2.0 PROJECT DESCRIPTION

The following chapter provides an overview of the current operation of the TANCO facility. No changes are proposed to the current operation, with the exception of the relocation of TANCO's final discharge point from Bernic Lake to Bernic Creek.

2.1 MINERAL & SURFACE RIGHTS

TANCO currently holds 13 surface leases (Figure 2.1):

- M-126 to M-130, inclusive (dated April 2, 1968);
- M-145 to M-149, inclusive (dated April 7, 1971);
- SL-1 (dated September 8, 1992);
- SL-3 (dated October 16, 1995); and,
- SL-11 (dated July 23, 2008, and held by Coltan Mines Ltd., a subsidiary of TANCO).

TANCO currently holds 3 mineral leases (Figure 2.2):

- ML-04 to ML-06, inclusive (dated April 1, 1992).

The proposed location of the temporary access road (portion of), temporary dike and dewatering/effluent pipelines west of the mine to Bernic Creek are located on Crown land.

2.2 GEOLOGICAL RESOURCES & MINE LIFE

The mine has been developed in what is referred to as the "TANCO Pegmatite" deposit, which is situated in the Archaen Bird River Greenstone Belt (comprised of metavolcanic and related and derived metasedimentary rocks of the Rice Lake Group). The pegmatite is estimated to be approximately 2.6 billion years old and is approximately 1,400 m in length, 100 m in thickness, and varies from 300 to 820 m in width.

TANCO estimates that the remaining mine life, based on mine reserves and production rates, is five to ten years. TANCO is currently evaluating options to extend mine life through alternate mining scenarios/methods.

2.3 Current Operations

2.3.1 *Existing Surface Facilities & Infrastructure*

Infrastructure on the TANCO Project Site (i.e., the facility footprint) covers approximately 85 hectares. Surface infrastructure required to support mining includes (Figure 2.3):

- headframe and portal;
- tantalum/spodumene mill and dry grinding plant;
- warehouse/maintenance shop;
- mine dry;
- Cesium products facility (chemical plant);
- Cesium containment cells and residue stockpile;
- tailings management areas;
- switchgear/transformer station;
- storage facilities;
- quarries;
- access road;
- parking lot;
- office facilities; and,
- security building.

2.3.2 *Mining*

The pegmatite is essentially a horizontal rock formation. Pollucite, spodumene, and tantalum are all located in separate zones of the formation. Mining activities historically often had to be planned to coordinate mining of one ore to obtain access to another product. Generally, the three product areas are now discrete so that mining of one product does not usually affect mining of the other products. TANCO is currently only mining pollucite.

2.3.3 *Mining Method and Production Rates*

Mining is by the room and pillar method. At full production, the capacity of the mine is approximately 1,000 t/day. The capacity of the mine and mill will not be affected by the proposed undertaking. At present, TANCO is mining and milling pollucite only at a rate of 100 t/day.

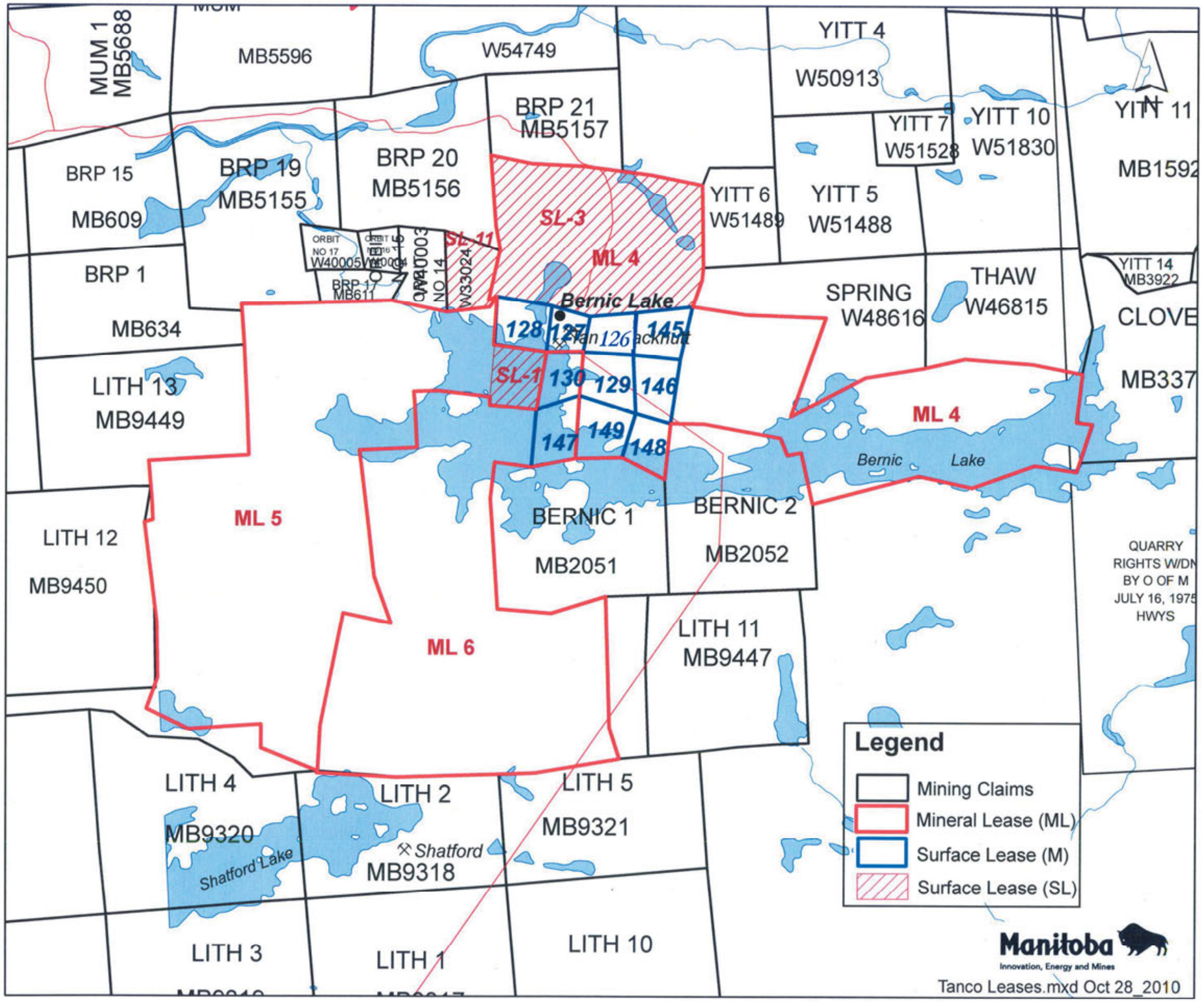

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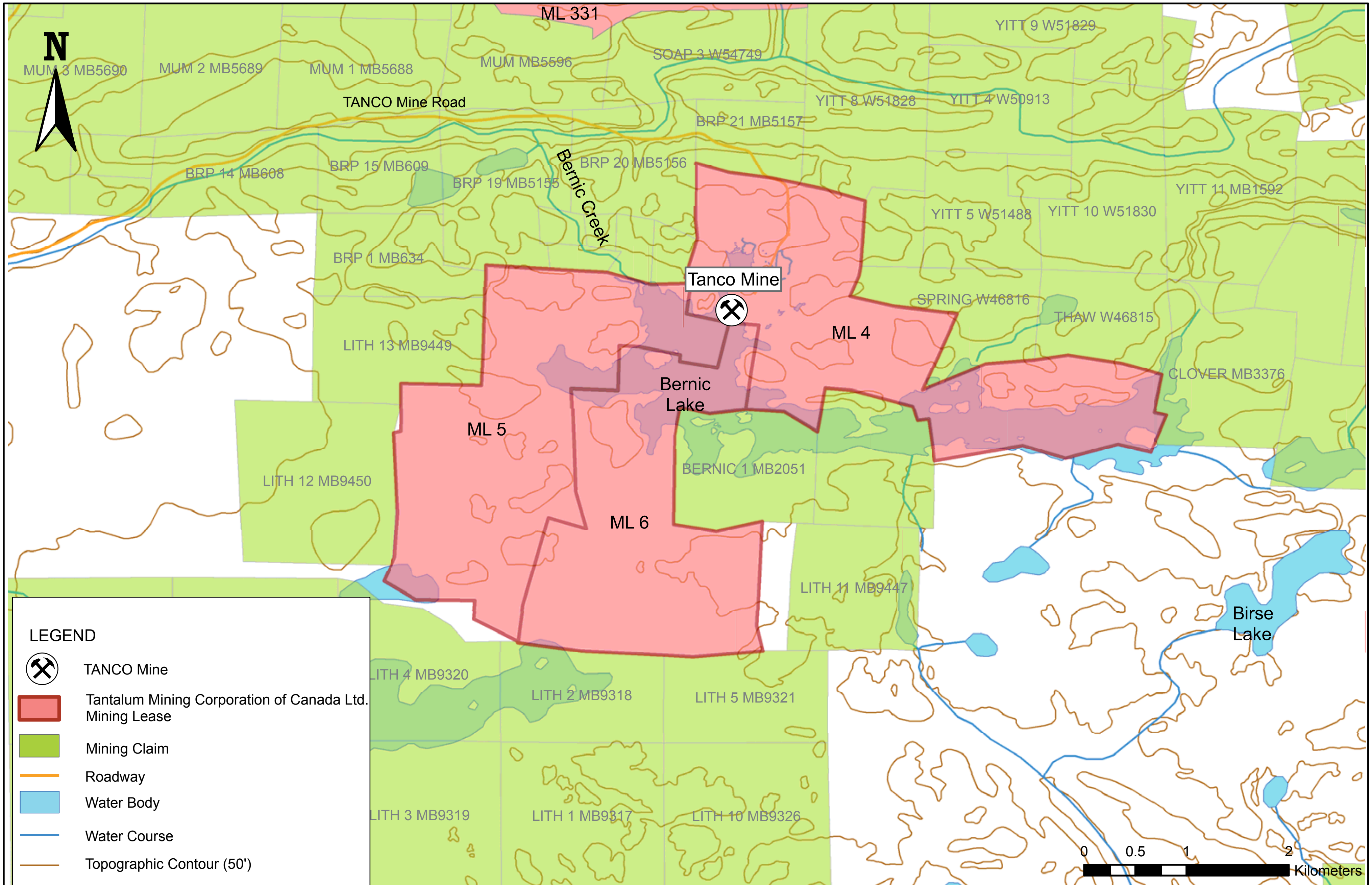
FIGURE 2.1
SURFACE LEASES



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BOX 2000 • LAC DU BONNET MANITOBA

FIGURE 2.2
MINERAL LEASES

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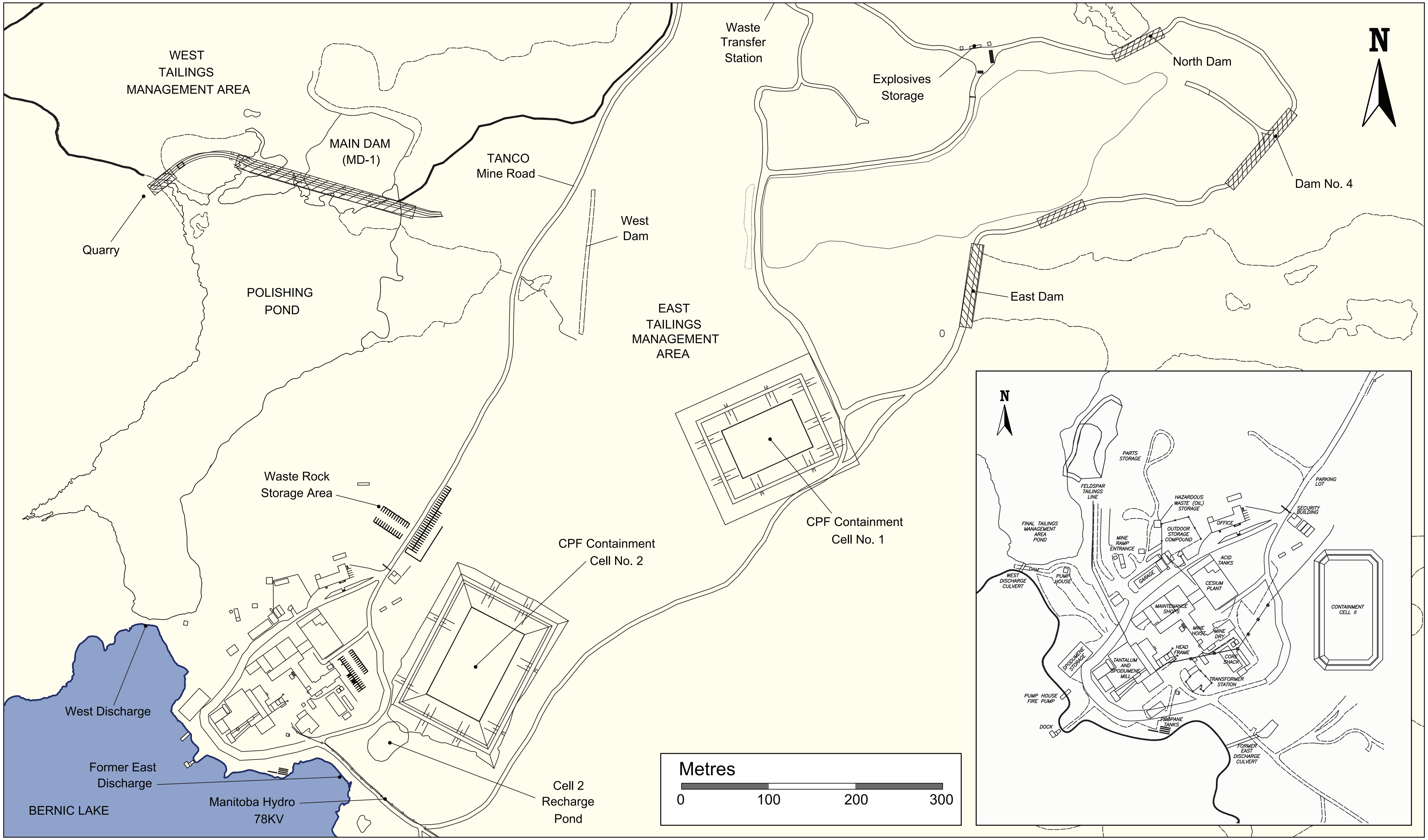

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FIGURE 2.3
GENERAL SITE PLAN OF THE TANCO MINE AT BERNIC LAKE, MANITOBA

2.3.4 *Mine Openings and Ventilation*

There are four mine openings: the main ramp, the shaft, and two vent raises (Figure 2.4). The vent raises are located 15 m east of the mill (Main Vent Fan) and approximately 450 m southeast of the mill (East Fan).

2.3.5 *Underground Infrastructure*

Blasted ore is mucked using load, haul, dump equipment (scooptrams) and/or 26 metric tonne ore trucks to move the ore to one of several ore passes. Rock breakers are used to break the rock to less than 7.5 cm and the rock is sent down the ore pass to the second level. A rail system, located on the second level, allows a locomotive to haul up to five full ore cars to the loading pocket where the ore is loaded into one of two 3 ton skips which are hoisted to surface via the shaft. At surface the skips are dumped into one of two coarse ore bins.

Also located underground are two refuge stations, one secured powder magazine, and one secured detonator magazine. An underground communication system was installed in 2009 providing telephone and WIFI access to most locations underground. The use of the emergency broadcast feature of the phones is used to notify of an emergency event. The emergency response plan is included in Appendix B.

2.3.6 *Mine Water Management*

Water from the mine workings is routed to the underground sump. The actual routing varies based on the source of the water and flow rates: i.e., if minewater is at a higher level than the sump, the water can be directed with trenches or drilling, but if minewater is at a lower level than the sump, pumps are used to pump the water up to a level where it can drain into the main sump. Minewater is pumped from the sump to surface using an 8 stage horizontal ring section pump with a capacity of 1.25 m^3/minute. Minewater is then directed to the West TMA via one of the tailings lines. Net water production from the underground is approximately 116,000 m^3 per year, with about 85% of this quantity derived from mine seepage and the balance being fresh water from Bernic Lake which is used for drilling and washing. The water is pumped intermittently; water flows underground can change based on rainfall or mining activities (e.g., access to a new fracture zone, sealing up a new fracture zone with grout). The main dewatering pump has a backup emergency power source in the event of a power failure, and there is a backup pump available in the event of a main pump failure.

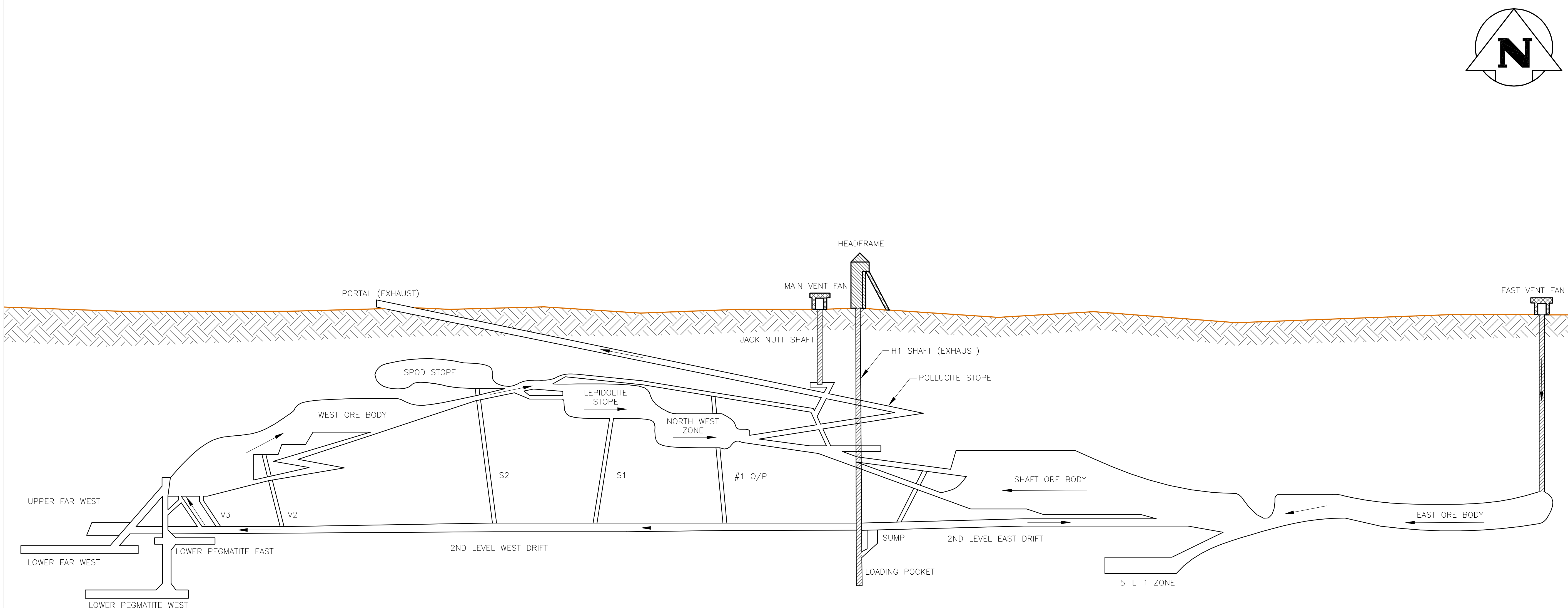

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FIGURE 2.4
IDEALIZED MINE CROSS-SECTION
LOOKING SOUTH WEST

2.3.7 MINING WASTE

As required, up to 200 tonnes of waste rock per year are transported to the surface, mainly for immediate use on the mine road. The waste rock used to maintain the mine road has traditionally been feldspar, although more recently amphibolite has been used. The waste rock is non-acid generating, as shown by acid-base accounting (ABA) test results in the Mine Closure Plan.

2.3.8 MILLING & TAILINGS MANAGEMENT

Pollucite is crushed and ground to minus 200 mesh in the dry grinding plant, then directed to the Cesium Products Facility (CPF) for production of cesium chemical products.

Tantalum and spodumene concentrates have historically been produced by gravity and flotation processes, respectively. During these processes, the ore is crushed and ground to minus 12 mm size, then concentrated using gravity separation methods (heavy media, hydrosizers, tables, and spirals), followed with flotation to produce finalconcentrates. The tantalum and spodumene tailings were then directed to the West Tailings Management Area (Figure 2.3).

The facility has two tailings management areas (TMA), East TMA and the West TMA (Figure 2.3). The general composition of the tailings is a combination of tantalum and spodumene gangue consisting of various feldspars, quartz, amphiboles, gabbro, unrecovered tantalum and lithium minerals, and other minor pegmatite minerals.

2.3.9 WATER USE & MANAGEMENT

The TANCO operation draws water from two sources: fresh water from Bernic Lake and recycled water from the West TMA polishing pond. All withdrawals from Bernic Lake are subject to the conditions of Water Rights Act Licence No. 92-125 which sets the maximum withdrawal rate at 0.113 m^3/sec and the maximum annual withdrawal at 3,700,500 m^3(3,700.5 cubic decametres).

The conventional milling process uses all of the recycled water and approximately 55% of the Bernic Lake water. Approximately 40% of the Bernic Lake water goes to the CPF for cooling and, with the exception of evaporative losses, is returned to the polishing pond. Small quantities of fresh water are directed to the mine for drilling and washdown (<1%), to the CPF process (2%), and for domestic uses (2%) in the office, mill, warehouse, and mine dry. Water for domestic use is passed through a sand bed filter and is chlorinated prior to distribution for domestic uses other than drinking.

The combined total annual water discharge from the mine and mill to the West TMA is 2,400,000 m^3 (maximum); this is less than water volume drawn into the mill because some water is evaporated off during drying of final product for both tantalum and spodumene.

The annual discharge from the west discharge (compliance point) of the polishing pond is approximately 3,000,000 m^3 when the mine is in full production. During 2010 and 2011, when tantalum processing was temporarily suspended, annual discharge was recorded at 1,671,435 m^3 and 1,118,757 m^3, respectively. As TANCO has recently announced that tantalum mining and processing has again been suspended, flows are expected to return to these levels during 2013 and onward.

2.3.10 Waste Management

Solid waste produced at the facility is collected at the waste transfer station where it is held until it is transported to a licenced facility. Sanitary waste produced at the facility is directed to a licensed tile field. All hazardous materials, waste petroleum products, and special wastes are collected for proper offsite disposal at a licensed facility.

A small (<5,000 tonnes) waste rock stockpile is located north of the parking lot (Figure 2.3). Waste rock (e.g., amphibolite, quartz, feldspar, granite) is generally managed underground; a small stockpile of non-acid generating waste rock is maintained on surface for use in various tasks (e.g., tailings dam construction, road maintenance).

2.3.11 Site Runoff Management

The majority of the minesite runoff drains into either the West TMA or East TMA. The West TMA drains through a polishing pond to the lake via an engineered control structure, which is referred to as the West Discharge. This constitutes the only mine effluent discharge to Bernic Lake. Until June 2004, surface runoff and tailings porewater from the East TMA drained to Bernic Lake via the East Discharge; a culvert installed in the main dam of the east TMA. The East Discharge was discontinued in June 2004 when the culvert was removed and all runoff accumulation was directed to the West TMA.

Surface runoff and tailings porewater from the East TMA drains to the phreatic ditch, which flows under CPF Containment Cell No.2 to the Surge Pond, and is then pumped to the West TMA via the tailings lines.

Direct runoff to Bernic Lake from the minesite is limited to the southern margins of the site, outside of the perimeter minesite road. All site roads have been contoured to direct runoff to the Surge Pond, the polishing pond, the East TMA, or the West TMA.

Cooling water from the CPF is discharged into the polishing pond approximately 50 m east of the West Discharge. Boiler blowdown water from the CPF is added to this stream and is diluted by the cooling water flow. The annual discharge of boiler blowdown water is 136.5 cubic metres. Water used for cooling in the CPF has no contact with any products or reagents.

2.3.12 DISCHARGES TO WATER

At present, discharge from the mine to Bernic Lake is via a weir and culvert located at the dyke between the West TMA polishing pond and Bernic Lake. The discharge point is known as the West Discharge and reports to Bernic Lake (Figure 2.3). Monitoring of West Discharge quality has been conducted since the discharge was first established in 1996. The water quality monitoring required under Environment Act License No. 973 is limited to monthly measurements of pH and total suspended solids (TSS). More detailed characterization of the West Discharge was voluntarily initiated in1997 by TANCO in anticipation of the requirement to comply with the Metal Mining Effluent Regulations, which ultimately came into effect in December 2002. The MMER requires weekly monitoring of pH and TSS and routine monitoring of what are termed deleterious substances (total As, Cu, Pb, Ni, Zn, and Ra^{226}) and acute toxicity to rainbow trout (48 hr LC50) and Daphnia magna (96 hr LC50).

Management of pH in the polishing pond is necessary to counter the effects of photosynthetically elevated pH that occurs as a result of algal photosynthesis during the open water season; therefore, an acid addition system was developed and implemented at the West Discharge in 2011. One measurement of pH outside of the prescribed MMER range was recorded in 2012. In consultation with Environment Canada, TANCO took the following measures to address pH concerns and maintain compliance by:

1. Relocating the acid addition point to the mill and establishing electronic monitoring of pH values with a verification check by operations staff before discharge to the TMA polishing pond;
2. Pneumatic mixing of the acid tote to the mixing procedure to ensure proper dilution of the acid; and
3. Addition of an aeration system to mitigate the effects of algal activity in the settling and polishing ponds.

Since implementing the aeration system and monitoring its effects on effluent quality, it has not been necessary to make use of the acid addition system; however it is available if necessary.

Effluent characterization data for 2012 are detailed in Table 2.1. The discharge characterization data were compared to current Manitoba Water Quality Standards Objectives and Guidelines (MWQSOG; MB Water Stewardship 2011) for the protection of aquatic life to identify potential impacts. Total phosphorus exceeded the Tier III MWQSOG of 0.025 mg/L for all of the sampling periods. Total Iron exceeded the Tier III MWQSOG value of 0.300 mg/L in October. No exceedances of the MMER discharge limits occurred on the characterization sampling events.

Table 2. 1 Effluent characterization by sampling period in the TANCO Mine West Discharge, 2012. Shaded values exceed the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for the protection of aquatic life. Units are mg/L unless otherwise noted.

Sampling Date	6-Feb	14-May	9-Jul	20-Aug	15-Oct	MWQSOG
Physicochemical						
pH (pH units)	7.80	7.56	7.70	8.70	7.40	6.5 - 9.0
Hydroxide (OH^-)	<0.50	<0.50	<0.50	<0.50	<0.50	
Specific Conductance (µS/cm@25°C)	214	253	250	292	335	
Total Dissolved Solids	150	154	176	184	204	
Hardness, dissolved	61.2	58.3	58.8	77.0	89.6	
Hardness, total	61.0	61.1	61.9	80.2	88.7	
Alkalinity (PP as $CaCO_3$)	<0.50	<0.50	--	1	<1	
Alkalinity (Total as $CaCO_3$)	64.0	46.2	70	60	50	
Bicarbonate (HCO_3)	78.1	56.4	86.0	70.0	60.0	
Carbonate (CO_3)	<0.50	<0.50	<0.5	1.2	<0.5	
Total Suspended Solids	3.7	10.5	9.9	21.5	16.9	
Turbidity (NTU)	3.25	7.25	7.6	22.0	8.7	
True Colour (Col. Units)	20	20	16	13	11	
Major Ions						
Potassium, dissolved (K+)	4.3	4.49	4.46	5.30	5.50	
Sodium, dissolved (Na^+)	14.9	17.6	17.4	19.9	19.5	
Calcium, dissolved (Ca^{2+})	18.8	18.8	19.0	25.9	30.2	
Magnesium, dissolved (Mg^{2+})	3.5	2.80	2.76	2.98	3.45	
Chloride, dissolved (Cl^-)	8.8	11.0	10.0	11.0	10.0	
Fluoride, dissolved (F^-)	0.31	0.39	0.54	0.81	0.71	
Sulphate, dissolved (SO_4^-)	20.5	51.1	33.1	59.9	90.8	
Nutrients						
Organic Carbon, dissolved	9.98	9.38	11.60	9.64	9.57	
Organic Carbon, total	12.70	11.30	11.10	9.82	10.40	
Nitrite	--	--	0.0069	0.0078	0.0104	0.06
Nitrate	1.740	0.819	0.0337	<0.0020	0.3220	13
Nitrate_Nitrite	1.740	0.843	0.0406	0.0028	0.3320	
Ammonia	0.3700	0.0520	0.3500	<0.0050	0.2600	
Total Kjeldahl Nitrogen	1.04	1.090	1.840	2.230	1.490	
Total Nitrogen	2.78	1.940	1.880	2.230	1.830	
Phosphorus, total dissolved	0.034	0.0185	0.1740	0.0792	0.0149	
Phosphorus, total	0.068	0.104	0.283	0.272	0.1420	0.025
Biological						
Chlorophyll a (µg/L)	--	26.9	11.9	81.4	24.8	
Radiochemical						
Radium-226 (Bq/L)	0.006	<0.005	<0.005	<0.005	<0.005	

Table 2.1 (con'd) Effluent characterization by sampling period in the TANCO Mine West Discharge, 2012. Shaded values exceed the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for the protection of aquatic life. Units are mg/L unless otherwise noted.

Sampling Date	6-Feb	14-May	9-Jul	20-Aug	15-Oct	MWQSOG
Dissolved Metals						
Aluminum (Al)	0.012	0.0161	0.0228	0.0444	0.0046	
Antimony (Sb)	0.0014	0.00235	0.00186	0.00182	0.00126	
Arsenic (As)	0.00610	0.00890	0.02790	0.02030	0.00285	0.15
Barium (Ba)	0.0094	0.00398	0.0106	0.00623	0.00522	
Beryllium (Be)	<0.00005	<0.00005	<0.000050	<0.000050	<0.000050	
Bismuth (Bi)	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	
Boron (B)	<0.3	<0.25	<0.25	<0.25	<0.25	
Cadmium (Cd)	<0.00003	0.000026	<0.000025	<0.000025	<0.000025	0.00019[1]
Cesium (Cs)	2.16	1.85	2.37	--	2.15	
Chromium (Cr)	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.05469[1]
Cobalt (Co)	0.00008	0.000077	0.000155	0.000159	0.000118	
Copper (Cu)	0.0013	0.00113	0.00026	0.00027	0.00049	0.00652[1]
Iron (Fe)	0.024	0.0069	0.0186	0.0058	<0.0050	
Lead (Pb)	<0.00003	<0.000025	<0.000025	<0.000025	0.000042	0.00168[1]
Lithium (Li)	1.66	1.92	1.96	2.08	2.49	
Manganese (Mn)	0.138	0.0161	0.568	0.00194	0.01190	
Mercury (Hg)	<0.00005	<0.000050	<0.000050	<0.000050	<0.000050	
Molybdenum (Mo)	0.0026[a]	0.00960	0.0123	0.0142	0.00660	
Nickel (Ni)	0.0014	0.00138	0.00239	0.00197	0.00431	0.03799[1]
Rubidium (Rb)	0.338	0.341	0.529	--	0.531	
Selenium (Se)	<0.0002	<0.00020	<0.00020	0.00030	<0.00020	
Silicon (Si)	4.4	2.16	3.23	3.86	4.11	
Silver (Ag)	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	
Strontium (Sr)	0.0867	0.07060	0.08260	0.10400	0.12800	
Sulphur (S)	<50	<50	<50	<50	<50	
Thallium (Tl)	0.00008	0.000081	0.000041	0.000020	0.000059	
Tin (Sn)	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	
Titanium (Ti)	<0.003	<0.0025	<0.0025	<0.0025	<0.0025	
Uranium (U)	0.00359	0.00758	0.00623	0.00392[a]	0.001610	
Vanadium (V)	<0.001	<0.0010	<0.0010	<0.001	0.0035	
Zinc (Zn)	0.0025	0.00227	0.00165	<0.00050	0.00073	0.08627[1]
Zirconium (Zr)	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	
Total Metals						
Aluminum (Al)	0.054	0.0602	0.0708	0.0751	0.0832	0.1[2]
Antimony (Sb)	0.0014	0.00239	0.00205	0.00174	0.00136	
Arsenic (As)	0.0068	0.00997	0.0291	0.0214	0.00538	
Barium (Ba)	0.0102	0.00521	0.0172	0.00869	0.00956	

Table 2.1 (con'd) Effluent characterization by sampling period in the TANCO Mine West Discharge, 2012. Shaded values exceed the Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOG) for the protection of aquatic life. Units are mg/L unless otherwise noted.

Sampling Date	6-Feb	14-May	9-Jul	20-Aug	15-Oct	MWQSOG
Beryllium (Be)	<0.00005	<0.00005	0.000064	0.000063	0.000111	
Bismuth (Bi)	<0.00003	0.000041	0.000049	0.000036	<0.000025	
Boron (B)	<0.3	<0.25	<0.25	<0.25	<0.25	1.5
Cadmium (Cd)	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	
Calcium (Ca)	19.2	19.7	20.2	27.0	30.1	
Cesium (Cs)	1.93	1.92	2.56	2.48	2.20	
Chromium (Cr)	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt (Co)	0.00009	0.000078	0.000196	0.000161	0.000286	
Copper (Cu)	0.0015	0.00116	0.00121	0.00130	0.00097	
Iron (Fe)	0.172	0.120	0.243	0.207	0.375	0.3
Lead (Pb)	0.00024	0.000232	0.000634	0.000233	0.000502	
Lithium (Li)	1.54	1.88	2.02	2.11	2.49	
Magnesium (Mg)	3.2	2.86	2.78	3.09	3.29	
Manganese (Mn)	0.204	0.125	1.09	0.372	0.620	
Mercury (Hg)	<0.00005	<0.000050	<0.00005	<0.000050	<0.000050	0.00026
Molybdenum (Mo)	0.0020	0.0100	0.0127	0.0123	0.00609	0.073
Nickel (Ni)	0.0013	0.00205	0.00299	0.00301	0.005	
Potassium (K)	3.8	4.71	4.62	5.57	5.42	
Rubidium (Rb)	0.309	0.356	0.576	0.53	0.558	
Selenium (Se)	<0.0002	<0.00020	<0.00020	0.00023	<0.00020	0.0010
Silicon (Si)	4.9	2.33	3.42	4.13	4.46	
Silver (Ag)	<0.00003	<0.000025	<0.000025	<0.000025	<0.000025	0.0001
Sodium (Na)	13.7	17.4	17.8	20.2	18.3	
Strontium (Sr)	0.0812	0.0743	0.0868	0.0990	0.12700	
Sulphur (S)	<50	<50	<50	<50	<50	
Thallium (Tl)	0.00010	0.000093	0.000051	0.000028	0.000085	0.0008
Tin (Sn)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
Titanium (Ti)	<0.003	<0.0025	<0.0025	<0.0025	<0.0025	
Uranium (U)	0.00309	0.00762	0.00649	0.00314	0.00155	0.015
Vanadium (V)	<0.001	<0.0010	<0.0010	0.0035	<0.0010	
Zinc (Zn)	0.0031	0.00629	0.00663	0.00259	0.00481	
Zirconium (Zr)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	

[1]Calculated based on average dissolved hardness (69.0 mg/L) and average duration 4 days.

[2]Guideline based on pH ≥ 6.5.

Surface water samples are collected from the west basin of Bernic Lake four times per year. Samples are analysed and compared to current Manitoba Water Quality Standards Objectives and Guidelines (MWQSOG; MB Water Stewardship 2011) for the protection of aquatic life to identify potential impacts. The results of this sampling are included in Section 5.

2.3.13 *Emissions Management*

2.3.13.1 *Air*

The facility produces the following emissions to air which are estimated and reported annually to the National Pollutant Release Inventory:

- Formic acid;
- Sulphuric acid;
- Particulate matter (PM10 and PM2.5); and
- Dust (from roads).

Formic acid vapour is emitted during truck unloading into the formic acid bulk storage tank. Sulphuric acid mist and vapour are emitted from the digester in the chemical plant where the pollucite ore is dissolved.

TANCO operates 11 baghouses and dust collectors in place to control emissions of fine host mineral particles. Air dispersion modeling was completed in 2013 using the US Environmental Protection Agency's SCREEN3 air dispersion model (Tetra Tech 2013).The cumulative ground level concentrations of particulate matter calculated over a 24 hour averaging period were compared against the maximum 24 hour allowable limit determined by the Manitoba Ambient Air Quality Criteria. It was found that particulate matter generated by the mine (57.5 $\mu g/m^3$) at peak operation is significantly lower than the Manitoba Ambient Air Quality Criteria Maximum Acceptable Level Concentration (120 $\mu g/m^3$) at a distance of 100 m from the release location.

2.3.13.2 *Greenhouse Gas Emissions*

Approximately 87% of recent project-related greenhouse gas (GHG) emissions originate from the combustion of propane for process steam production in the chemical plant, process and space heating for most on-site buildings, and heating the underground mine workings during the winter months. Heating of the ventilation air that goes underground during the winter months occurs at the vent fans. A further 10% of GHG emissions originate from the combustion of fuels in mobile equipment operation on surface and underground.

2.3.14 Site Security

Site security is maintained at the main entrance to the minesite by a contracted security service (Figure 2.3). All contractors and visitors must sign in at the security building before entering or leaving the site.

2.3.15 Contingency and Emergency Response Plan

TANCO maintains a standard of emergency preparedness to provide timely and coordinated response to an emergency, in order to minimize the effects of the emergency or disaster on TANCO employees, the public, the mine site and the environment. In the case of an emergency underground, the TANCO Mine Department will follow response procedures in compliance with Standard Mine Rescue Practice. In response to the recent fall of ground, TANCO installed highly sensitive micro-seismic monitoring equipment in the mine and revised the Emergency Response Plan to include a mine flood evacuation plan. A copy of the Emergency Response Plan is included in Appendix B.

TANCO has established an agreement with the RM of Alexander to provide fire/rescue emergency services to the mine of required. The agreement includes provisions to ensure that alternative resources would be available for the RM should they be responding to a call at the mine during a subsequent emergency.

2.4 Proposed Activities

2.4.1 Quarrying

Rock to construct the temporary dike will be quarried from an approved, existing quarry managed by Don Sikora Enterprises. Approximately 13,000 m^3 of rock is expected to be obtained from this quarry for the dike.Rock to be used for the temporary access road will be obtained from the existing quarry or a new quarry closer to the work site. Rock to be used for the temporary dike from the existing quarry has been submitted to Maxxam Analytics for acid-base accounting (ABA) testing with the results available in 4-8 weeks. It is anticipated that, like the waste rock generated from the mine, the rock obtained from the quarry will be non-acid generating.

2.4.2 Temporary Access Road and Staging Area

A 1,330 m temporary access road and a 0.5 ha staging area will be required to access the location and facilitate construction of the temporary dike at the Bernic Lake narrows (Figure 2.5). The temporary road alignment was selected to make use of existing mine roads and Manitoba Hydro maintenance trails along transmission line so as to minimize the amount of new road construction. Where possible, the temporary access road has been aligned within the Manitoba Hydro right-of-way so as to minimize brushing while maintaining a safe distance from the transmission line. Transmission line crossings have been minimized and sited adjacent to the towers to provide maximum clearance with the conductors. The majority of the temporary road, will be constructed on the existing mine surface lease while the remaining portion and the temporary staging area will be constructed on Crown land.

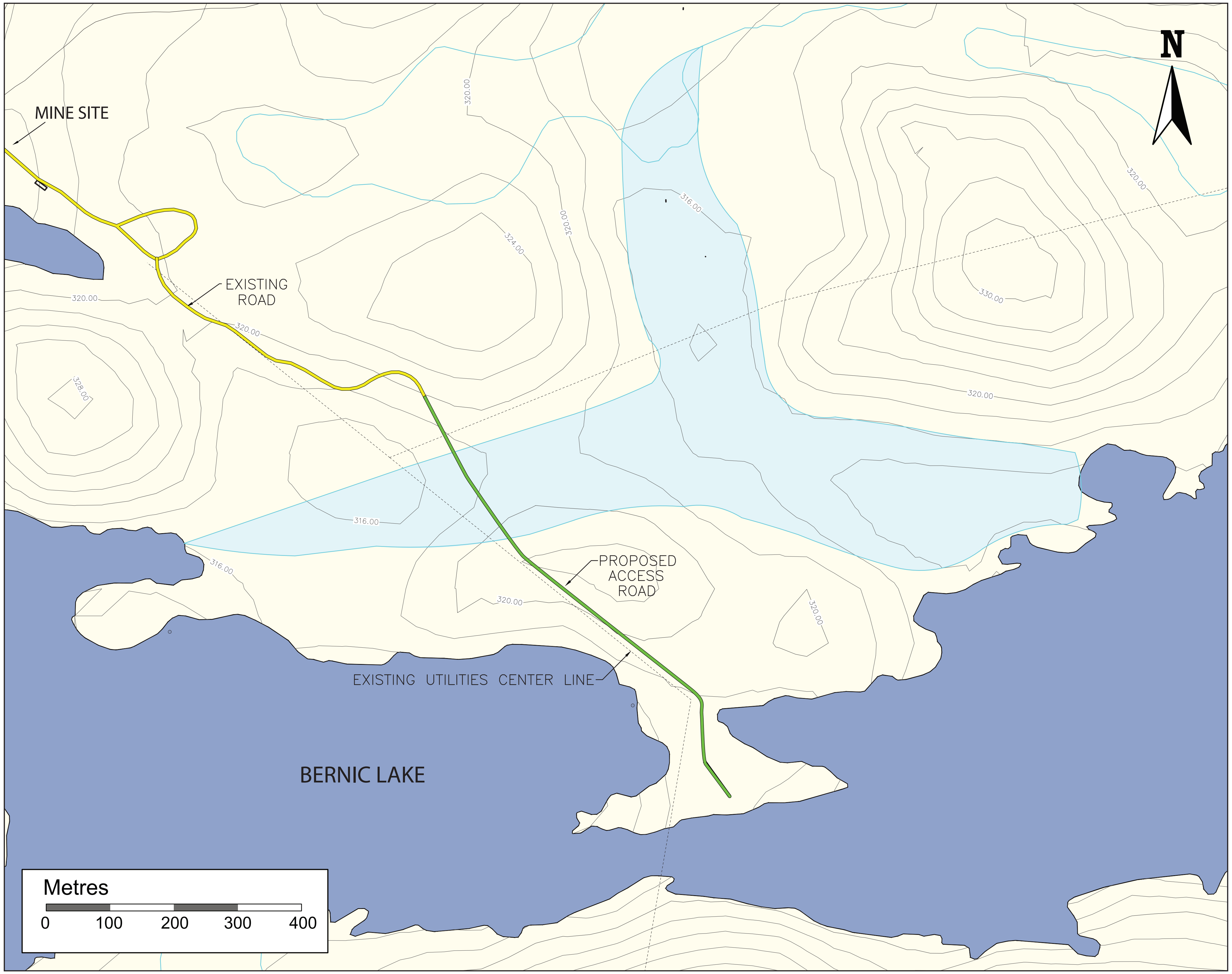
A 585 m section of the existing Manitoba Hydro maintenance trail will be upgraded to a single-lane road with quarried material (Figure 2.5). Trail curve radiuses at two locations may need to be adjusted to accommodate the turning radiuses for dam construction. equipment. Activities will include brushing secondary growth along the trail, potential minimal timber clearing at adjusted curves, and the placement of quarried rock (approximately 10,000 m^3) in low areas, and surfacing with till. The 745 m of new road and laydown area will require timber clearing and brushing in pioneered sections and brushing within the transmission line right-of-way. Timbers and brush will be left in place and quarried rock will be end-dumped to for a road base. Quarried till will be used for surfacing.

There are no stream crossings along the alignment. Cross drains will be placed within lowland area as necessary to maintain surface drainage patterns. Grubbing will be minimized in order to preserve the root mat and minimize disturbance in the lowland areas.

A second temporary access road or trail will be constructed from the polishing pond to the Bernic Creek discharge location to allow pipes associated with water management of the east basin and mine effluent discharge to be constructed and maintained. Alignment alternatives for the road/trail are currently being evaluated and every effort will be made to minimize their impact.

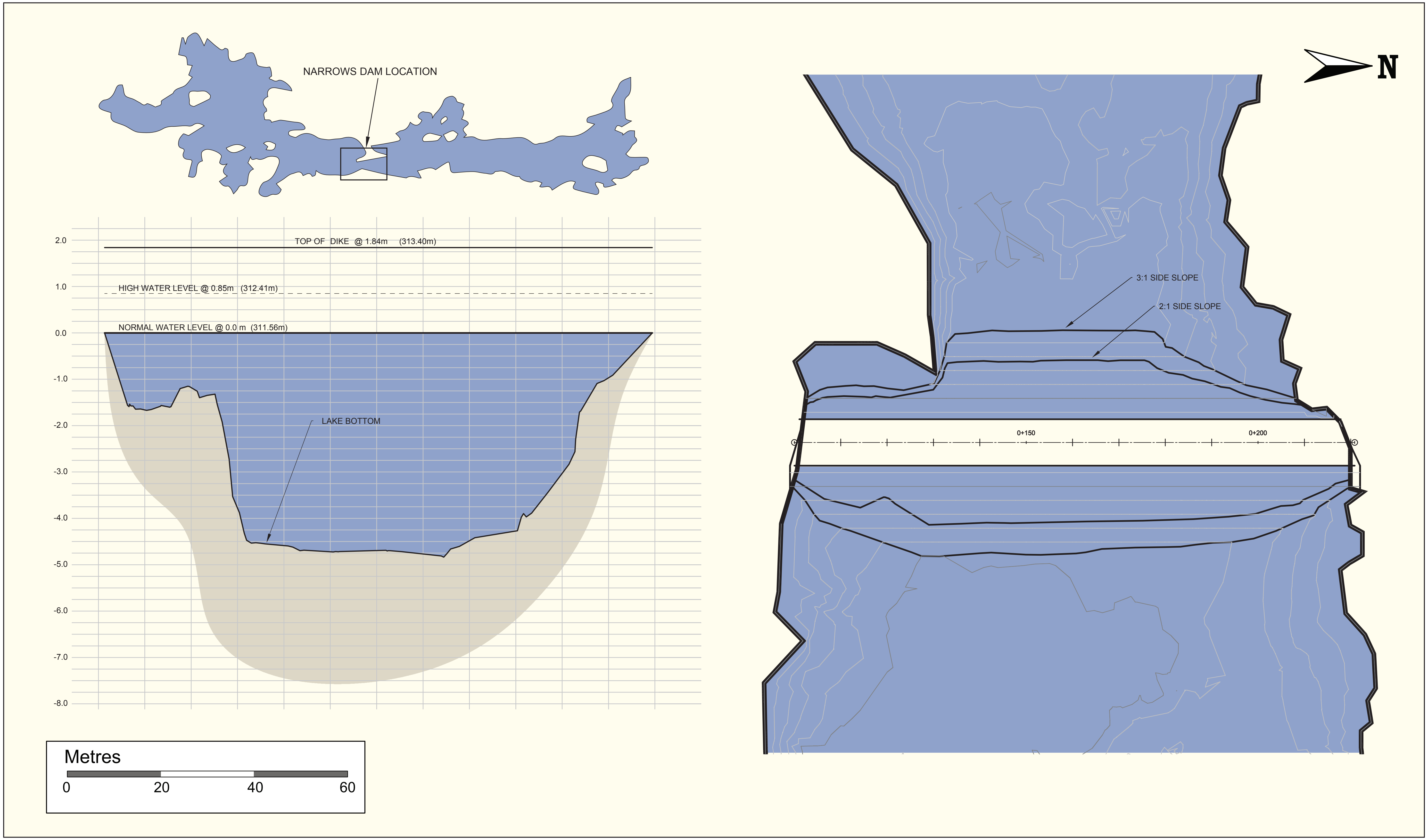
2.4.3 *Temporary Dike*

A temporary dike will be constructed at the narrows between the east and west basins of Bernic Lake (Figure 2.6). The dike location is immediately upstream (east) of the existing Manitoba Hydro transmission line crossing and placed such that the dike will not encroach on the transmission line right-of-way. This location was selected because the dike can be constructed and the west basin dewatered within the shortest possible time frame in order to minimize environmental risks to the lake and ensure the safety of mine personnel. The dike will also allow the east basin to be maintained at the normal water elevation which will preserve the existing fish community and allow at decommissioning the rapid colonization of the west basin by indigenous fish species without the need for stocking. The dike will be constructed of locally sourced rock and grout and/or LLPDE liner.



TETRA TECH

FIGURE 2.5
PROPOSED TEMPORARY ACCESS ROAD ALIGNMENT



TETRA TECH

FIGURE 2.6
LOCATION, CROSS SECTION AND PLAN VIEW OF TEMPORARY DIKE

Dike construction will begin with a rock fill embankment formed by pushing coarse rock into Bernic Lake from the north shore. The embankment will require approximately 13,000 m^3 of rock fill. A finer transition zone material will then be placed on the embankment and, if required, an LLDPE liner will be placed on the upstream (east) face. A key trench along the dike crest will be constructed to secure the liner and then sand and gravel ballast will be placed on the liner. Rip rap will be placed on the upstream face in the wave run up zone to provide protection for the ballast and liner. A passive spillway, running from the crest and down the downstream (west) side of the dike will be constructed to allow water from severe precipitation events to pass over the dike without damaging the structure. The spillway will also facilitate the refill of the west basin prior to the decommissioning of the dike. If dike seepage is observed after the west basin has been dewatered, a toe drainage collection system may be incorporated into a toe berm, depending upon seepage volume. The LLPDE liner has a life of five years. In the unlikely event that the dike is required for more than five years, an additional liner would be placed on the upstream face of the structure in order to provide adequate seepage control for the extended service life of the dike. Geotechnical investigation is underway to determine the depth of the sediment along the alignment of the narrows dike. If the investigation reveals that the sediment is too weak and compressible, steel sheet piling may be incorporated into the final design of the dike.

Decommissioning activities will be initiated after two to four years of service and will begin with the refilling of the west basin. The west basin will be allowed to fill naturally by discontinuing temporary water management activities and allowing upstream drainage to discharge through the dike spillway from the east basin. It is anticipated that natural water elevations will be achieved within 17 months. Once the water levels on either side of the dam have equalized, the dam crest, rip rap, and liner will be removed beginning at the south shore. In order to avoid disturbance of the natural lakebed, some rock, sand, and gravel will be left in the lake. This material will be contoured with the lake bed and while maintaining a minimum depth of 3 m. The LLPDE liner will be disposed of at a licensed waste facility while the quarried dam material will either be stockpiled onshore or recycled for mine use.

2.4.4 *Temporary Dewatering*

Water from the west basin of Bernic Lake will be directed to the natural outflow of Bernic Lake. Natural wetlands in Bernic Creek have been incorporated in the dewatering program and will be used throughout the dewatering phase with the purpose of reducing total suspended solids and nutrients. Dewatering of the Bernic Lake west basin will begin as soon as hydraulic isolation from the east basin has been achieved at the temporary dike and continue over a period of 9-12 months. During this period, the volume of the west basin (9.77M m^3) will be removed to Bernic Creek. Surface runoff into the east and west basin will also be managed during this time.

A containment weir will be constructed across Bernic Creek to prevent the wetlands from draining back into the west basin as the water level in the west basin declines. The containment weir will be constructed following the methods outlined for the temporary dike. The pipeline will be constructed directly from a barge-mounted submersible pump anchored over the deepest area of the basin to a diffuser array at the discharge point in Bernic Creek. The pump suction inlet will be suspended just below the water surface so as to draw surface water and to avoid causing currents at depth across the sediments and/or inadvertent lake turn-over and re-suspension of sediments. The pump will be located above the surface of the water. If a constant pumping rate is maintained over the nine month dewatering period, the rate would be approximately, 0.75 m^3/s.

The assimilation capacity and expected performance criteria for the Bernic Creek wetland are still under assessment. If the discharge rate exceeds the assimilative capacity of the wetland then pre-treatment methods will be considered.

2.4.5 *Temporary Water Management*

The west basin will continue to receive surface water and ground water drainage through and after dewatering. This water (approximately 4.2M m^3/yr) will be allowed to collect in the dewatered basin. The water will be periodically discharged to the Bernic Creek wetlands using the equipment and temporary infrastructure constructed to dewater the basin (Figure 2.7). If phosphorus and/or TSS concentrations become excessive (i.e., exceed the capacity of the wetland to treat water) then pre-treatment alternatives will be considered.

The east basin will also continue to receive surface water drainage (approximately 3.2M m^3/yr); however, the natural outflow path will be inaccessible. In order to manage water levels in the east basin a water transfer system will be installed. The system will consist of a pump in or adjacent to the east basin and pipeline to the Bernic Creek wetland. The pipeline will roughly follow the temporary access roads. The mine currently draws 1,000,000 m^3/yr of process water from the west basin. A take-off at the mine site will allow the mine to draw process water from the east basin until the west basin has been refilled.

The east basin pipeline will be decommissioned and removed at the same time the temporary dike and access road are decommissioned. Process water will once again be drawn from the west basin.

TETRA TECH

FIGURE 2.7
PROPOSED PIPELINE ALIGNMENT

2.4.6 Effluent Management

The existing final discharge point from the polishing pond is at the west basin therefore a new final discharge point will be required prior to the dewatering of the west basin. The polishing pond water will be directed to Bernic Creek through a stand-alone pipeline from the polishing pond (Figure 2.7). A flow meter will be installed to provide flow rates and volumes. Detailed designed will be provided prior to the change-over during the 2013-2014 winter season. The final discharge point will be maintained for the duration of the temporary dike at which point the discharge point will be reviewed. TANCO will continue to work with Environment Canada to develop a long-term solution.

2.4.7 Permanent Dike

The temporary dike and dewatering of the west basin will facilitate the construction of a permanent solution with a much smaller environmental footprint. An extensive geotechnical investigation of the area is planned for fall 2013. Detailed design including confirmation of the alignment of the permanent dike will follow subsequent to the geotechnical investigation and will be provided to the appropriate regulatory agencies as well as presented to the public.

A permanent dike around the mine workings will reduce the affected area significantly to less than 50 ha from over 200 ha as per conceptual alignment; Section 3). The permanent dike will be maintained in place until decommissioning at the end of mine life. Because the permanent dike will be located within a deeper area of the west basin, the dike design will need to be more robust than the temporary dike and more detailed geotechnical investigations will be required before a detailed design can be completed.

2.5 Decommissioning and Reclamation

At project closure, the minesite will be returned to a state compatible with the surrounding natural environment. TANCO will follow the plans laid out in the facility's Closure Plan which was prepared in accordance with Manitoba Mine Closure Regulation (67/99) and submitted to Mines Branch. TANCO is currently updating the Closure Plan.