyy/dd)	**1996/19**	1996/24	1996/02+	1996/01+	1996/02	1982/01+	1982/01+	1981/01+	1984/26	1995/25	1985/27	1992/31		
Days with Maximum Temperature:														
<= 0 °C	29	23.7	17.3	3.7	0.32	0	0	0	0	2.7	18.1	26.7		C
> 0 °C	2	4.5	13.7	26.3	30.7	30	31	31	30	28.4	11.9	4.4		C
> 10 °C	0	0.05	1.3	9.7	24.3	29.2	31	30.9	25.5	10.2	1	0.1		C
> 20 °C	0	0	0	1.3	8	16.7	24.7	21.4	5.5	0.6	0	0		C
> 30 °C	0	0	0	0	0.42	1	1.3	0.85	0.05	0	0	0		C
> 35 °C	0	0	0	0	0	0.11	0	0	0	0	0	0		C

Days with Minimum Temperature:													
> 0 °C	0.05	0.05	0.74	3.3	17.5	28.2	31	31	24.2	10.3	2.2	0.2	C
<= 2 °C	31	28.2	30.8	28.5	18.5	4.5	0.05	0.85	10.7	25.1	29.2	31	C
<= 0 °C	31	28.2	30.3	26.7	13.5	1.8	0	0.05	5.8	20.7	27.9	30.8	C
< -2 °C	30.8	27.8	29.1	23	7.5	0.42	0	0	2.4	13.7	26.1	30.1	C
< -10 °C	28.9	23.7	22.2	7.1	0.05	0	0	0	0	0.8	13.7	24.7	C
< -20 °C	23.1	18.2	11.7	1.4	0	0	0	0	0	0	4.1	17.1	C
< - 30 °C	11.2	7.8	3.2	0	0	0	0	0	0	0	0.25	6	C
Days with Rainfall:													
>= 0.2 mm	0.58	0.79	2.1	4.4	12.1	14.1	15.1	13.8	16.1	11.8	3.7	1	C
>= 5 mm	0	0	0.42	1.2	4.3	4.9	6.3	4.7	5.8	3.4	1.1	0.2	C
>= 10 mm	0	0	0.11	0.5	2.2	2.6	3.5	2.4	2.8	1.6	0.45	0.1	C
>= 25 mm	0	0	0	0.06	0.32	0.68	0.95	0.7	0.55	0.35	0.05	0.05	C
Days With Snowfall:													
>= 0.2 cm	15	12.2	10.4	5.9	1.4	0.05	0	0	1.1	6.4	14.3	17.1	C
>= 5 cm	3.2	2	1.7	1.7	0.16	0	0	0	0.15	1.2	3	2.5	C
>= 10 cm	0.63	0.42	0.58	0.67	0	0	0	0	0.05	0.5	1.5	0.65	C
>= 25 cm	0.05	0	0	0.11	0	0	0	0	0	0	0.05	0	C
Days with Precipitation:													
>= 0.2 mm	14.1	11.7	11.9	9.1	12.7	14.1	15.1	13.8	16.5	16	16.1	16.2	C
>= 5 mm	2.2	1.4	1.8	2.7	4.5	4.9	6.3	4.7	6	4.8	3.5	1.8	C
>= 10 mm	0.42	0.26	0.53	1.3	2.2	2.6	3.5	2.4	3	2.6	1.9	0.5	C
>= 25 mm	0.05	0	0	0.22	0.32	0.68	0.95	0.7	0.55	0.45	0.2	0.05	C
Days with Snow Depth:													
>= 1 cm	31	28.3	30.8	20.8	2.1	0	0	0	0.25	5.4	22.7	30.8	C
>= 5 cm	31	28.3	28.4	13.8	0.74	0	0	0	0.05	1.6	17.1	29.3	C
>= 10	31	27.8	25.8	11.1	0.47	0	0	0	0.05	0.9	12.2	26.8	C
>= 20	28.8	27.6	24.8	8.9	0.42	0	0	0	0	0.15	4.6	20.4	C
Wind:													
Speed (km/h)	10.8	10.9	11.9	11.9	11.9	12.1	10.7	10.3	12.1	12.5	11.7	10.4	C
Most Frequent Direction	W	SW	SW	NE	S	W	W	S	S	S	W	W	C
Maximum Hourly Speed	54	44	48	48	52	56	50	48	56	**59**	48	50	
Date (yyyy/dd)	1982/27	2002/12	1982/13+	1991/27+	1989/25	2001/19	1982/08	1995/20+	1985/24	**1997/09**	1990/22+	2001/06	
Maximum Gust Speed	72	69	81	74	82	85	98	83	72	**152**	80	78	
Date (yyyy/dd)	1982/27	1991/09	1982/13	1990/19	1998/16	2001/19	1997/17	1997/09	1995/12	**1993/26**	1982/12+	2001/06	
Direction of Maximum Gust	S	NW	W	S	W	NW	NW	S	SW	SW	N	W	SW
Days with Winds >= 52 km/hr	0.1	0	0	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0	0	C

Days with Winds >= 63 km/hr	0	0	0	0	0	0	0	0	0	0.1	0	0	C
Degree Days:													
Above 24 °C	0	0	0	0	0	0.4	0.5	0.2	0	0	0	0	C
Above 18 °C	0	0	0	0	3.8	14.9	27.1	20.5	2	0	0	0	C
Above 15 °C	0	0	0	0.1	10.9	43.7	76.6	59.9	8.8	0.3	0	0	C
Above 10 °C	0	0	0.1	3.4	45.5	137.7	215.2	181.6	51.8	5.2	0	0	C
Above 5 °C	0	0	1.2	19.4	127.8	275	369.6	334.1	153.4	32.2	1.9	0	C
Above 0 °C	0.1	1.4	11.5	74.7	265.9	424.3	524.6	489.1	294.2	115.4	17.5	1.3	C
Below 0 °C	596.6	437.9	291.9	62.5	2	0	0	0	0.2	19.5	201.2	461.5	C
Below 5 °C	751.4	577.9	436.5	157.2	18.9	0.7	0	0	9.4	91.3	335.6	615.2	C
Below 10 °C	906.4	719.1	590.4	291.2	91.6	13.4	0.6	2.5	57.8	219.4	483.7	770.2	C
Below 15 °C	1061.4	860.4	745.4	437.9	212.1	69.4	16.9	35.8	164.8	369.5	633.7	925.2	C
Below 18 °C	1154.4	945.2	838.4	527.8	298	130.6	60.5	89.4	248	462.1	723.7	1018.2	C
Humidex:													
Extreme Humidex	5.8	9.4	17.1	27.2	34.9	**42.3**	40.2	39.9	38.5	25.7	15.1	11.7	
Date (yyyy/dd)	1999/31	1991/03	1995/13	1985/22	1992/20	**1995/18**	1983/11	1991/29	2002/08	2000/01	1981/01	1982/03	
Days with Humidex >= 30	0	0	0	0	0.8	3.3	5.9	5	0.5	0	0	0	C
Days with Humidex >= 35	0	0	0	0	0	0.4	1.3	0.5	0.1	0	0	0	C
Days with Humidex >= 40	0	0	0	0	0	0.2	0.1	0	0	0	0	0	C
Wind Chill:													
Extreme Wind Chill	**-54**	-52.2	-47.4	-40.5	-17.4	-6.6	-3.1	-1.3	-9.2	-21.1	-38.7	-51.3	
Date (yyyy/dd)	**1994/14**	1996/02	1996/06	1982/06	1986/01	1982/02	2001/01	1989/24	1991/29	1996/31	1985/28	1993/26	
Days with Wind Chill < -20	26.9	20.7	15.3	2.5	0	0	0	0	0	0.1	7.5	20.5	C
Days with Wind Chill < -30	18.4	12.9	5.4	0.2	0	0	0	0	0	0	1.2	11.6	C
Days with Wind Chill < -40	6.8	3.4	0.7	0	0	0	0	0	0	0	0	2.2	C
Humidity:													
Average Vapour Pressure (kPa)	0.2	0.2	0.3	0.4	0.7	1.1	1.4	1.4	1	0.7	0.4	0.2	C
Average Relative Humidity - 0600LST (%)	74.5	75.2	77.3	80.5	85	86.3	91.2	92.4	93.4	90	86.6	79.9	C
Average Relative Humidity - 1500LST (%)	67.9	62.1	53.6	47.3	48.6	52.7	56.8	57	63.8	68.7	75.4	73.8	C
Pressure:													
Average Station Pressure (kPa)	97.3	97.4	97.5	97.4	97.3	97.2	97.2	97.4	97.3	97.3	97.2	97.3	C
Average Sea Level Pressure (kPa)	101.8	101.9	101.9	101.7	101.5	101.4	101.4	101.6	101.5	101.6	101.6	101.7	C
Visibility (hours with):													
< 1 km										13.9	19.1		D

1 to 9 km	95.7	129.9	D
> 9 km	634.4	571	D
Cloud Amount (hours with):			
0 to 2 tenths	117.3	96.1	D
3 to 7 tenths	119.7	100.5	D
8 to 10 tenths	506.9	523.4	D

Created : 2002-06-21
Modified : 2004-02-25
Reviewed : 2004-02-25
Url of this page : http://www.climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html

APPENDIX B

VEGETATION COMMUNITY PHOTOGRAPHS AND NHIC 2008 LIFE SCIENCE SITE

Junior Lake Baseline Assessment		
Client: Landore Resources Canada Inc.	**Project Number:** 08-1192-0080	
Site Name: Junior Lake	**Site Location:** Armstrong Station, Ontario	
Photographer: BW & JB	**Date:** July 22-25, 2008	**Drawn by:** JB

Photograph 1

V10 Trembling Aspen – Black Spruce – Jack Pine/Low Shrub

Photograph 2

V11 Trembling Aspen – Conifer/Blueberry/Feathermoss

Junior Lake Baseline Assessment		
Client: Landore Resources Canada Inc.	**Project Number:** 08-1192-0080	
Site Name: Junior Lake	**Site Location:** Armstrong Station, Ontario	
Photographer: BW & JB	**Date:** July 22-25, 2008	**Drawn by:** JB

Photograph 3

V19 Black Spruce Mixedwood/Herb Rich

Photograph 4

V22 Cedar (inc. Mixedwood)/Speckled Alder/*Sphagnum*

Junior Lake Baseline Assessment		
Client: Landore Resources Canada Inc.	**Project Number:** 08-1192-0080	
Site Name: Junior Lake	**Site Location:** Armstrong Station, Ontario	
Photographer: BW & JB	**Date:** July 22-25, 2008	**Drawn by:** JB

Photograph 5

V23 Tamarack (Black Spruce)/Speckled Alder/Labrador Tea

Photograph 6

V35 Black Spruce/Speckled Alder/*Sphagnum*

Junior Lake Baseline Assessment		
Client: Landore Resources Canada Inc.	**Project Number:** 08-1192-0080	
Site Name: Junior Lake	**Site Location:** Armstrong Station, Ontario	
Photographer: BW & JB	**Date:** July 22-25, 2008	**Drawn by:** JB

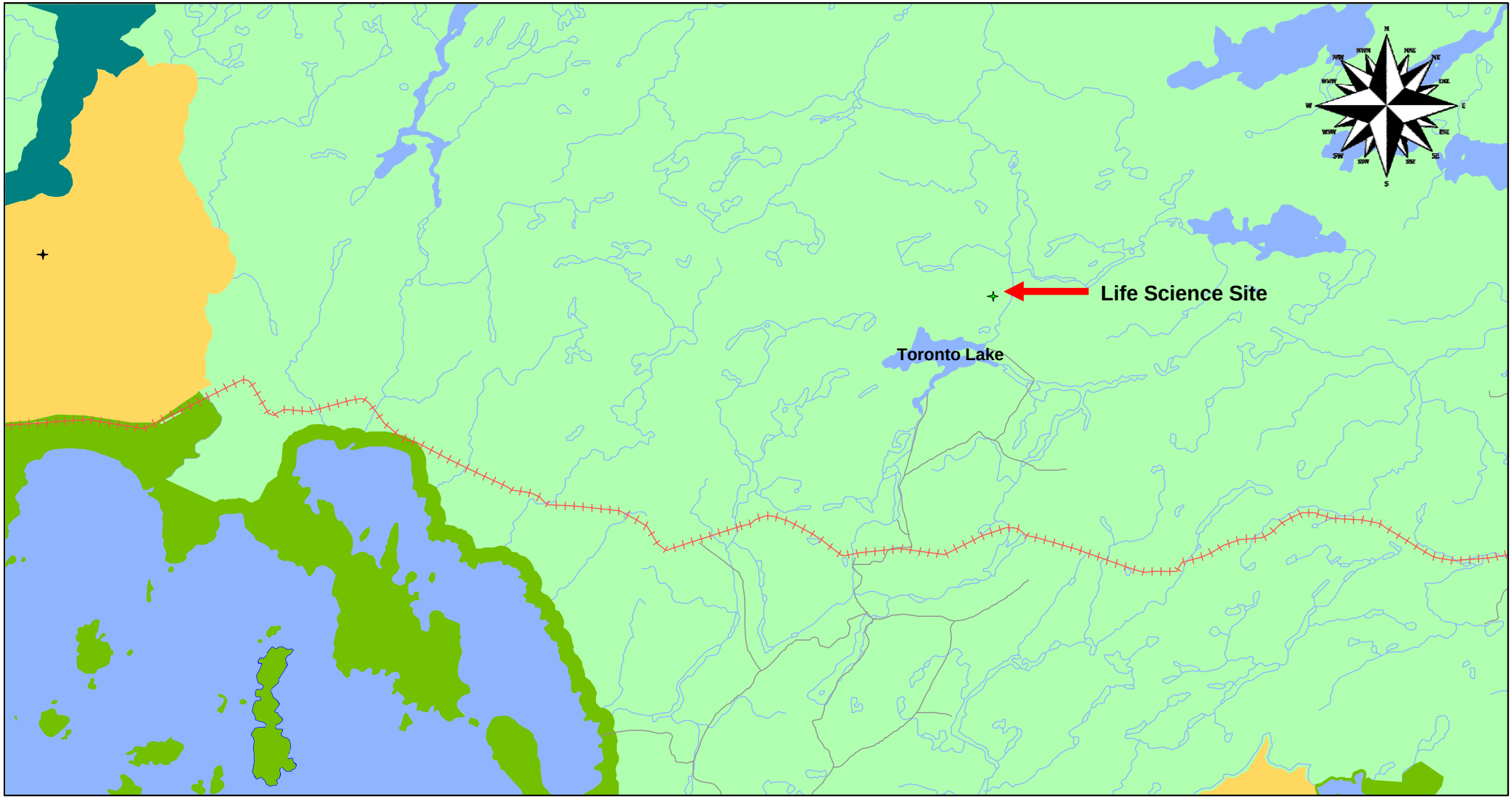
Photograph 7

V38 Black Spruce/Leatherleaf/Sphagnum

Photograph 8

Cultural

NHIC 2008 Life Science Site



UTM: 446000N / 5582000E
Map # 42L/5
Landform: An extensive area of peatland; black spruce swamp and black spruce treed bog (observed from the air) (Noble 1977)

APPENDIX C

FISH HABITAT PHOTOS

Appendix C – Fish Species Habitat Associations

Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 1

- northern pike - Typical shoreline for Juneau Lake, potential habitat use for spawning, rearing and foraging by all life stages.

Photo 2

- northern pike – Potential juvenile and adult foraging habitat in Trib 1, inlet to Juneau Lake.

Appendix C – Fish Species Habitat Associations		
Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 3

- white sucker – General view of available habitats for various life stages in OWM “C”.

Photo 4

- white sucker – Potential habitat in Trib 14, inlet to Ketchikan Lake, for juvenile rearing and foraging.

Appendix C – Fish Species Habitat Associations

Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 5

- lake chub – Habitat, Potential habitat in Trib 11, near confluence of Ketchikan Lake, for spawning, rearing and foraging by various life stages.

Photo 6

- northern redbelly dace - Typical habitat in OWM “C” with potential use for foraging by juveniles and adults.

Appendix C – Fish Species Habitat Associations

Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 7

- finescale dace – Open water habitat at OWM “A” with potential use for juvenile and adult foraging.

Photo 8

- finescale dace – Trib 13, outlet from OWM “C”, with potential habitat for spawning, YOY rearing and foraging by juveniles and adults.

Appendix C – Fish Species Habitat Associations		
Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 9

- pearl dace – Potential habitat available to various life stages in Trib 15, outlet to Ketchikan Lake.

Photo 10

- pearl dace – Potential habitat available to various life stages in Trib 16, inlet to Ketchikan Lake.

Appendix C – Fish Species Habitat Associations		
Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 11

- blacknose shiner – Potential habitat available to various life stages in Trib 1, inlet to Juneau Lake.

Photo 12

-burbot – Potential habitat available to juveniles for rearing and foraging in Trib 2, inlet to Juneau Lake.

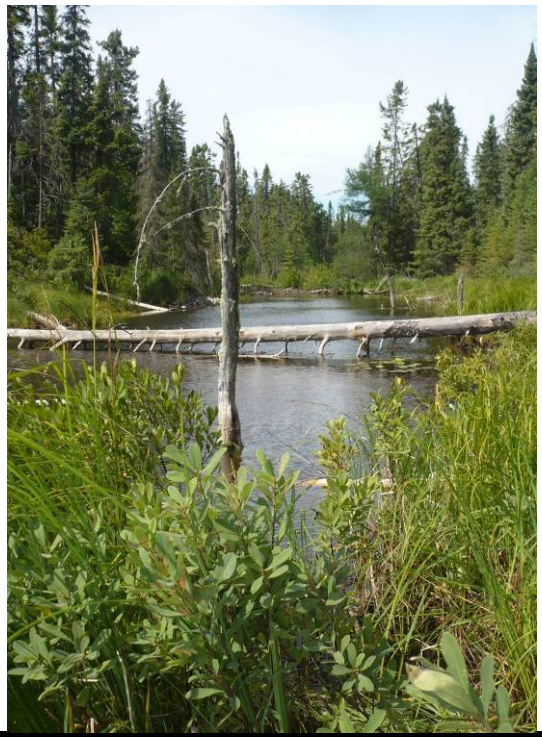
Appendix C – Fish Species Habitat Associations		
Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 13

- yellow perch – East Ketchikan Lake and potential shoreline habitat available to adults and juveniles.

Photo 14

- yellow perch – Typical habitat on Trib 9, outlet to Ketchikan Lake, with potential for use by juveniles for foraging.



Appendix C – Fish Species Habitat Associations

Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 15

- walleye – Typical view on Juneau Lake showing presence of shoal, island and open water habitats available to various life stages of walleye.

Photo 16

- Iowa darter – Trib 6, inlet to Juno Lake, and observed habitat for various life stages.

Appendix C – Fish Species Habitat Associations		
Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 17

- Iowa darter – Trib 16, at inlet to Ketchikan Lake, with observed habitat available for various life stages.

Photo 18

- brook stickleback – Typical habitat for YOY, juveniles and adults at Trib 12, inlet to OWM “C”.

Appendix C – Fish Species Habitat Associations

Client : Landore Resources Canada Inc.	**Project Number : 08-1192-0080**	
Site Name : 2008 Aquatic Survey	**Site Location : Junior Lake Property**	
Photographer : JD/EG	**Date : August 2008**	**Drawn By : RM**

Photo 19

- sculpin sp. -
Trib 10, inlet to Ketchikan Lake, showing typical habitat available to sculpin for potential use as spawning, nursery, forage areas.

Photo 20

- sculpin sp. -
Trib 10, inlet to Ketchikan Lake, showing typical habitat available to sculpin for potential use as spawning, nursery, forage areas.