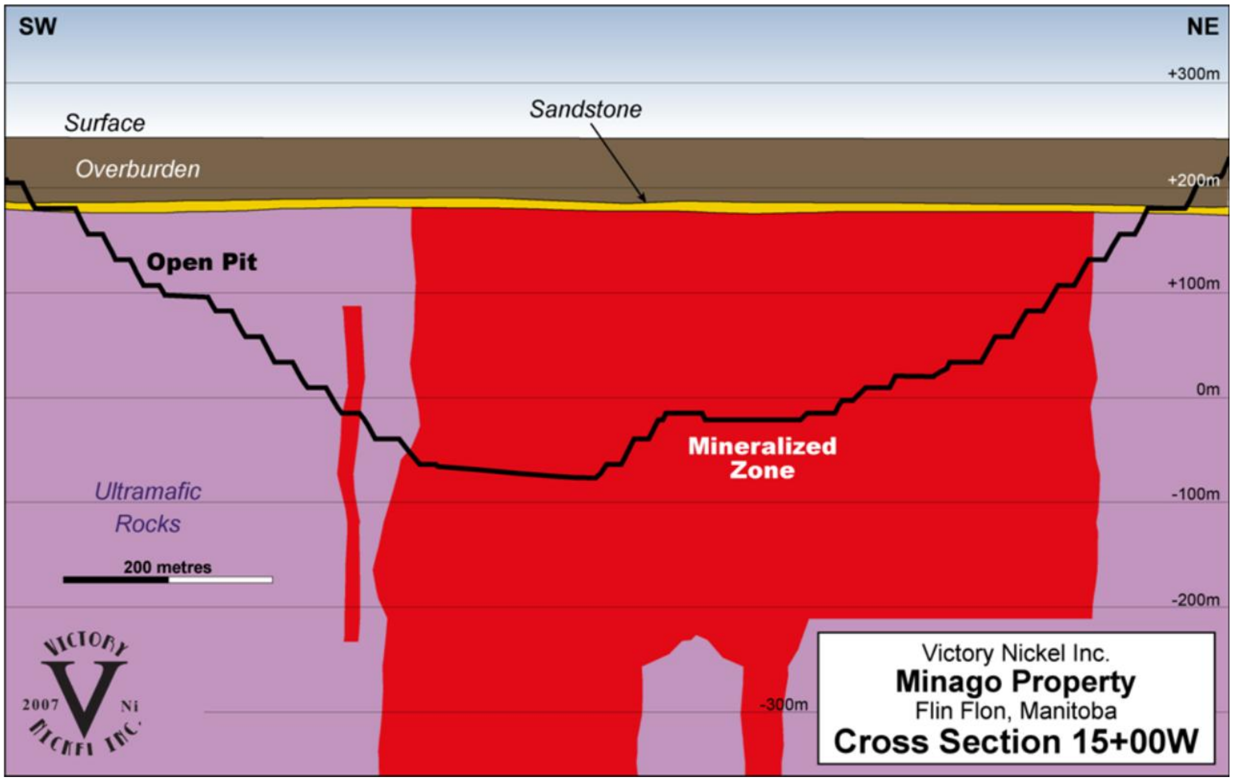

Chapter 3 – Project Schedule and Phases

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3. PROJECT SCHEDULE AND PHASES

A Project Implementation Plan (PIP) was developed to ensure the successful execution of the engineering, procurement, and construction phases, and their alignment with subsequent mine development phases. The PIP and the Project Implementation Schedule will form the basis of a Project Execution Plan (PEP) as the project moves forward into subsequent project execution.

The PIP includes a review of project management methods, contracting strategies, procurement and logistics, and construction workforce planning, including training and housing. In addition, environmental planning issues, site safety, infrastructure and communication aspects of the project are addressed.

3.1 Project Implementation Plan (PIP) and Schedule

The Project Implementation Plan (PIP) and Project Implementation Schedule are given in the 2010 EAP/EIS Report, Figure 3.2-1. The projectedTWRMF Construction Schedule is given in Figure 3.1-1; and Construction and Deposition Schedule are given in Table 3.1-1.

Table 3.1-1 TWRMF Deposition and Construction Schedule

Operating Period	Duration (years)	TWRMF Operating Phase	Dolomite Placement		Compacted Clay Placement		Frac Sand Tailings Deposition		Nickel Tailings Deposition		PAG Waste Rock Deposition	
			Quantity (M-m^3)	Location	Quantity (M-m^3)	Location	Quantity (M-m^3)	Location	Quantity (M-m^3)	Location	Quantity (M-m^3)	Location
Year -2	1	Starter Dam / Pre-load Construction	1.3	TWRMF Dams	0.1	TWRMF Dams	-	-	-	-	-	-
			0.3	Polishing Pond Dams	0.05	Polishing Pond Dams	-	-	-	-	-	-
Year -1	1	Ultimate Dam Construction	1.9	TWRMF Dams	0.2	TWRMF Dams	0.04	Decant Cell	-	-	1.0	Divider Dyke and Separation Dyke
Year 1	1	Operations	-	-	-	-	0.3	Decant Cell	0.6	East Cell	2.1	West Cell
Year 2 to Year 3	2	Operations	-	-	-	-	0.4	Decant Cell	4.8	Alternating between East and West Cells	5.5	Alternating between East and West Cells
Year 4 to Year 6	3	Operations	-	-	-	-	0.7	Decant Cell	7.3	Alternating between East and West Cells	6.8	Alternating between East and West Cells
Year 7 to Year 8	2	Operations / Closure	-	-	-	-	0.4	Tailings Cover	4.8	Tailings Cover	2.5	Decant Cell
Year 9 to Year 10	2	Operations / Closure		-	-	-	0.4	Tailings Cover	3.3	Tailings Cover	-	-
		Total	3.5		0.35		2.2	-	20.8	-	17.9	-

Prepared by: MJV2
Checked by: JBH1

Figure 3.1-1 Projected Construction Schedule

3.2 Construction Phase Activities

A partial list of the proposed construction activities is given below:

- Initial construction activities will take place in the winter, when the ground is frozen, to accommodate the flooded nature of the site. Victory Nickel proposes constructing an initial early works program and road with ditches during the winter of 2010/2011/2012.
- The de-watering wells and some of the infrastructure will be required to support the dredging operation. This infrastructure will include the roads around the pit and waste disposal areas, a sub-station and 13.8 kV power distributions.
- To meet the tight schedule for the installation and commissioning of the dewatering wells and the procurement, construction and commissioning of the sub-station, design activities on these early items will be of high priority during “Year-2".
- A basic level of support for an initial camp and facilities will be required to carry out initial site activities. A full camp will be developed to meet the additional requirements during construction of the Frac Sand Plant, Ore Processing Plant, the Tailings and Ultramafic Waste Rock Management Facility (TWRMF) and associated facilities.
- Initial engineering work will be required for the preliminary detail design, procurement and construction. Other than for long-lead items, the bulk of the engineering will commence in “Year-2” with the engineering for the process plants.
- The removal of the dolomitic limestone will take approximately two years; and frac sand will become available at the beginning of “Year-1”, one year into mine development. Nickel ore

will be available for processing at the beginning of Year 1. Accordingly, the Frac Sand Plant will commence production at the beginning of "Year-1"and the Ore Processing Plant at the beginning of Year 1. The associated engineering work for the two plants will begin in early "Year-2" and construction for both plants will begin in early "Year-1".

- Procurement of major equipment.
- Development of construction contracts that among other things address permitting requirements.

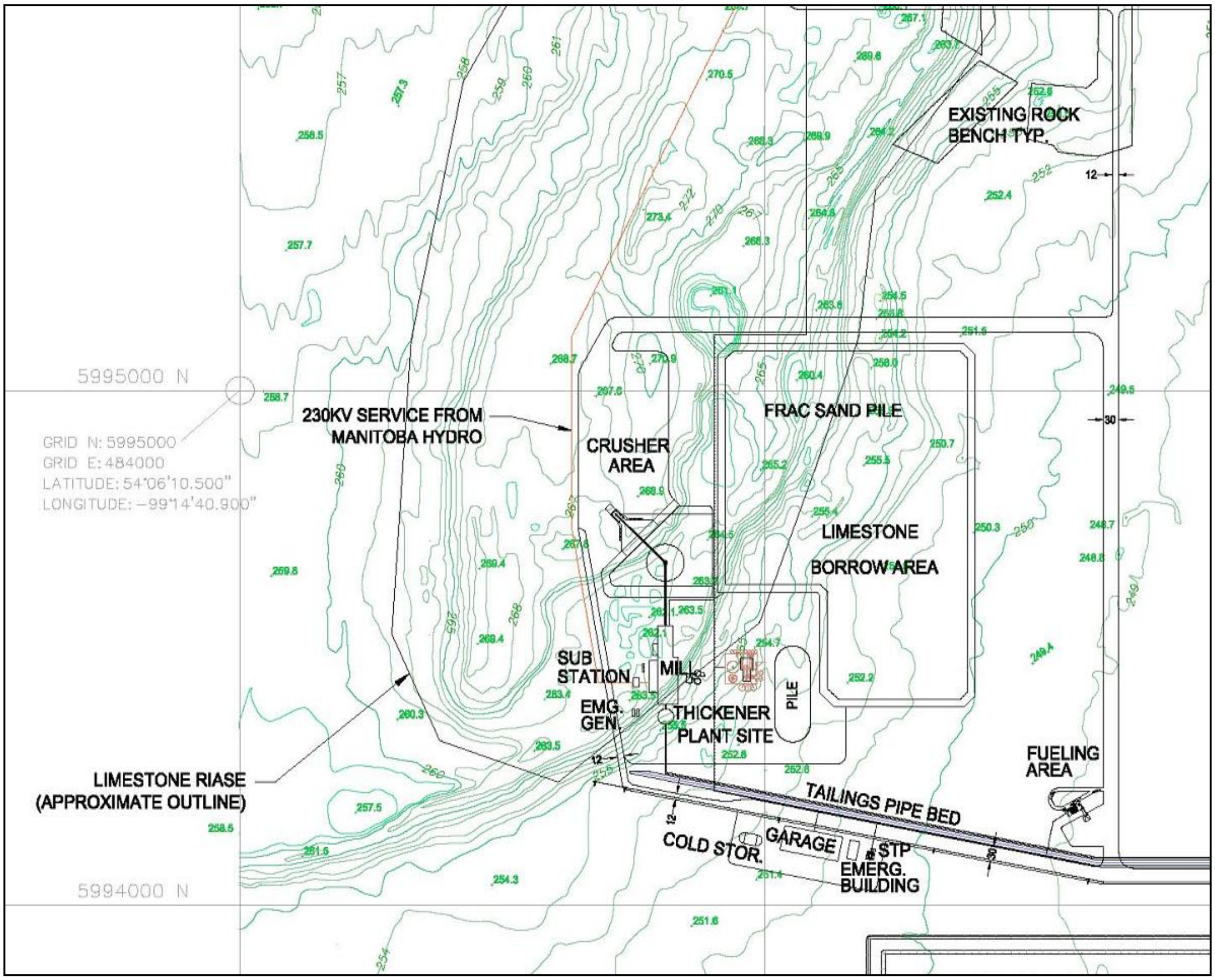
3.2.1 Planned Facilities

A detailed sketch showing the plant facilities is provided in Figure 3.2-1 and an overall site plan is provided in Figure 3.2-2. The site infrastructure will consist of several facilities including a maintenance building, fuelling facilities, emergency services building, cold storage, fresh and process water pump house, modular complex building, guardhouse and scale house, treatment plants, dewatering facilities, and a Tailings and Ultramafic Waste Rock Management Facility (TWRMF). Dewatering facilities include groundwater pumps located around the perimeter of the pit as well as portable dewatering pumping stations within the open pit.

The plant and infrastructure facilities have been located as close to the open pit mine as possible on the limestone bluff to the west of the site. The escarpment will be cut back to a general elevation of 254 m.a.s.l. to ensure clearance above the water table for the plant facilities. The crusher will be located on the limestone bluff at a position where the elevation grade is most favorable.

The TWRMF is proposed to occupy a long, narrow water-saturated muskeg/peat wetland with some forested areas approximately four (4) km northwest of the proposed pit. This lowland extends approximately 8 km from the southwest to the northwest and is bound on the east and west by sub-parallel dolomite bedrock ridges, approximately 2.5 km apart. The ridges rise nearly 20 meters above the wetland valley that slopes gently at approximately 0.2 % but consistently to the north-northwest. The proposed TWRMF structures would be oriented between the ridges, and along the lowland. The TWRMF will be used to discharge tailings and dispose of ultramafic waste rock.

Although the location of the TWRMF dam was governed by the geotechnical conditions, the dam is nonetheless reasonably close to the Processing Plant. The remaining dumps, namely the Dolomite Waste Rock Dump and the Country Rock Waste Rock Dump, are located around the pit to minimize the haul distances from the pit. In order to minimize the areas required for the TWRMF dam and the waste rock dumps, a consolidation period and setbacks have been designed into the deposition cycle to optimize their height.



Source: adapted from Wardrop's drawing 0951330400-G0002 (Wardrop, 2009b)

Figure 3.2-1 Minago Plant Area

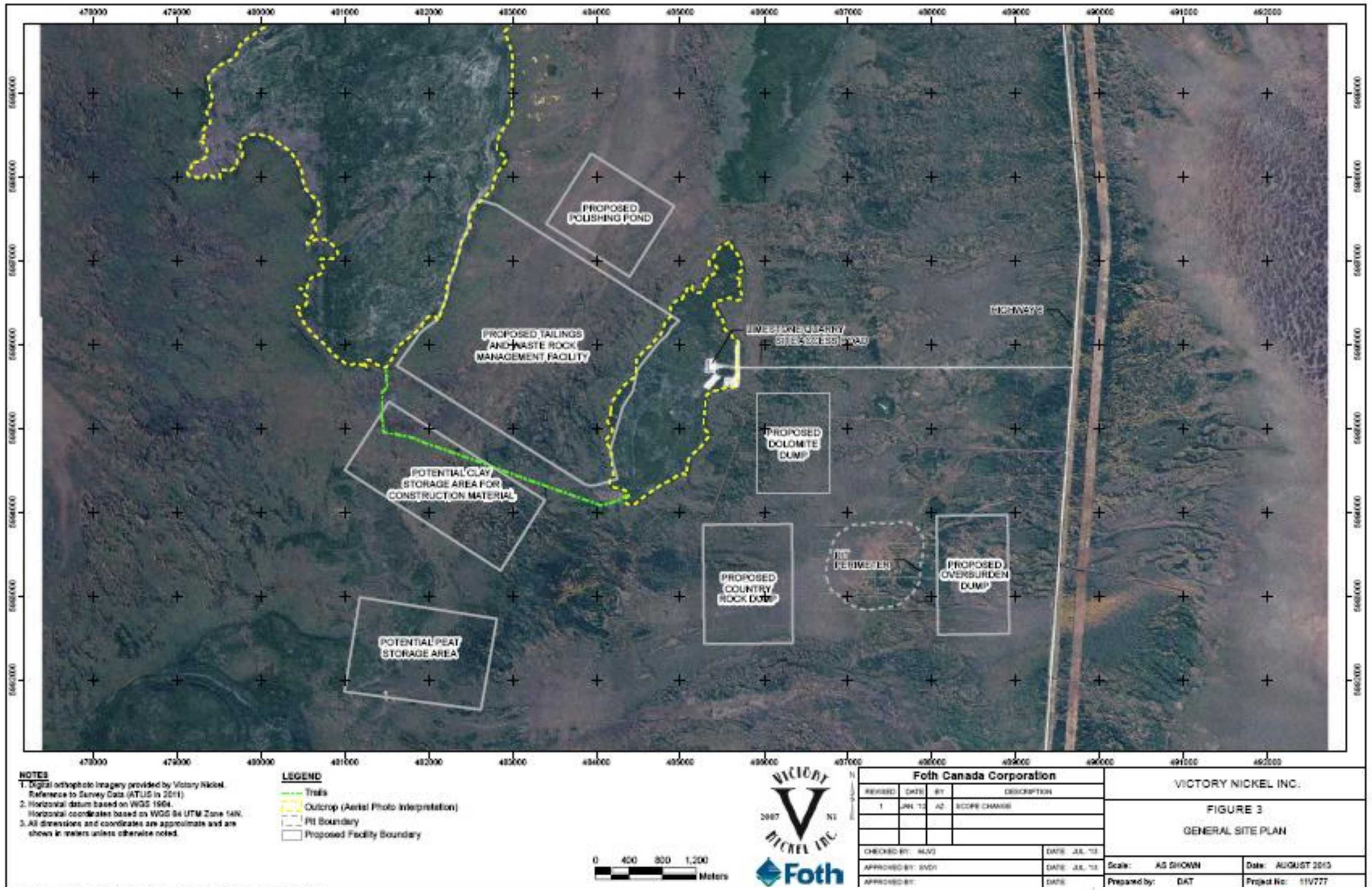


Figure 3.2-1 General Site Plan

The mine site buildings were arranged close together to minimize travel distances. The general maintenance building supporting the truck repair shop is located close to the ore concentrator building. The truck shop will be used for vehicle repair, tire replacements, welding and general maintenance. This truck shop will comprise a wash bay, lube storage, hydraulic shop, electrical shop, instrumentation shop, storage warehouse and lunchroom. The fuelling faculties will provide diesel fuel storage for mining trucks and diesel generators.

The modular complex is situated in a cut north of the process area, to provide some shelter and separation from the process area. The modular complex building will consist of mine staff dormitories, staff kitchen and cafeteria, mine dry, recreational facilities and office complex.

The electrical substation, emergency diesel generator set, site fuelling area, and water and waste water treatment plant were located in the process area. The water and waste water treatment facilities include sewage treatment plant and potable water treatment plant. The locations and sizes of the stockpiles for both the ore and the frac sand dictate that the frac sand plant will be separated from the ore processing area.

The plant area will be reasonably close to the modular complex containing the accommodations, cafeteria, and mine offices. The main access will be controlled by a guardhouse, located close to Highway 6 with the weigh scales in close proximity. To minimize interference with haul road traffic, a separate access to the camp area will be provided.

The arrangement of the roads was determined by the location of the dumps, facilities, and the ring road around the open pit mine to access the de-watering wells. An access and maintenance road to service the discharge line to the Minago River was positioned in relation to the Polishing Pond and associated pump houses.

3.2.1.1 Electrical

Electrical power will be required for the Ore Processing Plant, the Frac Sand Plant, the open pit mine, de-watering and general services. A main substation 230 kV/13.8 kV will be installed to transform the primary power at 230 kV to the secondary power at 13.8 kV. The secondary power distribution network will consist of 13.8 kV primary feeders and overhead transmission lines (ACSR). The secondary feeders will consist of 6.6 kV, 4.16 kV and 0.6 kV Teck cable. All operational loads will be calculated on a 24 hr basis for the various load centres.

The total operational load for the Victory Nickel Minago mine will be approximately 50 MVA. The processing plant, which mainly consist of the grinding, flotation, concentrate thickener, process water plant and reagent areas, will account for 29 Megavolt amperes (MVA) (58 %) of the load requirement. The remaining load of approximately 21 MVA (42 %) will be required by equipment in the open pit mine/remote locations (consisting of shovels, drills, and dewatering pumps, etc.), administration buildings, sand plant, and transfer pond pumps.

3.2.1.2 Logistics and Transportation

The Minago property enjoys the advantage of being located directly adjacent to Manitoba Provincial Highway 6, a major north-south highway transportation route. Also, the property may be served by the OmniTRAX rail company with a railhead at Ponton 60 km away. Therefore both inbound and outbound goods from the Minago site can be transported by conventional land transportation methods such as truck and rail. These transportation costs have been taken into consideration in both operational costs and capital costs. OmniTrax will own and operate the Ponton load out facility.

3.2.2 Open Pit

Wardrop determined that the Minago mining operation is amenable to a conventional open pit mining operation. The mine will provide mill feed of sulphide ore at a rate of 10,000 tonnes/day (t/d) for a total of 30,954,000 Mt of ore grading at 0.43%, over a period of approximately 10 years (Wardrop, 2009b). Local sandstone, that forms part of the overburden, is of suitable quality to produce frac sand, which is used in the oil and gas industry. The open pit will provide sand feed to a frac sand processing facility at a rate of about 4,100 t/d of sand, for a total of 14.9 Mt of frac sand over a period of about 10 years. Although the sand will be mined over a period of 3 years at the start of the mining operations, and then stockpiled, the throughput of the sand plant will be maximized to match the ore processing schedule (Wardrop, 2009b).

Work completed in December 2008 indicated that economic recovery of the underground resource at Minago is currently not feasible due to an insufficiently measured and indicated resource. For this reason, mine optimization calculations have been based on an “open pit only” option and do not take the effect of breakeven open pit and underground costs into account (Wardrop, 2009b).

The estimated overall stripping ratios (waste-to-ore ratio tonne/tonne, t/t) to mine both the nickel sulphide ore and frac sand are given in Table 3.2-1.

Table 3.2-1 Open Pit Design 14 Stripping Ratios

Case	SR (t/t) (No Overburden)	SR (t/t) (With Overburden)
Frac Sand Only	7.48	8.23
Nickel Ore Only	11.27	11.71
Nickel Ore and Frac Sand	6.72	7.00

Source: Wardrop, 2009b

The Minago Project development has been broken down into the stages of pre-production work (stripping) and three mineable phases based on mineralogical, geotechnical and pit optimization work conducted by Wardrop. Wardrop designed the three mineable phases based on the measured and indicated mineral resources and the selected optimized pit.

Mine development will commence with the removal of trees and roots, then the removal of muskeg and clay overlying the dolomitic limestone and then the frac sand and nickel ore body will be removed by dredging. Pre-production work will begin three years prior to the designated mill-start up year.

Contractors will strip peat and clay, and limestone and dolomitic waste rock. Once Victory Nickel's mining equipment becomes available, the contractor's stripping equipment will be gradually phased out and replaced by the owner's equipment (Wardrop, 2009b). Approximately 11.2 Mt of peat and clay will be excavated from the open pit area by dredging in "Year -2" in preparation for the owner to start stripping 42.7 Mt dolomite/limestone waste rock at the beginning of "Year -1".

Minago's mining sequence was developed in three mineable phases: one initial pit phase and two pushback phases. Each phase corresponds to a designed open pit that will be mined in sequence in accordance with the ore grade and stripping ratio. The mine development for the ore and the waste will progress using 12 m high benches.

Three mineable phases were designed to meet the following objectives:

- Enable the accelerated removal of limestone rock for use in construction of roads to hasten access to the frac sand zone, in order to generate short-term revenues to pay for stripping.
- Mine and stockpile the nickel sulphide ore in time for the operation of the mill in "Year 1".
- Provide a balance in the haul truck fleet.

3.2.2.1 Phase I

For Phase I, the pit was designed from the initial economic shells generated by a Whittle™ optimization run. The initial economic shells prioritize the high grade ore mining at the top portion of the orebody, and at the lowest amount of waste stripping. The objective of this prioritizing was to maximize cash flow and to speed up the capital recovery during the initial years. Phase I will mine 2.47 Mt of sand and 1.70 Mt of Ni(S) ore at 0.387% Ni(S) for a total material of approximately 44.8 Mt (Wardrop, 2009b).

3.2.2.2 Phase II

The Phase II geometry expands in all directions from the Phase I geometry to mine the next high grade blocks of the orebody. The final high walls will be reached in the west and southwest of the ultimate pit shell to achieve the required minimum mining width. Phase II will mine 4.91 Mt of sand, 9.4 Mt of Ni(S) ore at 0.438% Ni(S) for a total material of about 93.6 Mt (Wardrop, 2009b).

3.2.2.3 Phase III

In Phase III, the remaining ore inside the ultimate pit shell will be mined to achieve the final high walls. Phase lll will mine 7.47 Mt of sand, 14.03 Mt of Ni(S) ore at 0.429% Ni(S) for a total material of about 170.3 Mt.

3.2.2.4 Ultimate Pit

The ultimate pit contains 14.8 Mt of sand and 25.17 Mt of Ni(S) ore at 0.43% Ni(S). A total of 308.7 Mt will be removed from the open pit in the three mineable phases (Wardrop, 2009b). The total depth of the ultimate pit will be 359 metres and the elevation of the pit bottom will be -112 m.a.s.l.

Table 3.2-2 and Figure 3.2-3 summarize the material that will be mine in each mineable phase for the 2010 EAP/EIS. Table 3.2-3 provides an overall Tailings and Waste Rock production schedule for the proposed TWRMF and Table 3.2-4 details the projected material quantities and volumes to be mined from the open pit. Table 3.2-5 summarizes ultimate pit characteristics and Figure 3.2-4 illustrates the ultimate pit design. Table 3.2-6 and Figure 3.2-5 summarize the estimated annual mined nickel ore tonnage and grade (from 2010 EAP/EIS).

The mine will start delivering frac sand ore in the year just prior to Frac Sand production at the start of 2013. The delivery of nickel sulphide ore is scheduled to begin in late 2013 in preparation for Ore Processing at the start of “Year 1” and will continue until “Year 8”. The mine production will peak at 51.2 Mt in 2013, because of the high proportion of waste rock.

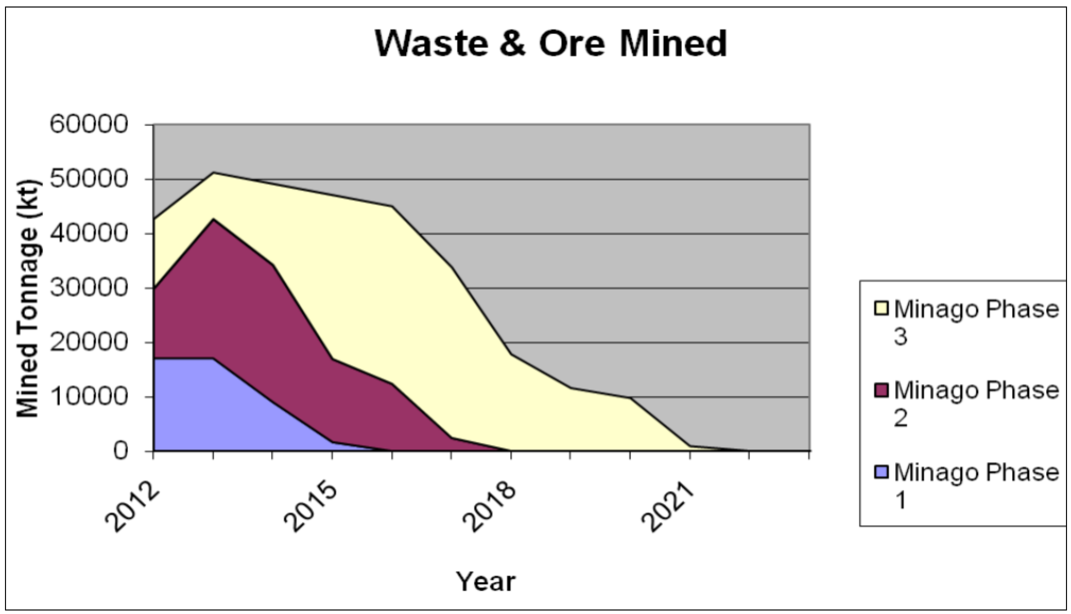
The delivery and placement of overburden, limestone, and basement rock will closely follow the geotechnical parameters governing the construction of the waste rock dumps, TWRMF dam, and the Overburden Dump (Wardrop, 2009b).

Each of the mineable phases or pushbacks are designed at a mining width of about 65 m to accommodate the mining equipment that will operate in the benches. The mining width allows for 35 m of double-sided loading if, for example, a Komatsu PD4000 electric hydraulic shovel were to be used. The remaining 30 m road is designed to accommodate two lanes of traffic using typical 218 tonne haul trucks.

Table 3.2-2 Material to be Mined by Mineable Phase (in Kilo Tonnes)

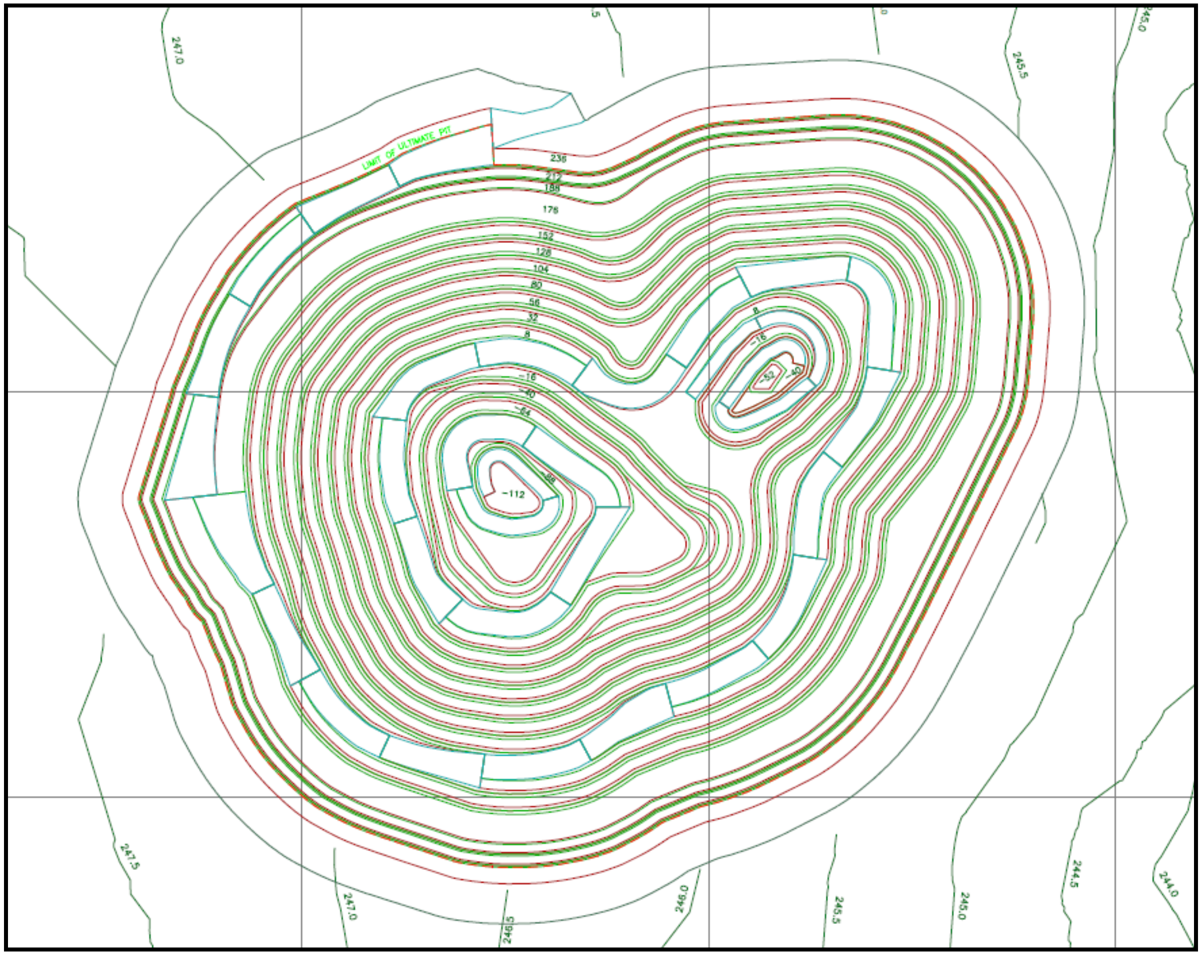
Phase	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOTAL
Minago Phase 1	17,063	17,063	9,003	1,642							**44,771**
Minago Phase 2	12,796	25,592	25,213	15,274	12,339	2,391					**93,605**
Minago Phase 3	12,796	8,531	14,890	30,129	32,639	31,400	17,766	11,570	9,729	881	**170,330**
Total	**42,655**	**51,185**	**49,106**	**47,045**	**44,978**	**33,791**	**17,766**	**11,570**	**9,729**	**881**	**308,706**

Source: adapted from Wardrop, 2009b; 2010 EAP/EIS



Source: adapted from Wardrop, 2009b

Figure 3.2-3 Material to be Mined by Mineable Phases



Source: adapted from Wardrop, 2009b

Figure 3.2-4 General Layout of the Ultimate Mine

Table 3.2-3 Tailing and Waste Rock Production Schedule (tonnes)

Unit (tonne)	Overburden	Dolomite	Country Rock	Mill (Ni) Production	Frac Sand Plant Production	Mill (Ni) Tailings to TWRMF	Frac Sand Tailings to TWRMF	Ultramafic (PAG) Waste Rock To TWRMF	Total Tailings to T&PAGWRM
Year - 2	6,600,000	29,653,000	0	0	0	0	0	0	0
Year - 1	2,685,000	41,066,000	3,389,000	0	285,000	0	68,000	2,026,000	68,000
Year 1		26,060,000	11,031,000	900,000	1,140,000	889,000	356,000	4,189,000	1,245,000
Year 2		13,928,000	12,465,000	3,600,000	1,140,000	3,555,000	356,000	5,896,000	3,911,000
Year 3		325,000	27,165,000	3,600,000	1,140,000	3,555,000	356,000	4,945,000	3,911,000
Year 4		0	27,200,000	3,600,000	1,140,000	3,555,000	356,000	4,100,000	3,911,000
Year 5		0	16,236,000	3,600,000	1,140,000	3,555,000	356,000	4,223,000	3,911,000
Year 6		0	11,043,000	3,600,000	1,140,000	3,555,000	356,000	5,218,000	3,911,000
Year 7		0	6,836,000	3,600,000	1,140,000	3,555,000	356,000	4,449,000	3,911,000
Year 8		0	786,000	3,600,000	1,140,000	3,555,000	356,000	613,0000	3,911,000
Year 9		0	0	3,600,000	1,140,000	3,555,000	356,000	0	3,911,000
Year 10		0	0	1,254,000	770,000	1,238,,000	240,000	0	1,478,000
Year 11		0	0	0	0	0	0	0	0
Total	9,285,000	111,032,000	116,147,000	30,954,000	11,315,000	30,567,000	3,512,000	35,659,000	34,079,000

Table 3.2-4 Projected Material Quantities and Volumes Mined from the Open Pit

Material	Tonnes (kt)	Density (t/m^3)	Volume (in-situ m^3)	Volume (swelled m^3; swell value: 30%)
Ore	25,166	2.612	9,634.697	12,525,106
Sand	14,847	2.400	6,186,065	8,041,885
Granitic Waste Rock	122,005	2.702	45,148,004	58,692,405
Ultramafic Waste Rock	35,659	2.590	13,767,708	17,898,020
Overburden	11,217	1.856	6,044,945	7,858,428
Limestone	111,032	2.790	39,797,437	51,736,668
Total Waste Rock	**268,695**		**98,713,149**	**128,327,093**
Total Mined	**319,924**		**120,578,855**	**156,752,512**

Source: Wardrop, 2009b

Table 3.2-5 General Pit Characteristics

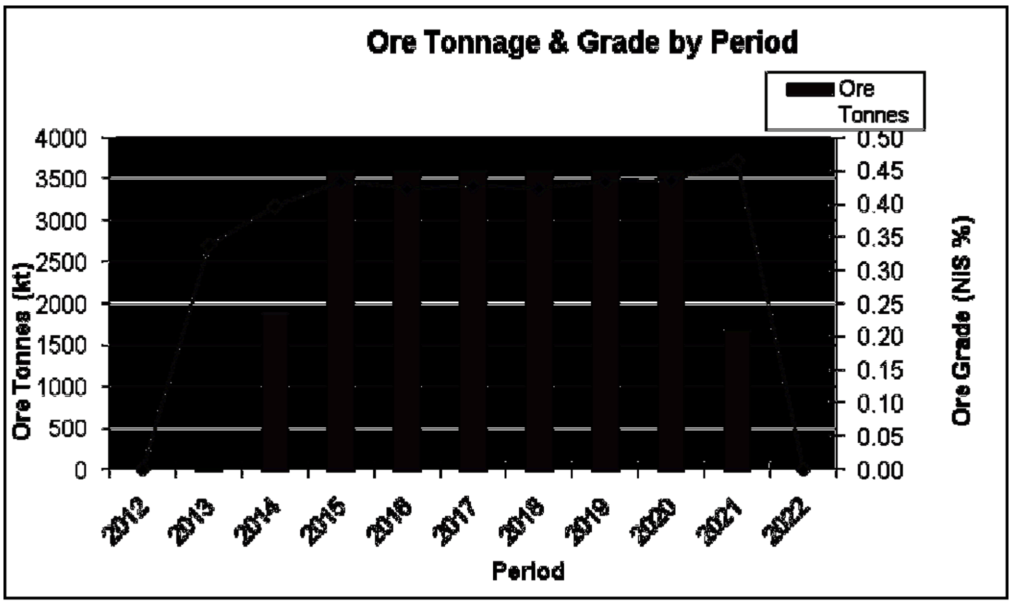
Item	Size
Pit Top Elevation	About 247 m
Pit Bottom Elevation	-112 m
Pit Depth	About 359 m
Volume of Pit	156.7 million m^3
Area of Pit Top	1.0 million m^2
Perimeter at the Top of the Pit	3,7 km
Length from East to West	1.2 km
Length from North to South	1.1 km

Source: Wardrop, 2009b.

Table 3.2-6 Estimated Annual Ore Tonnage (in Kilo Tonnes) and Grade

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ni Ore		112	3,000	3,600	3,600	3,600	3,600	3,600	3,600	453		
Grade (%)		0.37	0.42	0.43	0.43	0.41	0.44	0.43	0.45	0.47		

Source: adapted from Wardrop, 2009b.



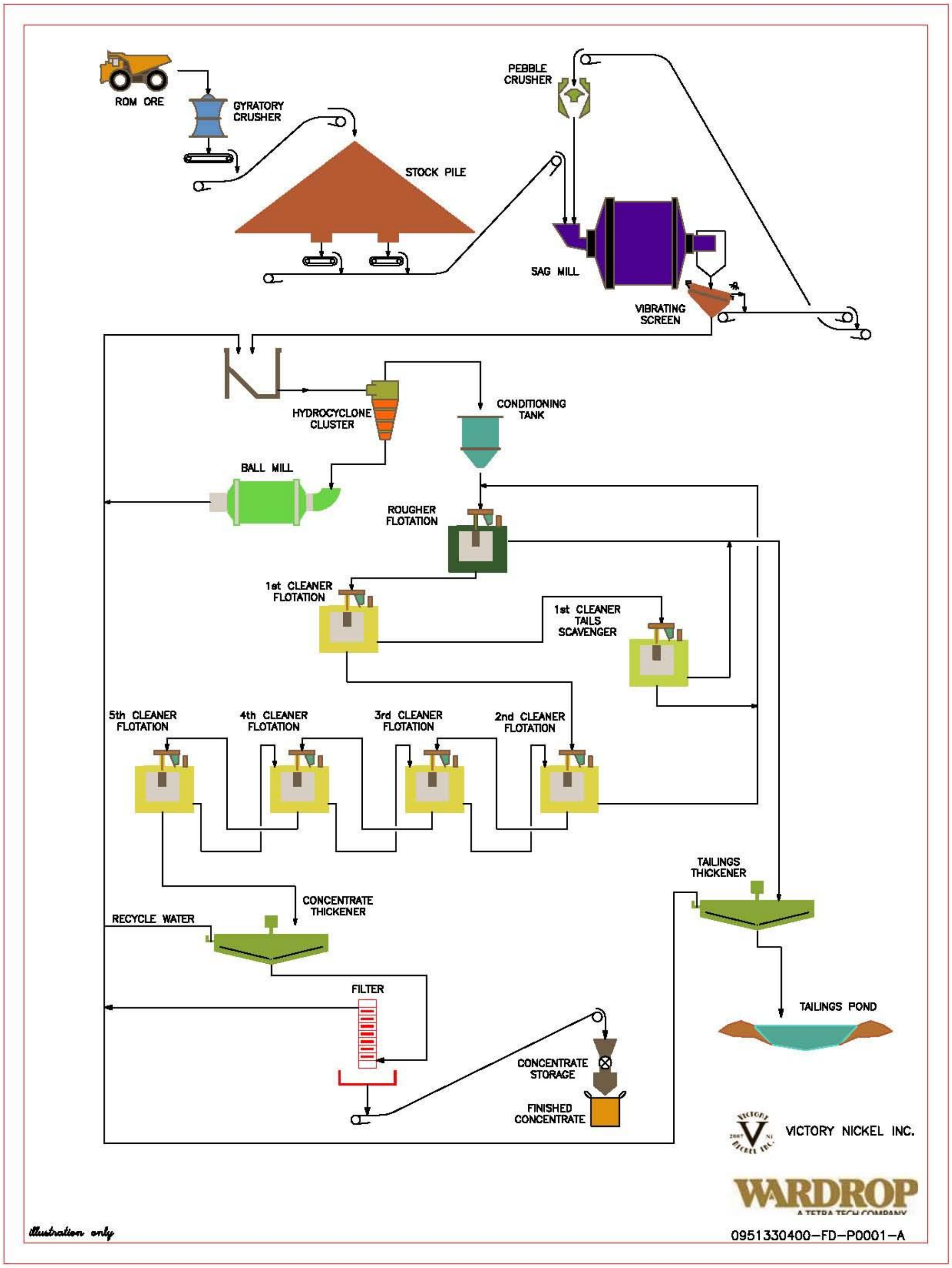
Source: adapted from Wardrop, 2009b.

Figure 3.2-5 Projected Annual Nickel Ore Tonnage and Grade

3.2.3 Process Plant and Frac Sand Plant

3.2.3.1 Nickel Ore Processing

The mineral processing plant will process nickel ore at a nominal rate of 10,000 t/d beginning with the haulage of ore to the primary gyratory crusher and hydraulic rock breaker capable of crushing the ore to an optimal size for grinding (Figure 3.2-6).



Source, Wardrop, 2009b

Figure 3.2-6 Simplified Flowsheet of the Nickel Ore Processing Plant

The grinding circuit, consisting of one semi-autogenous grinding (SAG) mill and one ball mill, will grind the ore prior to flotation. An intermediate crushing stage consisting of one pebble cone crusher will crush oversized product from the grinding circuit for recirculation to the SAG mill. The SAG mill product will be fed to a vibrating screen. The screen oversize will be recycled through a pebble cone crusher. The screen underflow will feed to a hydrocyclone cluster, which will classify the underflow of the vibrating screen and the ball mill discharge. The hydrocyclones' underflow will feed to the ball mill. The hydrocyclone cluster overflows will gravity-flow to the conditioning tank at the start of the flotation circuit (Wardrop, 2009b).

The flotation circuit will consist of conventional rougher, scavenger and cleaner cells to produce a high-grade nickel concentrate and final tailings. One bank of rougher cells, one bank of scavenger cells, and five banks of cleaner cells will be utilized throughout the flotation circuit. The final flotation concentrate will be thickened in an indoor conventional concentrate thickener and stored in a stock tank. Concentrate from the stock tank will be dried for shipment in a horizontal plate filter press. The filter press will dewater the concentrate to an 8.6% moisture content. A bagging machine will bag the final concentrate in 2 t bags for shipping.

A high rate tailings thickener will clarify the final tailings from the flotation circuit and distribute the tailings underflow to the tailings management area. Flocculants will be used in each thickener to assist in settling and generating a precipitate from solution. Reagents including potassium amyl xanthate (PAX) and sodium hexametaphosphate (SHMP or Calgon) will be added to the ore in the grinding stage to enhance the flotation performance downstream. Methyl isobutyl carbinol (MIBC) and depramin C (CMC) will also be added to the cleaner flotation to increase the concentrate quality.

Flotation optimization will be provided by on-stream samplers, particle size analyzers and an on-line X-ray analyzer. The samplers and analyzers will be used to monitor performance of the flotation process to optimize concentrate grade and nickel recoveries. An assay and metallurgical laboratory will be incorporated into the mill building to perform laboratory tests.

3.2.3.2 Frac Sand Processing Plant

The Preliminary Economic Assessment (PEA) identified a sandstone horizon averaging nine (9) metres thick above the unconformity of the main nickel bearing serpentinite (Wardrop, 2006). This sandstone layer must be removed to access the nickel mineralization within the proposed open pit mine. The sandstone unit, which is comprised of small, round, uniformly sized silica sand particles is amenable for use as hydraulic fractionating sand or frac sand in the oil and gas industry.

The sandstone is not expected to require drilling and blasting to be removed, but will require additional backhoe cleanup due to the expected undulating contact at the top of the basement rocks. The backhoe will windrow the sand so that a front-end loader can easily load the material while minimizing the loss of sand due to the loaders large bucket size. The sand is then hauled to a stockpile location, separate from the waste rock dumps, prior to processing. The sand will be released each time a mining stage passes through the bedrock contact in Years 1, 2 and 3 (Table 3.2-7). The insitu sand will be processed at a feed rate of 1.5 Mt/a, producing different grades of frac sand at a rate of 1.14 Mt of marketable sand annually (2010 EAP/EIS).

Table 3.2-7 Final Pit Contained Sand Resource

Phase	Sand (tonnes)
Starter Pit	5,288,864
Phase 1	2,091,628
Phase 2	7,466,065
Total	**14,846,557**

Source: Wardrop, 2009b; 2010 EAP/EIS

3.2.4 Construction Planning and Management

The Construction Management (CM) group will be responsible for the management of all field operations. Reporting to the Owner, the Construction Manager will plan, organize, and manage construction quality, safety, budget and schedule objectives.

Construction of the Project will be performed by contractors under the direction of the CM team, reporting to the Project Manager of the Engineering, Procurement and Construction Management (EPCM).

Key objectives of the Construction Managers will be to:

- conduct Health, Safety and Environmental (HS&E) policy training and enforcement for all site and contractor staff. Site hazard management tools and programs will be employed to achieve the no harm/zero accident objective for the site;
- apply contracting and construction infrastructure strategies to support the project execution requirements;
- maintain and support a construction-sensitive and cost-effective master project schedule;
- maintain and support a project cost control system to ensure effective cost reporting, monitoring, and forecasting as well as schedule reporting and control. A cost trending program will be implemented and the EPCM Contractor will be responsible for evaluating costs on an ongoing basis for comparison to budget and forecasting for the cost report on monthly basis;
- establish a field contract administration system to effectively manage, control, and coordinate the work performed by the contractors;
- apply an effective field constructability program, as a continuation of the constructability reviews performed in the design office;

- develop a detailed field logistics and material control plan to maintain the necessary flow and control of material and equipment to support construction operations; and
- meet the schedule for handover of the constructed plant to the commissioning team.

3.2.5 Construction Organization

The construction organization charts are given in Figures 3.2-7 and 3.2-8.

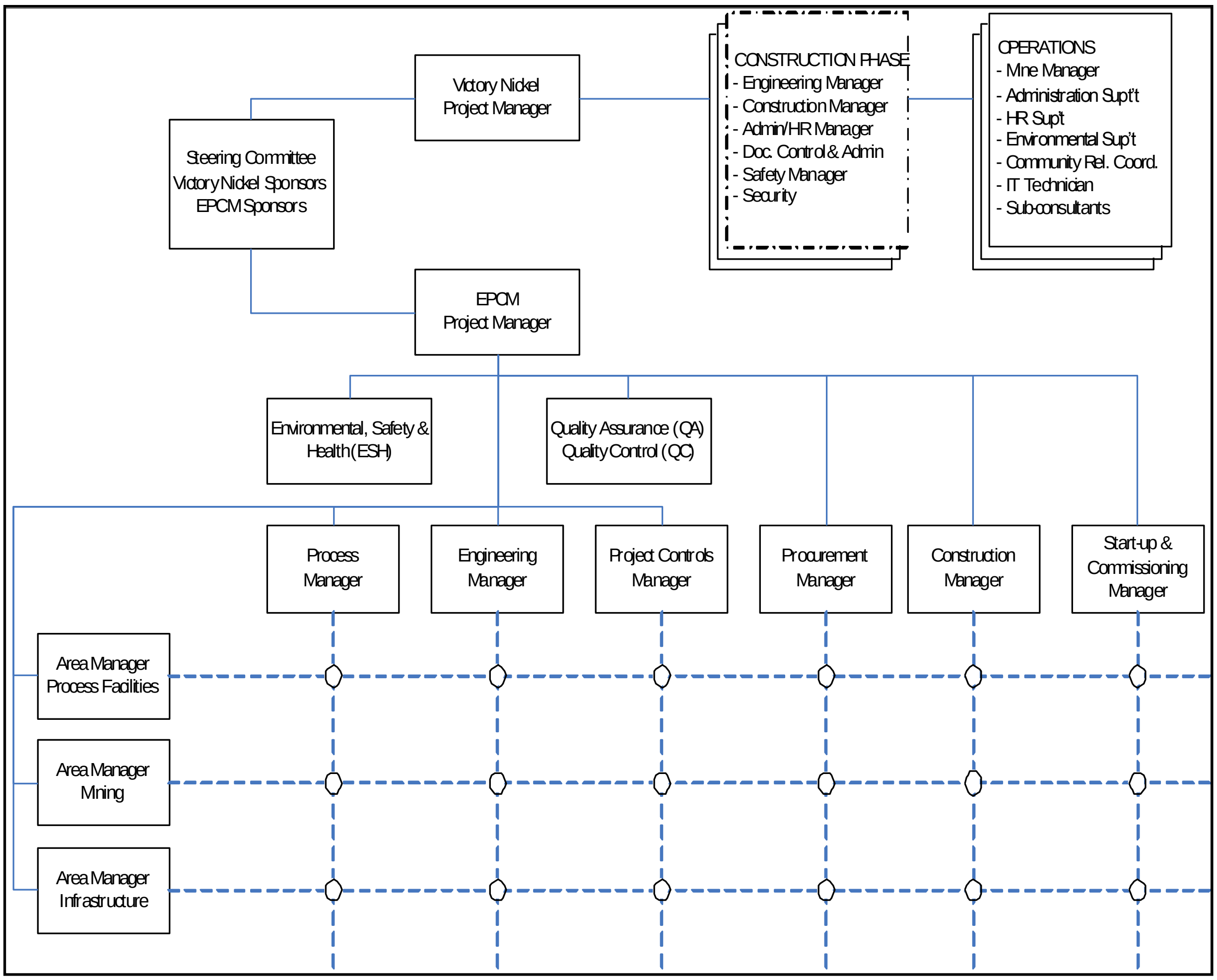


Figure 3.2-7 Organization Chart for the Construction Management Team

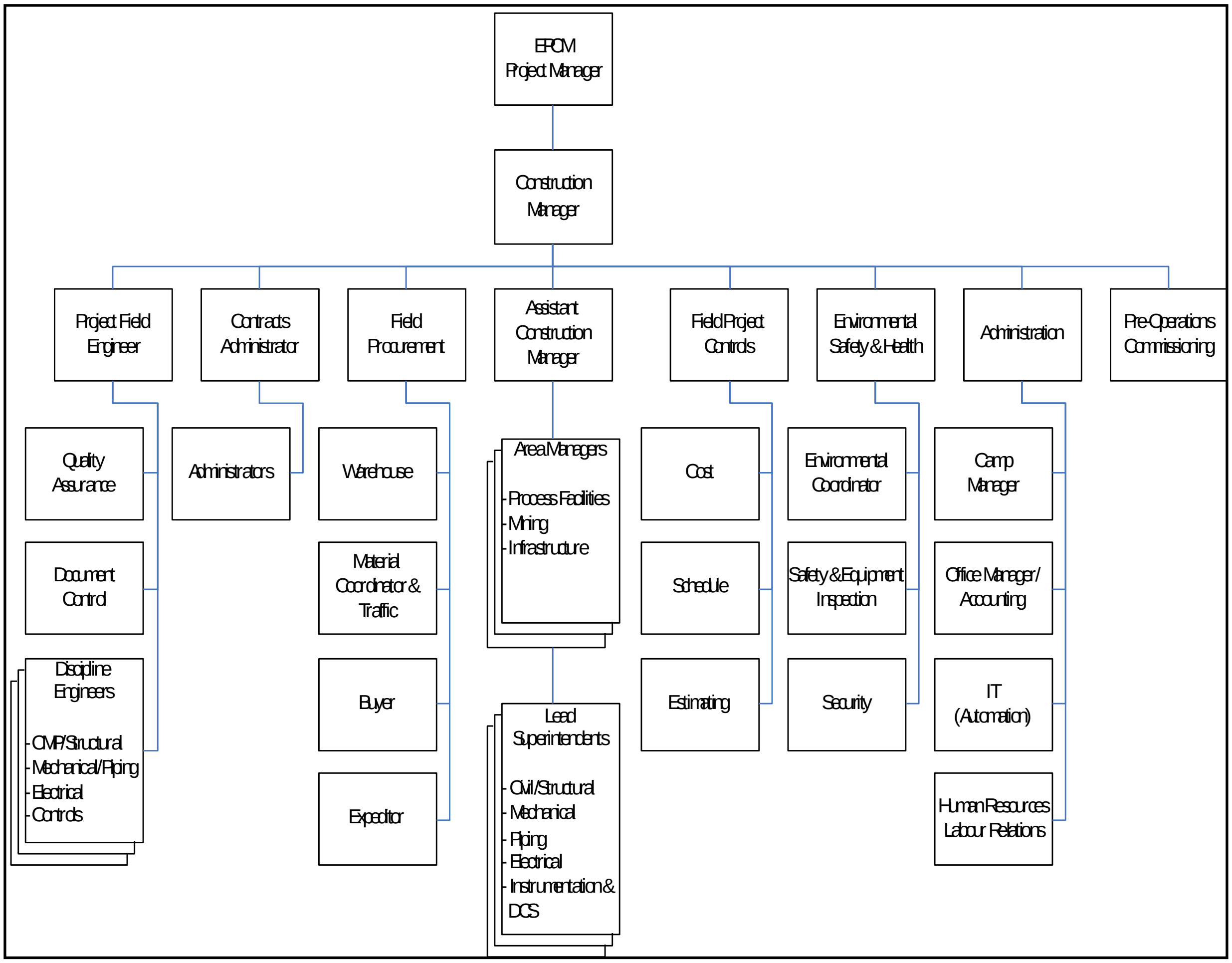


Figure 3.2-8 Site-based Organization Chart

3.2.6 Transport and Logistics

The EPCM team will direct logistics and freight for incoming equipment and materials, to be transported by rail and truck to the site. A single-point freight forwarding company will coordinate with manufacturing facilities, establish shipping points and dates, forward the shipments to the most convenient ports, and complete trans-shipments to the project site.

An experienced freight forwarder with representation in Manitoba will function under the direction of the EPCM Contractor, who will issue timely shipment and materials status reports.

It is anticipated that the majority of required materials and equipment will be trucked from Winnipeg, MB to the site.

Products generated by the mine will be trucked to the nearest railway siding, Thompson, MB or Winnipeg, MB. Nickel concentrate may either be hauled by truck to Thompson, MB for smelting or the proposed Railway Siding along the OmniTrax Canada railway line near Ponton, MB or be trucked to Winnipeg for further transport to a suitable smelter for processing. Frac sand products will either be hauled by truck to the proposed Railway Siding near Ponton, MB or be trucked to Winnipeg for further transport to customers.

The anticipated production volume will result in 4 truck loads per day of Ni concentrate and 62-63 truck loads per day of Frac Sand Plant products or in slightly less than 3 trucks per hour, on average, passing any point on the haul routes.

3.2.7 Construction Site Infrastructure

3.2.7.1 Construction Camps

Development of a full-service camp for construction contractors will begin with VNI's approval to begin detailed design. Initially, the Owner's operating personnel and contractors engaged in the early contracts will need to reside in nearby communities. However, as the workforce becomes larger, the requirement for a permanent camp will become a priority.

The camp which will be a modular design with propane heat will be erected in phases as the requirements demand. The camp will accommodate up to 300 workers with double occupancy for couples and handicap-accessible rooms. The recreation complex will contain the games and gym facilities.

Transportation, potable water, waste management and other support services will be scaled to support the various development stages. The CM team will ensure that the catering contractor meets the staffing, hygiene, food handling, storage, and meal expectations.

Only prescription drugs will be permitted on site and firearms, drugs and alcohol will be prohibited.

3.2.7.2 Temporary Facilities and Construction Site Infrastructure

3.2.7.2.1 Communication

The Owner's systems manager will determine the appropriate telecommunications technologies for the project. Requirements include voice and data link technologies adequate to support construction and plant operation growth.

The communications framework for management offices will be installed early in the construction period. The system will be supplemented with additional telephones in common areas and suitable internet connections.

3.2.7.2.2 Construction Power

Approximately 1-1/2 MW of operating power capacity will be required for camp utilities excluding heat and limited construction facilities during the construction period. The provision for construction power will comprise one working generator with one generator on standby. Once the Starter Pit excavation is commenced, permanent power will supply the power loads for the remaining duration of the construction phase.

3.2.7.2.3 First-aid and Site Security

VNI will provide a fully-equipped first-aid facility with ambulance and fire engine for project-wide use. The facility will normally be staffed 12 h/d, with on-call services ensuring continuous coverage for the camp. In addition, contractors will be expected to provide basic first-aid stations at their working locations.

VNI will supply a 24-hour staffed site security program during the initial field mobilization. Access to the site will be controlled at the principal road entrance and will be limited to personnel who have had induction training and to approved visitors.

3.2.8 Waste Materials

A waste management plan will be developed during the operational phase to deal with the site waste. All mine wastes will be handled, stored, managed and disposed of in an environmentally sound manner. Tailings will be co-disposed of with ultramafic waste rock in the Tailings and Waste Rock Management Facility (TWRMF); Country Rock Waste Rock Dump in one of the dedicated waste rock dumps, sludge from the Potable Water Treatment Plant (WTP) will be disposed of in the TWRMF. Grey water and sewage will be deposited in an extended aeration mechanical sewage treatment plant. All domestic refuse will be transported to a designated landfill for disposal. Non-hazardous solid wastes (garbage) will be disposed of in an acceptable manner as per *Solid Waste Regulations*. VNI may also apply for a license to burn (Burning Permit) some of the waste materials on site.

3.2.9 Drilling and Blasting

3.2.9.1 Drilling

Tables 3.2-8 and 3.2-9 show penetration and drilling rates for a variety of drill hole parameters. A diesel-powered hydraulic percussion track drill will be used for secondary blasting of oversize material, sinking cut drilling, pre-sharing etc.

Table 3.2-8 Penetration Rate and Drilling Rate

	Units	Rock Type		
		Dolomite	**Basement Waste**	**Ore**
Hole Depth	m	13.7	13.7	13.6
Penetration Rate	cm/min	100	65	65
Grade control sampling time	min	2.0	2.0	2.0
Move and Align Time	min	3.0	3.0	3.0
Total Time Per Hole	min	18.18	25.55	25.42
Holes Per Hour	holes	3.30	2.35	2.36
Average Drilling Rate	**m/h**	**45**	**32**	**32**

Source: Wardrop, 2009b; 2010 EAP/EIS

Table 3.2-9 Blasthole Hole Parameters and Drill Productivity

Blast Hole Drill Productivity	**Units**	**Rock Type**		
		Dolomite	**Basement Waste**	**Ore**
Hole Diameter	cm	26.9	26.9	26.9
Bench Height	m	12.0	12.0	12.0
Sub grade	m	1.7	1.7	1.6
Powder Factor	kg/t	0.21	0.21	0.24
Bank Density	t/m^3	2.7	2.7	2.61
Rock Mass per Hole	t	2,286	2,286	2,006
Spacing and Burden	m	8.4	8.4	8.0
Drilling Rate	**m/h**	**45**	**32**	**32**

Source: Wardrop, 2009b; 2010 EAP/EIS

3.2.9.2 Blasting

Explosives will be supplied to VNI by a Contractor. The Contractor will build an explosive batch plant. The plant will be independently owned and operated by the Explosive Contractor. VNI will not own an explosive manufacturing plant.

Overall explosive consumption was based on using a 70% ANFO and 30% emulsion mix product. Some blasting parameters may be seen in Table 3.2-9. Drillhole liners will be used in wet holes where practical.

An explosive supplier will be selected to erect a plant and storage facility on site. Under the supervision of the mine blasting foreman, the supplier will be contracted to supply, deliver, and load explosives into the blastholes. The drill blast foreman will oversee the contractor blasting crew who will prime, stem, and tie-in blastholes.

3.3 Operational Phase Activity

3.3.1 Production

Wardrop determined that the mining operation is amenable to a conventional open pit mining method. The mine will provide mill feed of sulphide ore at a rate of 10,000 tonnes/day (t/d) for a total of 30,954,000 Mt of ore grading at 0.43%, over a period of 10 years.

In addition, the open pit will provide sand feed to a frac sand processing facility at a rate of about 4,100 t/d of sand, for a total of 14.9 Mt of frac sand over a period of about 10 years. Although the sand will be mined over a period of 3 years at the start of the mining operations, and then stockpiled, the throughput of the sand plant will be maximized to match the ore processing schedule.

The overall stripping ratios (waste-to-ore ratio tonne/tonne, t/t) to mine both the nickel sulphide ore and frac sand are outlined in Table 3.3-1 below.

Table 3.3-1 Open Pit Design Stripping Ratios

Case	SR (t/t) (No Overburden)	SR (t/t) (With Overburden)
Frac Sand Only	7.48	8.23
Nickel Ore Only	11.27	11.71
Nickel Ore and Frac Sand	6.72	7.00

Source: Wardrop, 2009b; 2010 EAP/EIS

An overall mining sequence was developed in three phases: one initial pit phase and two pushback phases. Each phase corresponds to a designed open pit that is mined in sequence. The mine development for the ore and the waste will progress using 12 m high benches.

Mine development will commence with the removal of trees and roots, and then the dredging removal of the muskeg and clay overlying the dolomitic limestone. For this initial stage of the mining operation, the work will be performed using contractors as part of capital expenditures. Mechanical removal using excavators for removal, trucks for transportation and dumping would be difficult because of the soft clays.

Given the challenges and costs associated with the mechanical removal of the overburden, a dredging method has been selected to remove the muskeg and clay.

The removal of the dolomite will take approximately 2 years with frac sand being available at the beginning of “Year -1”. A further year later at the start of “Year 1”, the nickel ore will be available for processing.

The ultimate pit design (Figure 3.2-4) contains the mining reserves as listed in Table 3.3-2. The mining reserve represents ore contained within the ultimate detailed pit design and includes mining dilution, ramps, and berms. The values shown in Table 3.3-2 represent concentrator feed in terms of Nickel (Ni(S)) values, which will be subject to a 71.3% concentrator recovery at the 0.430% Ni(S) feed grade.

Table 3.3-2 Selected Pit (#14) Mining Reserves

Classification	Tonnes (millions)	Grade (%Ni(S))	Nickel (millions of pounds)
Proven	6.6	0.487	70.5
Probable	18.6	0.410	167.5
Total Proven and Probable	25.2	0.430	238.0

Source: 2010 EAP/EIS

The values shown in Table 3.3-3 represent overall Frac Sand feed to the Frac Sand Plant, over a period of 10 years.

Table 3.3-3 Selected Pit frac Sand Reserves

Classification	Tonnes (millions)	Grade
Proven	0.0	n/a
Probable	14.8	n/a
Total Proven and Probable	14.8	n/a

Source: 2010 EAP/EIS

3.3.2 Manpower

Well trained, qualified personnel are essential to a successful operation. The correct staffing levels and the requirements in each category define the basis for assessing labour operating costs. Out of a total contingent of 422 employees, 349 will be employed directly by Victory Nickel and the balance of 73 will be staff contracted to a service supplier.

The schedule implements the following staffing arrangements:

- Regular day-time employment: this arrangement applies to managerial and professional staff working a 40-hour, 5-day week, 8 hours per day.
- Regular four-shift employment: this arrangement applies to skilled and semi-skilled staff working a 12-hour day, 7 days per week, 2 weeks on and 2 weeks off.

The organization structure at the mine site will be headed by the General Manager, with direct reporting from the following operational and administrative departments:

- Maintenance Department;
- Mining Department;
- Processing Department;
- Geology Department;
- Engineering Department;
- Human Resources Department;
- Environmental Department; and
- Mine Controller Department.

The staffing of each department is summarized in Table 3.3-4. There will also be dual functional reporting lines with the following mine personnel reporting to corporate positions.

- Mine Controller; and
- Mine Environmental Manager.

Table 3.3-4 Department Staffing (Including Contracted Services Personnel)

Department	No. of Personnel
Maintenance Department	94
Mining Department	121
Processing Department	94
Geology Department	4
Engineering Department	6
Human Resources Department	13
Environmental Department	5
Mine Controller Department	14
Contracted Services Personnel	71
Total	**422**

Source: 2010 EAP/EIS

The number of personnel supports shift rotation and augmented staff. The proposed Mine Management Organization Chart for the Project is provided in Figure 3.3-1. The work force schedule will change each year. The staffing levels have been assessed to take vacations, training, and absence relief into account for the various categories.

Victory Nickel expects to contract out the following services:

- explosives plant operation;
- camp services;
- employee busing transportation;
- heavy equipment machines; and
- tire maintenance.

The administration of these various contract services will be the responsibility of the Contract Services Supervisor. The staffing levels for contracted personnel identified above are summarized in Table 3.3-5 gives the number of personnel projected for Contract work.

Table 3.3-5 Contract Personnel

Job/Position	No. of Personnel (No. Includes rotation)
Staff Service Foreman	1
Cooks	12
Dishwashers	8
Cafeteria Staff	8
Janitorial Staff (Camp)	16
Laundry Staff	8
Janitorial Staff (Offices)	3
Janitorial Staff (Dry)	4
Bus Drivers	4
Augmented Staff (contracted)	7
Total Contracted Staff	**71**

Source: 2010 EAP/EIS

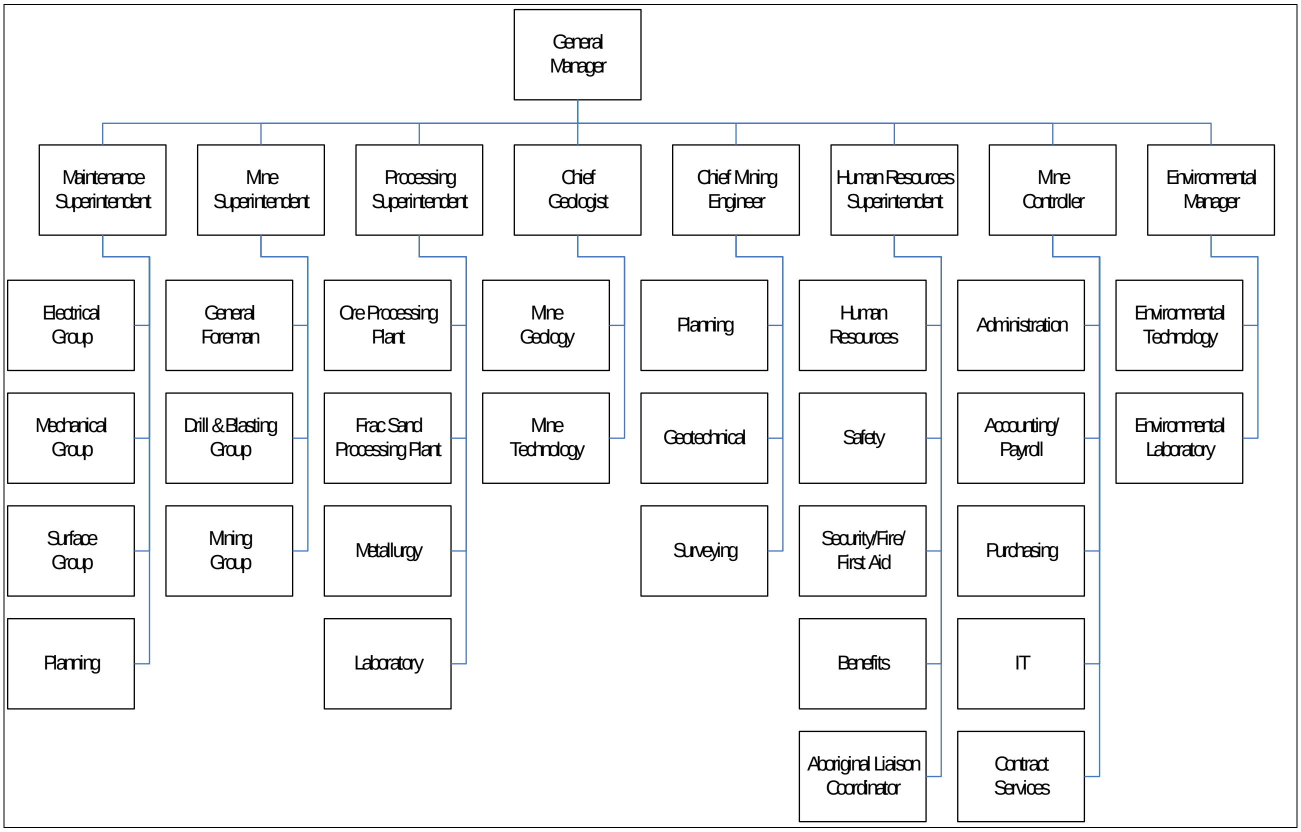


Figure 3.3-1 Mine Management Organization Chart for the Project

Victory Nickel recognizes the highly technical nature of the skills required to operate a mine, mill and associated facilities. Furthermore, Victory Nickel recognizes the importance of developing the local talent from the local aboriginal groups to meet the requirements of the mine. To that end, Victory Nickel is committed to providing the enhanced training to enable employees to match the required skill levels.

To help facilitate the training program, Victory Nickel will cooperate with the Government of Manitoba to integrate various government programs into the mine training program.

In addition to the formal trades training, employees and contractors will be required to undergo a formal training program. This program will be designed to alert employees to the potential work-related risks and acquaint employees with:

- health, safety and environmental regulations;
- the use of personal protective equipment;
- emergency procedures;
- internal work regulations and employee services;

- duties, job requirements, and reporting relationships;
- Workplace Hazardous Materials Information System (WHMIS) training; and
- environmental awareness and relevant corporate code of practices.

Victory Nickel will provide room, board, a recreation centre and janitorial services to employees. Catering services will provide three meals a day and optional packed meals for field staff.

The accommodation will be single occupancy, dual-use for non-professional staff with a change-over every two weeks. There will be a communal wash block with laundry facilities and lockers for use during change-overs. For professional staff, there will be a shared washroom arrangement with one shared washroom between two adjoining rooms.

Victory Nickel will work to ensure the health and safety of employees. In particular, the requirements of Canadian and Manitoba occupational health and safety legislation will be assumed to be the minimum standards. Hazardous areas will be identified and the notices advising the requirements for personal protective equipment will be posted.

Employees working in hazardous areas will be trained to minimize any physical and chemical risks. The training programs will include preventative and emergency measures to deal with the effects of the hazards.

Victory Nickel will ensure that employees will be provided with the necessary safety boots and protective equipment required by legislation and good safety practice. In addition, the company will provide laundry service for employees working in the process, mining and maintenance departments.

The standard personal protective equipment will include helmets, safety glasses, ear plugs, dust masks, respirators, gloves and safety boots.

3.3.3 Transportation

The Minago Property is located directly adjacent to Manitoba Provincial Highway 6, a major north-south highway transportation route as shown in Figure 3.3-2. The Property may be served by the Hudson Bay Railway Company (HBR), with rail lines accessible from Ponton, MB, approximately 65 km north of the mine site. Due to the Property's proximity to Provincial Highway 6, it was assumed that all inbound freight for equipment and construction services will arrive by highway transportation.

Several transportation options were considered for possible final smelter locations to which the nickel concentrate from the Minago Project might be sold, including:

- containerized shipping to a smelter in China;
- containerized shipping to a smelter in Finland;
- bulk shipping by rail to Montreal then by sea to a smelter in Finland;

- bulk shipping by rail to Sudbury, ON; and
- bulk shipping by rail to Thompson, MB.

Other transportation options were considered, such as bulk shipping from a west coast port or through the port in Churchill, MB. In each of the west coast options, Wardrop determined that the existing infrastructure at these ports to store, bulk load, and ship the nickel concentrate was inadequate (Wardrop, 2009b). The capital cost to construct a facility of this capacity in this northern environment could be prohibitive.

Wardrop determined that shipping the concentrate by typical highway-type tractor trailer for 223 km (one way) to the smelter in Thompson, MB, was the most viable option (Wardrop, 2009b).

It was assumed that the sand products produced at the Minago operation will either be trucked from the mine site directly to buyers, or trucked to a rail siding located at Ponton, MB, where it will be loaded into rail cars for onward shipment. This siding would be serviced by HBR, which has a working relationship with CN Rail. Alternatively, the sand may be trucked into Winnipeg where both CN Rail and CP Rail lines can be accessed.

The primary market destinations investigated for sand were:

- Fort Nelson and Prince George in British Columbia (BC), which service the BC Shales;
- Medicine Hat, Alberta (AB), and Grande Prairie, AB;
- Weyburn/Estevan in Saskatchewan (SK), which services the Bakken Field; and
- Houston, Texas (TX), which services the Barnett Shales.

These destinations were identified as the current distribution centres for frac sand. Based on these destinations, quotations were acquired, and a cost analysis was performed.

The Minago operation will be staffed by workers on a rotating 14-day basis. The majority of the operational workforce will be comprised of residents from surrounding local communities. Victory Nickel may provide bus service to and from the mine site through a contracted local bus company.

There is no significant increase in environmental impact from these transportation decisions because current and well-established transportation routes and practices already exist on the Provincial Highway 6 corridor.

Source: Wardrop, 2009b

Figure 3.3-2 Minago Shipping Routes for Frac Sand and Concentrate

3.4 Decommissioning and Closure Activities

All mining projects have to submit a closure plan developed in accordance with *Manitoba Regulation* 67/99 along with the 2010 EIS and Environment Act License proposal.

In keeping with its high standards for environmental and social responsibility, Victory Nickel will implement an environmentally sound and technically feasible decommissioning and closure plan for the Minago Project. Closure planning and its implementation will be undertaken with appropriate environmental care to meet provincial and federal laws, satisfy the interests of the public, Communities of Interest, and the company's environmental standards. Victory Nickel will exercise reasonable efforts to plan, design, construct and operate the facilities for closure, with the intention of achieving a "walk-away" scenario.

Closure activities planning involved an assessment of the key site components that may place the public or the environment at risk after closure. Mitigation measures were designed to address public safety issues and environmental concerns. Post-closure monitoring and inspections have been planned at the commencement of the Project to ensure that objectives will be met. The final determination of the effectiveness of closure measures for a walk-away status of the project will likely be subject to review to ensure compliance with regulatory requirements.

Where possible, performance-based criteria have been adopted for the decommissioning and closure plan. The *Metal Mines Effluent Regulations* (MMER) end-of-pipe effluent discharge standards were used as criteria for waters emanating from the Polishing Pond. *CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (CCME, 2007, last updated, 2011) were used to assess effectiveness of closure measures to local downstream receiving waters. These same performance-based criteria will be used to determine the effectiveness of closure measures during post-closure monitoring. It is expected that post closure monitoring, and inspection results will be reviewed to ensure that the projected objectives continue to be met after the Project is decommissioned. If the projected objectives are not met, maintenance or contingency plans will be developed as necessary to address potential areas requiring further mitigation.

The closure strategy was developed to achieve the following objectives:

- protection of public health and safety;
- implementation of environmental protection measures that prevent adverse environmental impact;
- ensuring land use commensurate with surrounding lands;
- implementation of progressive reclamation measures during mine operations;
- post-closure monitoring of the Project site to assess effectiveness of closure measures for the long-term; and
- achieve "walk-away" post-closure monitoring and management until the mine presents evidence of long-term compliance with closure criteria and objectives.

3.4.1 Overview

The closure plan addresses the short-term and long-term physical, chemical and biological stability of the site including reclamation of surface disturbances. A plan has been developed that manages and monitors the site both during closure implementation in years 1 to 3 and after decommissioning and reclamation measures will be completed in years 4 to 6. The details of the plan will be updated and/or altered as information becomes available. Decommissioning cost estimates have been provided and financial security requirements have been reviewed.

3.4.2 Progressive Reclamation Programs

During the operational phase, VNI will focus on progressive reclamation as appropriate. The criteria that will be used to select candidate areas for progressive reclamation initiatives will take into account the redundant nature of site components with respect to inherent risks, impacts on the receiving environment and budgetary constraints.

At this stage, the areas that will be considered for progressive reclamation may include, but are not limited to:

- lay down areas that will not be needed after construction of the mine site;
- temporary structures installed during the construction phase;
- areas disturbed during the construction phase;
- redundant transportation corridors developed during the construction phase; and
- redundant components during the operational phase.

Components required for ongoing operations will not be subject to progressive reclamation. Necessary environmental protection measures have been adopted in the development of the overall project plan to ensure a healthy environment after mine closure.

3.4.3 Decommissioning and Closure Phase Activities

Figure 3.2-2 provides a general arrangement plan for the planned infrastructure at the property. A detailed site plan is given in 2010 EIS report.

Mine site closure will involve the removal of all equipment, the dismantling of all buildings, and the removal of all hazardous wastes. The power line will be removed and all non-essential roads will be decommissioned by removing culverts, scarifying the road, and seeding. The TWRMF and other infrastructure sites will be covered with soil and revegetated. The pit will be allowed to fill naturally, creating a deep, oligotrophic lake.

3.4.3.1 Closure of the Mine and Industrial Complex

This portion of the study focuses on the site components that require action upon closure of the operation and is restricted in scope towards the physical safety and stability of these features.

3.4.3.1.1 Open Pit Mining Equipment and Materials

All materials with marketable value will be removed from the pit workings. Materials without any marketable value, which are non-hazardous, such as piping, wood, and concrete, etc., will be left in place. Electric installation and cables will be removed. Mobile equipment such as mine trucks, drills and shovels will be removed from the pit. Equipment that cannot be sold will be disposed of in a proper environmentally sound manner.

3.4.3.1.2 Explosives and Chemicals

All explosives, detonators and accessories will be removed and returned to suppliers by the selected Explosive Contractor. Any remaining explosives that cannot be returned to suppliers will be disposed of in accordance with the *Explosive Act* by the Explosive Contractor.

3.4.3.1.3 Surface Openings

All minor horizontal openings that may cause safety problems will be capped with dolomitic waste rock and the cap will be shaped to form a 2H:1V slope to ensure stability. Any waste rock piled outside the openings will be re-graded, scarified and revegetated.

3.4.3.1.4 Borrow Areas

During construction, a large quantity of benign material will be required for the construction of the TWRMF and site infrastructure. The TWRMF and transportation corridors construction programs will require approximately 2.2 million m^3 of construction quality limestone partly originating from the limestone bluff (limestone quarry) based on the 2010 EIS report. The walls of borrow areas will be stabilized by drilling and blasting, if there are public safety concerns related to the slope of the walls.

Runoff from the borrow areas will be controlled with ditches, sediment fences and settling ponds during the initial years following decommissioning. The quarry will be monitored and the performance results will be evaluated and a decision will be made at the time whether the closure measures are satisfactory or not. The flats will be revegetated using a custom seed mixture and local plant species. The seed mixture will be developed during the operational phase as part of the research program.

3.4.3.2 Closure of Waste Rock Dumps

Waste rock from the mine will be end-dumped at a designated area – either in the TWRMF (where ultramafic waste rock will be co-disposed of with tailings) or in the Dolomite Waste Rock Dump or in the Country Rock Waste Rock Dump. The material quantities expected at closure are given in Table 3.4-1.

Table 3.4-1 Projected Quantities of Various Materials at the End of Mine Life (Victory Nickel Inc., EAP/EIS, 2010)

Material	Tonnes (kt)	Density (t/m^3)	Volume (in-situ m^3)	Volume (swelled m^3; swell value: 30%)
Ore	25,166	2.612	9,634.697	12,525,106
Sand	14,847	2.400	6,186,065	8,041,885
Granitic Waste Rock	122,005	2.702	45,148,004	58,692,405
Ultramafic Waste Rock	35,659	2.590	13,767,708	17,898,020
Overburden	11,217	1.856	6,044,945	7,858,428
Limestone	111,032	2.790	39,797,437	51,736,668
Total Waste Rock	**268,695**		**98,713,149**	**128,327,093**
Total Mined	**319,924**		**120,578,855**	**156,752,512**

Source: Wardrop, 2009b

3.4.3.3 Tailings and Ultramafic Waste Rock Management Facility

The management system for the Tailings and Waste Rock Maintenance Facility (TWRMF) includes tailings and waste rock impoundment and ancillary facilities. The ancillary facilities include a TWRMF dam, diversion and collection ditches, a spillway, and a seepage recovery system. The tailings will be co-disposed of with ultramafic waste rock.

The general layout of the TWRMF is shown in Site Plan given in Figure 3.2-2. The TWRMF will have a capacity to store tailings and ultramafic waste rock in the order of magnitude of 30.57 Mt and 36 Mt, respectively. The estimated volume for the tailings and ultramafic waste rock is 43.33 million m^3.

The Minago tailings are non-acid generating (NAG). The ultramafic waste rock is potentially acid generating (PAG) and is expected to be co-disposed with tailings under the planned closure scenario, using a “wet” closure to avoid ARD or ML from the ultramafic rock stored in the TWRMF. A permanent water cover is proposed in order to keep the materials saturated to minimize acid generation. Tailings and ultramafic waste rock geochemical characterization data are covered elsewhere. The wet closure option calls for maintaining a minimum of 1.5 m metres of water cover.

The water balance studies performed by Foth Canada and KR Design show that the facility will operate with a net water surplus. In order to minimize the amount of runoff from entering the TWRMF, Victory Nickel will install diversion ditches along the upland flank of the TWRMF. In addition, a seepage recovery ditch will also be installed to capture leakage through the TWRMF.

TWRMF supernatant waters will be discharged to the Polishing Pond before the water is discharged into the receiving environment. An emergency spillway will also be maintained during mining operations to allow discharge of water under severe storm conditions.

The TWRMF will be regularly monitored to ensure that its integrity will not be compromised.

Overall Approach to the TWRMF Management

The overall operation of the tailings management system during all mine development stages (the operational phase, the closure and post closure stages, and potentially the Temporary Suspension or State of Inactivity) will be reviewed periodically by a competent person to ensure that the TWRMF components are functioning as per design criteria and intent. In addition, prior to decommissioning, a comprehensive plan for decommissioning will be developed and submitted to the Government of Manitoba for review and approval and all subsequent decommissioning activities will be carried out according to the approved plan.

3.4.3.3.1 Operations, Maintenance and Surveillance (OMS) Manual

During operations, the site will develop an Operation, Maintenance and Surveillance (OMS) manual to deal with operational facets of the TWRMF.

The preparation of an OMS Manual for the TWRMF will be one of the major components of an overall site management framework, with linkages to other aspects of the operation. It also falls under the tailings management framework suggested by the Mining Association of Canada (MAC) in 1998. The framework includes the integration of environmental and safety considerations into each stage of the life cycle of a tailings facility.

The objective of an OMS Manual is to have one lead document which will provide basic information and procedures required for the safe operation, maintenance and surveillance of the TWRMF. It will also provide reference information to enable access to pertinent technical information.

The OMS Manual will define and describe:

- key components of the facility;
- roles and responsibilities of personnel assigned to the facility;
- procedures and processes for managing change, including a Temporary Suspension (TS) of operations or a State of Inactivity (SI);
- procedures required to operate, maintain and monitor performance of the facility to ensure that it functions according to its design and meets regulatory and corporate policy obligations and links to emergency planning and response; and
- requirements for analysis and documentation of the performance of the facility (MAC, 2003).

3.4.3.3.2 Closure Issues of the TWRMF

The long-term physical stability of the tailings embankment and the geochemical stability of the ultramafic waste rock are the key items that have been addressed in this section. The key physical stability issues are associated with potential design floods and seismic events. The only chemical stability issues associated with the waste rock in the TWRMF is the fact that these materials are potentially acid generating (PAG) as described above.

Physical Stability

The design earthquake selected for the TWRMF dam was based on the *Canadian Dam Safety Guidelines* (CDA, 1999). The tailings impoundment is classified as a Significant/High Consequence Facility. The annual probability of exceedance of horizontal peak ground acceleration was chosen to be 0.001, corresponding to a return period of 1,000 years. For the seepage recovery dam, the annual probability of exceedance of horizontal peak ground acceleration was selected to be 0.0021, corresponding to a return period of 475 years, as no tailings will be stored directly behind the dam.

Hydrotechnical Design Basis and Criteria

The hydrotechnical design criteria and basis for selected design aspects for the water management system are given in Table 3.4-2. These design criteria are expected to be adequate to protect the integrity of the TWRMF and other components of the site.

Chemical Stability

The ultramafic waste rock that will be stored in the TWRMF has the potential to generate acid. If left uncontrolled, the discharge will have a detrimental effect on the environment. In order to control ARD/ML, a water cover was selected as the design basis for the TWRMF. Therefore, the TWRMF was designed as a water–retention structure and an annual water surplus will be maintained in the impoundment during the operational, TS, SI and closure phases. The minimum water cover depth required within the impoundment to limit oxygen ingress and hence prevent the onset of ARD, is a function of the site water balance considering direct precipitation, run-in to the pond, pond evaporation and seepage losses. A minimum water depth capable to prevent de- saturation of the tailings during a 1:100 year dry-year hydrological event has been selected as the design criteria. In general, the minimum water cover could be expected to be 0.5 m. As the submerged beach will slope towards the centre of the pond, there could be in the order of 2 metres of water cover at the lowest point. During operations, the Project will develop a tailings and coarse waste rock deposition plan to ensure that all wastes will be submerged.

Table 3.4-2 Hydrotechnical Design Criteria and Basis for Selection

• Construction Diversion Peak Flow	• 1:20 yr - 24 hr rainfall	• All peak flows are estimated from catchment time of concentration and storm magnitude. Seepage to be collected via collection ditches reporting to the overall water management system.
• Operation peak flow	• 1:200 yr – 24 hr rainfall	• Runoff to be segregated from seepage, with seepage reporting to the overall water management system.
• Closure Spillway and Diversion peak flow	• 1:1,000 yr – 24 hr rainfall	• To determine wave run-up in the freeboard.
• Freeboard	• 1.0 m on the top of Closure Spillway wet section for 1:200 year runoff. • 1.0 m operational freeboard	
• Closure Flood • Runoff Coefficient	• 1:1,000 yr – 24 hr rainfall • 1	• All runoff derived from precipitation falling on the TWRMF will report to the PP, via decant structure, or seepage collection ditches and ponds.

During the closure phase, best efforts will be made to ensure a water cover is maintained to limit the formation of ARD. The water cover will address the chemical stability problems associated with the geochemical nature of the ultramafic waste rock. The natural catchment area of the TWRMF will be maintained to provide the required water balance. During operation, Victory Nickel will undertake a sensitivity analysis on the water balance for the TWRMF after mine closure to explore the water conditions during dry years and other return periods.

TWRMF Embankments

The site will develop an Operation, Maintenance and Surveillance (OMS) document to ensure that the structural integrity of the embankments is protected. The embankments will be maintained at all stages to provide a water cover for the mitigation of ARD/ML.

Dust Control

Redundant components associated with the TWRMF will be decommissioned and re-contoured. Where needed, a nominal 300 mm cover of soil will be placed over the areas to control dust and provide a growth medium for re-vegetation. The soil will consist of locally available overburden with sufficient amounts of fines for seeding and planting.

Interceptor Ditches

Redundant interceptor ditches associated with the TWRMF will be breached and re-graded to restore the ground to erosion resistant drainage patterns.

Tailings Pipelines

During the closure and post closure phases, the tailings pipelines will be removed and stored on site for future use and those sections that are of poor quality will be disposed of in a proper manner. All drop boxes will be removed.

Spillway

The spillway is designed to allow the safe passage of flood water without overtopping the TWRMF embankments under extreme design hydrological events. The spillway will be maintained during the closure phase to ensure that it performs as per design intent and criteria. The spillway approach channel to the Polishing Pond will be maintained to be in good working order. The approach will contain sufficient coarse-grained material to effectively prevent local re-suspension of tailings solids. The spillway crest and side slopes will be covered by riprap.

Seepage Recovery Ditch

The seepage recovery pond will be maintained and inspected on a regular basis during the closure and post-closure phases.

3.4.3.4 Infrastructure: Buildings, Structures and Services

Closure issues related to infrastructure include public health and safety, site stabilization aesthetics and restoration of disturbed lands. Site decommissioning will include the removal of all constructed infrastructure materials, with the exception of concrete foundations. Concrete foundations and other concrete structures will be broken down to ground level and buried in situ. This will be accomplished using internal resources and contractor demolition companies. It is expected that there will be a salvage value for much of the materials, particularly structural steel and other crushing, grinding and processing equipment from the mill. The residual values of the mining and milling equipment and materials may be used to offset closure costs.

In all cases, equipment with marketable value will be removed first. The remaining facilities and equipment will be assessed for disposal through demolition and salvage contracts. It is not possible to accurately predict the residual values of the non-reclamation assets at the time of closure; values have instead been assumed based on current market conditions. Milling and mining equipment are expected to carry significant salvage value that can be used to offset closure costs. Material that is not economically salvageable will be buried in an on-site refuse landfill.

At the time of closure, the following infrastructure will remain in place to support post closure care and maintenance:

- local access roads to the base camp and water treatment plant;
- reclamation equipment such as trucks, dozer and snowmobile machine;
- water management systems;
- fuel storage facility;
- small power generating facility;
- small maintenance workshop;
- limited accommodations;
- environmental laboratory; and
- communication system.

The above facilities will be decommissioned, once they will no longer be required.

3.4.3.4.1 Concentrator Building (Mill Building)

The concentrator building will be decommissioned during the closure phase.

The ore concentrator (the "mill") will be comprised of the mill building itself; the crusher house; grinding, flotation and dewatering systems; conveyors; and a truck load out facility. All buildings will be made from steel and constructed on concrete slab flooring. The mill building itself will house what is expected to be the most marketable components from a salvage perspective, especially the crushing and grinding circuits and structural steel, as well as other scaffolding and processing equipment.

Buildings and equipment that will not be salvaged will be demolished and the debris will be hauled for burial in the refuse landfill on site. The concrete foundations will be demolished to ground level and the rubble will be buried in situ after being covered.

3.4.3.4.2 Maintenance Shop

The maintenance shop will be demolished and removed upon closure. Debris will be hauled to the refuse landfill. The foundation will be demolished to ground level and buried on-site with approximately 300 mm of native soil material.

3.4.3.4.3 The Camp

The 300-person camp will consist of sleeping units, ablution units, a communal cafeteria style kitchen and limited indoor recreational facilities. The modular units will be factory-built to minimize construction time on site. All unused sleeping units will be secured until closure when they will be removed from the property and sold.

3.4.3.4.4 Explosive Magazines

Explosives magazines will either be returned to suppliers for credit, or shipped to other nearby mines that may use the explosives. Unused explosives will be checked and either returned to the supplier for credit or destroyed through appropriate procedures. Detonation devices will be returned to the supplier for credit. In all cases, the explosives will be handled, transported and disposed of in accordance with the *Explosive Act*.

3.4.3.4.5 Miscellaneous Buildings and Structures

During the closure phase, all miscellaneous buildings and structures will be demolished and the debris disposed of in an environmentally sound manner.

Fuel tanks will be hauled away and sold. Fuel berm will be re-contoured, the liner removed and hauled to the refuse landfill on site. The back-up diesel generators will be removed for salvage. The power transformers and power line will be removed for salvage and power poles will be destroyed or removed for salvage based on their condition. Fencing will be demolished and buried on site.

3.4.3.5 Industrial Reagents and Wastes

3.4.3.5.1 Mill Reagents

Some chemicals and mill reagents are more likely to be sold more than others. These chemicals and reagents will be shipped and stored in the concentrator in kilogram barrels. Storage of reagents in the mill provides containment within a concrete foundation in the event of leakage or fire.

3.4.3.5.2 Other Chemicals

Other chemicals such as solvents, paints, cleaners, and battery acid will be removed and:

- returned to the original supplier for credit and reuse;
- given to a third party user, subject to meeting the *MB Environment Act*; or
- removed from the mine site and disposed of through a licensed waste management firm. In such an event, the disposal will only take place following consultation with and approval from the appropriate regulatory authorities.

Waste vehicle batteries will be segregated and stored in a containment area for periodic shipment to a licensed battery disposal facility.

3.4.3.5.3 Sewage System

Upon closure, the septic system will be pumped out and de-sludged. The sludge will be deposited in the TWRMF. The remaining infrastructure (i.e. piping and related materials, including the septic field) will be buried on-site.

3.4.3.5.4 Fuels and Lubricants

It is expected that the inventory of hydrocarbon products at the Minago Project will be consumed as mine operations are brought to a close. Fuels and lubricants will be required during the closure phase.

The inventory remaining on-site once all activities will have ceased will be:

- returned to the original supplier for credit wherever possible;
- sold to a third-party user; or
- trucked to an authorized disposal agency to be recycled or destroyed.

Diesel-powered vehicles and the back-up diesel-fired electrical generators will provide Victory Nickel with a method of reducing remaining inventory of diesel fuel as the mining operations will cease. Excess gasoline storage facilities will be removed and disposed of in an approved manner. The bulk diesel fuel storage tanks will be emptied of their contents in accordance with the *Manitoba Environment Act*. Tanks too large for removal will be cleaned by a licensed waste management company. The sludge will be treated or removed in accordance with regulations. The cleaned tanks will then be salvaged, or buried on-site in the landfill.

Rental propane tanks will be removed by the propane supplier. Associated fuel delivery lines will be removed and disposed of in a manner similar to that of the gasoline and diesel fuels.

Victory Nickel plans to return unused hydrocarbon products, such as hydraulic fluids, lubricant oils, greases, antifreeze and solvents, to suppliers for reuse or sale. In certain circumstances, small volumes of specialized products may require disposal through a licensed waste management firm.

During the final site assessment, hydrocarbon contaminated soils will be isolated and processed for remediation. Any fuel storage areas and refuelling stations, once decommissioned, will then be assessed for soil contamination. The contaminated soils may be removed from the mine site and disposed of through a licensed waste management firm. Alternatively, the soil may be land-farmed in cases where bioremediation will effectively clean the soils. In either case, the selected disposal method will be in accordance with the Provincial *Environment Act* and *Special Waste Regulation*.

3.4.3.5.5 Scrap Metal

Scrap equipment will be stored in various lay-down areas located within the industrial area. At the time of mine closure, salvageable material from these sites will be sold as scrap and removed from the site. Materials that have no scrap value will be disposed of in the landfill on site. Prior to disposal in the landfill, all of the materials will be examined to ensure that all hazardous materials have been removed and disposed of in an environmentally sound manner.

3.4.3.5.6 Site Landfill (Garbage Disposal Area)

The landfill on site will be used for the disposal of non-putrescible wastes, such as lumber and scrap metal, that have no salvage value. Where permitted, the combustible wastes in the landfill area will be burned and the non-combustible debris will be buried under a soil cover. Final demolition and reclamation of the site will generate some non hazardous waste material that will be disposed of in the landfill area. The landfill area will be reclaimed with a 300 mm thick layer of compactable soil material obtained from the Overburden Disposal Facility (ODF). The landfill will be graded to prevent pooling of precipitation runoff and to encourage the shedding of water. The site will then be re-vegetated.

3.4.4 Decommissioning and Closure Activities in Pre-final Mine Closure Stages

Potentially, there may be two stages prior to final closure: Temporary Suspension (TS) and State of Inactivity (SI). TS means that mining and milling production activities have been suspended, while SI means that mine production and mining operations on site have been suspended indefinitely. The TS may become an SI, if the suspension period is longer than planned. Similarly, the SI may turn into a permanent closure, if prevailing conditions for resumption of operations are not favourable.

TS means that advanced exploration, mining or mine production activities have been suspended due to factors such as low metal prices, or mine-related factors such as ground control problems and labour disputes. On the other hand, SI occurs when mine production and mine operations have been suspended indefinitely.

Victory Nickel recognizes the legitimate concern that government and the public may have with respect to a TS. Generally, Victory Nickel will not be able to definitively state when the Project will reopen after a TS. However, during a TS, Victory Nickel will act as a responsible steward and will demonstrate its commitment to reopening the site by:

- continuing to have the site under the care and maintenance of an on-site caretaker;
- continuing to maintain the main access road in a manner that heavy equipment can be brought to the site on short notice to deal with any environmental emergency;
- continuing to adequately monitor and maintain buildings and facilities such as the TWRMF on the site; and
- ensuring that major fixed equipment and buildings remain essentially intact on site.

The Provincial government may periodically review the temporary closure status of the mine. If the above conditions are not substantially met, then the closure may be deemed "permanent" unless factors exist to reasonably convince the government otherwise. If closure is deemed to be permanent, then the Decommissioning and Closure Plan must be implemented. An updated closure plan to reflect the state of the site may be required.

3.4.4.1 Aboveground and Underground Tanks

The aboveground and underground tanks will be regularly monitored for leakage to ensure they are operating according to the applicable regulations and licenses.

In the event that the TS turns into an SI, a fuel distribution agent or a licensed waste management contractor will pump out the contents of all storage tanks that were not used during the TS and disposed of appropriately. Tanks that will not be reused will be removed and offered for sale or scrap, following appropriate procedures and protocols.

3.4.4.2 Pipelines, Power Lines and Power Supply

All out of service, above-ground pipelines, except for the water lines, will be cut into usable sections and offered for sale or disposed of in a proper manner.

3.4.4.3 Tailings and Ultramafic Waste Rock Management Facility (TWRMF)

The TWRMF dam will be maintained in a safe condition pursuant to the *Dam Safety Guidelines* (Canadian Dam Association, 2007) with spillways left open to ensure natural drainage. A geotechnical inspection protocol will be developed for the TS, SI and ultimate closure. The inspection protocols will be in line with the TWRMF Operating, Maintenance and Surveillance (OMS) program. There will be three levels of surveillance to monitor the TWRMF:

1. a daily visual inspection of the TWRMF by site personnel;
2. an annual geotechnical inspection of the TWRMF by a geotechnical engineer; and
3. a dam safety review as per *Dam Safety Guidelines*.

Instrumentation will be in place to assess the geotechnical behaviour of the TWRMF. The instrumentation will include but not be limited to the following:

- electric wire and standpipe piezometers to measure pore pressure in the tailings upstream of the dam;
- embankment movement points and settlement pins to measure surface deformation of the dam(s);
- weirs at the toe of the dam to estimate seepage through the dam; and
- survey levels on the decant system (e.g. towers) to measure pond water levels.

Meteorological data (temperature, rainfall, snow pack, etc.) will continue to be collected to confirm design assumptions and to establish the monitoring frequency during the operational and closure phases.

Chemical Stability

During TS, SI and closure phases, best efforts will be made to ensure a water cover is maintained to limit the formation of ARD. The water cover will address the chemical stability problems associated with the geochemical nature of the ultramafic waste rock.

TWRMF Embankments

During the TS and SI, the tailings embankments will be maintained and inspected as per the TWRMF OMS manual.

Tailings Pipelines

During the TS and SI stages, the tailings pipelines will be left in place and will be maintained to ensure that they are operable when operations resume.

Spillway

The spillway will be maintained during the TS, SI phase to ensure that it performs as per design intent and criteria. The spillway is designed to allow the safe passage of flood water without overtopping the TWRMF embankments under extreme design hydrological events.

Seepage Recovery Ditch

The seepage recovery pond will be maintained and inspected on a regular basis during the TS and SI phases.

3.4.4.4 Hazardous Materials and Lubricants

Victory Nickel will maintain the appropriate permits to ensure compliance with conditions under the *Environment Act* and applicable regulations, such as the *Storage Tanks Regulations*, for the storage and handling of petroleum products and other hazardous substances.

3.4.4.5 Chemicals, Fuels, Explosives and Chemical and Other Wastes

All unused chemicals that have short shelf lives will be returned to suppliers/manufacturers; all other chemicals will be disposed of in an environmentally-sound manner. In the event that the TS becomes an SI, no chemicals will be stored at the site, with the exception of those required for incidental uses.

Fuel supplies for equipment will remain on-site and diesel fuel tanks will remain in service during this stage. Victory Nickel will comply with the requirements under the *Environment Act* pertaining to storage and handling of petroleum products.

All unused explosives and blasting agents will be returned to the suppliers by the selected Explosive Contractor. If considered impractical, then, the explosives will be destroyed in a safe manner consistent with the *Explosives Act* by the Explosive Contractor.

All chemical wastes will be handled, stored and disposed of according to the appropriate regulations under the Manitoba Government (MBG) *Environment Act* and *Special Waste Regulation*. The appropriate regulations include but are not limited to the *Contaminated Site Remediation Regulation*, *Special Waste Regulation*, *Solid Waste Regulation*, *Storage Tank Regulation* and *Spills Regulation*.

All other mine wastes will be handled, stored, managed and disposed of in a proper manner during the TS. As there will be no tailings and waste rock generated during this phase, the main waste sources will be from the mobile equipment such as spent fuels, domestic waste and other minor waste streams. A waste management plan will be developed during the operational phase to deal with the site waste. The wastes stored during the operational phase and the TS will be disposed of in an environmentally-sound manner, either locally or at a licensed waste management facility. Sludge from active water treatment will be deposited in the TWRMF.

Non-hazardous solid wastes (garbage) will be disposed of in an acceptable manner as per *Solid Waste Regulations*. Victory Nickel also may apply for a license to burn some of the waste materials on site through a Burning Permit.

3.4.4.6 Infrastructure: Buildings, Structures and Services

The infrastructure, including buildings, structures and services, will be left in place during the TS and SI stages. However, the redundant infrastructure will be decommissioned and disposed of in an appropriate manner.

Few of the sleeping units in the 300-person camp will be occupied during the TS and SI phases, since there will be a limited number of people on site for care and maintenance. The unused sleeping units in the 300-person camp will be secured.

3.4.4.7 Water Management during TS and SI

Schematic diagram of the water management systems for the site during TS, SI, Closure and Post Closure Stages are given in Section 2.14. The water management systems will be maintained to:

- meet the MMER Water Quality standards;
- facilitate the recovery and removal of as much supernatant water as practicable from within the TWRMF during TS and SI; and

- allow the discharge of water to the environment only upon verification of acceptable quality. The TWRMF supernatant water will be directed to the Polishing Pond. The discharge from the Polishing Pond will be pumped out to the Minago River.

The TS and SI will differ from the operational water management system configuration as follows:

- the recycle loop of water to the process plant will not exist during the TS and SI, and
- a smaller quantity of water will be pumped from the groundwater wells to provide water for fire fighting.

3.4.4.7.1 Polishing Pond during TS and SI

The water quality in the Polishing Pond will be monitored to ensure that all discharges to the receiving environment will meet the *Metal Mines Effluent Regulations* (MMER) discharge criteria (Environment Canada, 2002a), detailed in Table 3.4-3.

During TS and SI, the influent to the Polishing Pond will be lower than the operational inputs to the plant. This is due to the fact that sources of effluents such as the process plant will be eliminated.

Victory Nickel will develop an OMS manual for the Polishing Pond in order to ensure that the discharges to the receiving environment will meet discharge criteria. The sludge from the Polishing Pond will be disposed of in the TWRMF. Victory Nickel will ensure that stringent sludge handling, storage and disposal measures will be implemented and will be in line with the Regulations under the *MB Environment Act*.

Table 3.4-3 MMER End-of-Pipe Effluent Discharge Criteria

Contaminant of Concern	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentration in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
TSS	15.00 mg/L	22.50 mg/L	30.00 mg/L
Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

3.4.4.8 Contingency Measures

Water quality in the collection system and discharges to the receiving environment will be monitored in accordance with the MMER, CCME Guidelines (for aquatic environment) or Site Specific Water Quality Objectives (SSQO) and Water License operating standards. If there is any significant degradation of water quality, Victory Nickel will develop contingency measures that will best achieve water quality improvements. Contingency measures intended to address upset conditions are detailed below. The measures to reduce water inputs into the water management system will include but not be limited to the following:

- maintenance of the existing diversion corridors and, if required, enlargement thereof to increase water handling capacity; and
- monitoring of all sensitive areas.

Any bare or denuded areas will be reseeded and shrubs will be planted. Areas that appear to be nutrient-deficient will be re-fertilized. It is expected that shrubs and tree growth will occur naturally within the revegetated areas. All major revegetation tasks will occur after roads and structures will have been removed.

3.4.4.9 Monitoring Program during TS and SI

The permit-related monitoring program will continue during the TS phase. The program will be adjusted to account for the non-operational main waste stream of tailings slurry (zero flow). The permit and non-permit related waste streams will be assessed in terms of their physical and chemical characteristics. For any parameters that exceed the stipulated thresholds, Victory Nickel will develop contingency measures to ensure that the receiving environment is protected.

3.4.5 Land Reclamation and Land Use

Pre-Mining and Current Land Use

Existing land use for the project area consists largely of wildlife habitat with some limited hunting, trapping and fishing. Land uses for TS, and SI phases will be the same as those for the operational phase. The recreational capability of the area is limited by poor accessibility due to presence of muskegs and soft clays, excessive snow depths and prolonged climatic winter conditions.

At present there are no agricultural activities in the area. Soil capability for agriculture is restricted by climatic limitations including short growing season and wetland conditions.

Post-Mining Land Use

Reclamation plans will be developed to return the site to a condition that will support wildlife uses, which in a large part centres on the deactivation of access corridors and surface openings. The projected end land use is qualified by the fact that the site experiences significant snow depths, prolonged winter climatic conditions and isolation from large population centres. There will be no losses of valuable aquatic habitat during the operational, TS, SI and closure phases.

The project area does not have any significant marketable timber and therefore, commercial harvesting of timber from the claims area in the future is unlikely. Consequently, lands within the project area are classified as having low forestry capability.

Land Reclamation

The primary objectives of land reclamation will be to provide short and long-term erosion control, to ensure land uses compatible with surrounding lands, and to create a self-supporting ecosystem. The overall goal is to prepare the site so that the vegetation returns to a state as near as possible to that in existence prior to mining activities.

This section describes the areas projected for reclamation, and the closure constraints and measures proposed.

Victory Nickel will determine the availability of natural seed or productive seed material available from local surroundings for the reclamation of the disturbed areas. Revegetation seed mixtures will be formulated using knowledge of the naturally occurring vegetation and soil conditions. Additional soil samples on the disturbed areas will be required to determine areas of localized nutrient deficiencies. Further to soil sampling, experimentation with seeding and fertilizer rates will be carried out at the property to determine the optimum mixes for preventing seeded species from becoming too firmly established which will in turn inhibit the invasion of the area’s natural colonizing species.

The nutrient uptake by northern native seed varieties on nutrient deficient soil is usually more effective than nutrient uptake by southern agronomic species. However, seeding with agronomic species at the site may be required due to high cost and limited availability of northern native re-vegetation species.

To determine whether wildlife may be exposed to metal poisoning, Victory Nickel will test various site plant species for metals uptake to assess if there are any potential concerns of ingestion of the plants by grazing and/or browsing animals.

In order to establish a successful revegetation program, Victory Nickel will initiate a methodical program to confirm:

- an inventory of overburden dump soils around the site for reclamation cover;
- the nutrients in available soils to determine level of amendments required;
- optimum seed mixes to determine appropriate seed mixes for reclamation; and
- the potential metals uptake by the plants.

These studies are expected to be implemented during the operational phase to establish the recipe for progressive reclamation and closure. Victory Nickel plans to develop field test trials and test plots as part of the assessment.

In large areas, such as the industrial areas, where natural seed sources are less available, the seeding/planting of indigenous shrub species (primarily willow, birch and alders) may be required to encourage the later stages of plant succession on these sites. Shrub species will be planted concurrent to the re-vegetation program.

Potential Re-vegetation Species

Based on the review of currently established shrub species in the previous Section, green alder (Alnus crispa), willows (Salix spp.), and potentially paper birch (Betula papyrifera) and/or shrub birch (Betula glandulosa) appear to be candidates for successful re-vegetation at Minago Project. All of these species have been successfully used or recommended at other sites for the purposes of reclamation and re-vegetation.

3.4.6 Decommissioning, Closure and Reclamation Schedule

The Decommissioning, Closure and Reclamation (DCR) schedule will depend on a number of factors including: redundancy nature of the component(s); future use of the components; Environmental, Health and Safety (EHS) considerations and cost effectiveness. Table 3.4-4 gives DCR projections for the closure implementation stage (1 to 3 years) and the demonstration period (4 to 6 years following the closure implementation stage). It is important to note that once the closure is declared, Victory Nickel will develop a detailed closure plan complete with revised cost estimates and time schedule. The revised DCR plan will be the basis for final closure implementation and setting out the components for the demonstration period.

Table 3.4-4 Minago Project DCR Schedule

Component or Program	Closure Implementation Stage (1 to 3 years following Closure)	Demonstration Period (1 to 3 years following the Closure Implementation Stage)
Site Access Corridors that are Redundant	Will be decommissioned and reclaimed during this stage.	Performance monitoring will be undertaken.
Industrial Area Complex (Mill, Frac Sand, Warehouse, Maintenance Shop, etc.)	Will be decommissioned and removed during this stage.	Performance monitoring will be undertaken.
Main Access Road	Access road will be blocked to restrict entry.	Access road will be blocked to restrict entry. However, the Access Road may not be completely deactivated if the COI would like to use it in the future and therefore, stewardship will be transferred to COI.
Open Pit Mine	Pit will be decommissioned and flooded.	Performance monitoring will be undertaken to determine the water quality and discharge points.
TWRMF (Co-disposal of tailings and ultramafic waste rock)	Will be decommissioned and closed out with a water cover.	Will remain to be a water retention dam to provide a wet cover to mitigate ARD. Performance monitoring will be performed during this stage.
Personnel Camp	Partial	Limited camp buildings will be left.
Water Discharge Line to the Minago River	Will be deactivated.	Water discharge line will be decommissioned and the line removed. The line bed will be blocked to prevent entry.
Polishing Pond	Depending on TWRMF water quality the Polishing Pond will be decommissioned and reclaimed during this phase.	Performance monitoring will not be required during this period.
Oakley Creek	Monitor surface water upstream and downstream of the Oakley Creek watershed.	Monitor surface water upstream and downstream of the Oakley Creek watershed.
Minago River	Discharge to the Minago River will be staged to allow smooth transition to pre-development base flows. Water quality will be monitored to determine recovery after closure.	Monitor water quality to determine the degree of recovery after closure.
William River downstream of Oakley Creek	Monitor impacts (if any) and degree of recovery.	Monitor impacts (if any) and degree of recovery.

Table 3.4-4 (Cont.'d) Minago Project DCR Schedule

Component or Program	Closure Implementation Stage (1 to 3 years following Closure)	Demonstration Period (1 to 3 years following the Closure Implementation Stage)
Industrial Area – Contaminated Sites	Undertake an assessment and remediation programs.	Monitor to determine performance of remediation measures.
Hydro Sub Stations	Decommission and leave adequate capacity for the closure implementation period, demonstration period and beyond, if needed.	Assess future power requirements.
Pit Dewatering Wells	Decommission the Pit Dewatering Wells and remove their appurtenances.	Decommission the Pit Dewatering Wells and remove their appurtenances.
Dolomite Waste Rock Dump	Where practical, plant green alder seedlings.	Monitor the performance of the revegetated areas of the dump.
Country Rock Dump Waste Rock Dump	Where practical, plant green alder seedlings.	Monitor the performance of the revegetated areas of the dump.
Overburden Disposal Facility (ODF)	Where practical, plan green alder seedlings.	Monitor the performance of the revegetated areas of the dump.
Runoff Collection Systems	The site ditches will be left in place.	The ditches will be left in place and will be monitored accordingly.
Equipment	Set aside reclamation assets and dispose of non reclamation assets.	Continue to market non-reclamation assets and assess equipment needs for post-demonstration period, if required.
Water Supply Systems	To be decommissioned, if not required.	To be decommissioned if not already done so.
Reclamation Maintenance	Assess requirements for reclamation maintenance.	Assess requirements for reclamation maintenance.
Decommissioning, Closure and Reclamation (DCR) Cost Estimates	Continue to review the DCR cost estimates.	Continue to review the DCR cost estimates.
Monitoring Programs	Update monitoring programs to reflect prevailing environmental constraints.	Update monitoring programs to reflect prevailing environmental constraints.
Comprehensive DCR Performance	Plan for a comprehensive DCR performance assessment.	Undertake DCR performance assessment. Obtain Certificate of Closure if all requirements are met or exceeded.

3.4.7 Reclamation and Decommissioning Cost Estimates

The costs of site rehabilitation have been developed using market prices for similar work recently completed or quoted on other sites. Using rates for the demolition of buildings solicited from local contractors, typical demolition unit rates were evaluated. For the Minago Project, unit rates between $10 and $30 per square metre for demolition were used. Other unit rates for associated work were also solicited from Contractors with experience on similar projects. A 10% cost increase was assigned to the 2010 EAP/EIS Unit rates. Table 3.4-5 summarizes the reclamation, decommissioning, monitoring, closure and post-closure costs. Costs estimates for the closure of the TWRMF are given in Table 3.4-5.

Table 3.4-5 Estimated Closure Costs for the proposed TWRMF

1 TWRMF	**Cost**
1.1 Construct Spillway Exit Channel to the Pond	
Supply and Place Geotextile	$ 8,000.00
Supply and Place Rip	$ 1,705.00
Design of Spillway Channel	$ 23,000.00
Construct Spillway Exit	$ 16,280.00
Site Supervision of Spillway and Channel Construction	$ 12,800.00
Sub Total	**$ 61,785.00**
1.2 Tailings Pipeline (2km)	
Remove Pipeline from Mill to TWRMF	$ 20,265.00
Seeding and Fertilizer Application	$ 4,664.00
Sub Total	**$ 24,929.00**
1.3 Pipeline to Minago River	
Remove Pipeline (10 km)	$ 108,284.00
Seeding and Fertilizer Application	$ 8,745.00
Sub Total	$ **117,029.00**
1.4 Mine Dewatering System Pipeline	
Remove Mine Dewatering Pipeline (6 km)	$ 64,970.40
Seeding and Fertilizer Application	$ 5,247.00
Sub Total	**$ 70,217.40**
Grand Total (Estimated Closure Costs for TWRMF)	**$ 273,960.40**

The demolition costs have been estimated assuming that salvaged material is the property of the contractor after the removal of process equipment.

On the basis of the cost estimates, the overall closure cost is estimated to be Cdn $8,036,858.

Table 3.4-6 Closure Cost Summary

Component	Cost
Estimated cost for TWRMF closure	$273,960
Estimated demolition costs for site buildings	$1,044,169
Estimated costs for closure of miscellaneous site components	$446,0161
Estimated costs for land reclamation	$904,568
Estimated costs for post closure site management and environmental protection	$5,368,099
Total	**$8,036,858**

3.4.8 Financial Assurance

Manitoba Mine Closure Regulation 67/99 requires that financial assurance be provided for the anticipated reclamation costs. Victory Nickel will negotiate the required financial assurance with the MB Government at the appropriate time.