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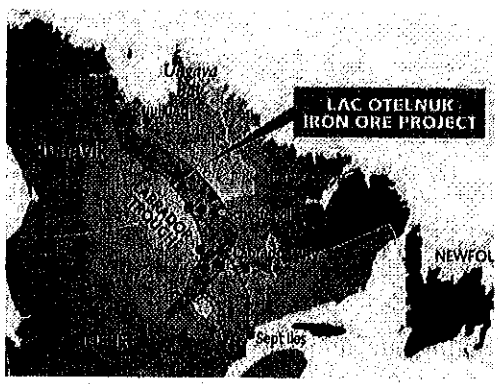
Adriana Resources Inc.

NI 43-101 TECHNICAL REPORT ON THE PRELIMINARY ECONOMIC ASSESSMENT FOR 50 MTPY

OTELNUK LAKE IRON ORE PROJECT

QUEBEC – CANADA



43-101 Final Report

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MET-CHEM

IMPORTANT NOTICE

This Report was prepared as a National Instrument 43-101 Technical Report for Adriana Resources Inc. (Adriana) by Met-Chem Canada Inc. (Met-Chem). The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in Met-Chem's services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this Report. This Report is intended for use by Adriana subject to the terms and conditions of its contract with Met-Chem.

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EXECUTIVE SUMMARY

Background, Scope of Work and Basis of Study

The present report presents a preliminary assessment of the capital and operating costs of the Lac Otelnuk Iron Property project owned by Adriana Resources Inc. (Adriana). This estimate is considered to be a Scoping Study based on the estimate of mineral resources compliant with Canadian Securities Administrators National Instrument 43-101 (NI 43-101) as provided by Watts, Griffis and McOuat Limited (WGM) in their report dated May 7, 2009.

Diamond drilling was undertaken between 1970 and 2008 on what became defined as the North Zone and the South Zone. Development work on the project included metallurgical testing, and culminated with a NI 43-101 compliant resource estimate (WGM, May 2009) amounting to 4.29 billion tonnes of Indicated Resource grading 29.08% TFe and 1.97 billion tonnes of Inferred Resources at 29.24% TFe.

In November 2010, Met-Chem Canada Inc. (Met-Chem) was retained by Adriana to produce a NI 43-101 Preliminary Economic Assessment of the Lac Otelnuk Iron Property. This scoping level is intended to evaluate options, based on the present limited data, to establish the viability of the Project at a production rate of 50 million tonnes of pellets per year in order to justify proceeding with other phases of project development.

The present study is based on the assumption that an open pit mine and concentrator operation will be constructed at Lac Otelnuk together with the required tailings disposal works and site infrastructure. Pellet production is also included in the concept with an assessment of site location at either the mine or port site included within this Study. Railway transport of the iron pellets to a newly constructed port facility, capable of servicing +400,000 DWT vessels, located at the Sept-Îles Port is also assumed.

The technical review and annual capacities considered for the base case are approximately 182 million tonnes of ore generating 49 million tonnes of concentrate to produce 50 million tonnes of pellets. Cost estimates are developed, in part, on the basis of three modules producing 16.6 million tonnes of pellets per year.

Property Location and Access

The Lac Otelnuk Iron Property is located in the region of Nunavik created under the James Bay and Northern Quebec Agreement in the Province of Québec about midway north in the Labrador Trough iron range. The property is situated approximately 155 km in a straight line northwest of the village of Schefferville near the border with Labrador, and 225 km south of the village of Kuujjuaq. Schefferville is located approximately 1,200 km northeast by air of Montréal.

There is no road access to the Property. Several lakes on the north and south parts of the Property, and are accessible from Schefferville and Kuujjuaq via fixed-wing float or ski-equipped aircraft. Access to Schefferville and Kuujjuaq is provided by daily scheduled air service from Québec City, Montréal, and Sept-Îles. There is also a once-a-week round-trip passengers and freight train between Schefferville and Sept-Îles.

The village of Caniapiscau, situated about 160 km southwest of the Property, provides an alternative access route. The village is connected by the Trans-Taiga road from Val d'Or via Matagami and Radisson.

Geology, Mineral Resources and Mining

The Property is situated in the Labrador Trough, also referred to as the Labrador-Québec Fold Belt, or the "Trough", adjacent to Archean basement gneiss. The southern part of the Trough is crossed by the Grenville Front representing a contact with highly metamorphosed and complexly folded rocks. Adriana's Lac Otelnuk Property is located north of the Grenville Front in the Churchill Province where the principal iron formation unit is known as the Sokoman Formation.

Iron deposits in this part of the Trough are taconite, or weakly metamorphosed iron formation. Taconite iron deposits in the Trough include New Millennium's KéMag and LabMag deposits (Howells River Deposit) and the December Lake deposit. Mineralization of interest on the Lac Otelnuk property is the iron formation that consists mainly of magnetite (Fe_3O_4) and hematite (Fe_2O_3) in bands alternating with chert or jasper.

WGM modeled the upper five geological sub-units of the Lac Otelnuk iron formation for the Mineral Resource estimate. A summary of the Mineral Resources, presented in the WGM Report of 2009, is presented in Table ES 1.

Table ES 1 – Lac Otelnuk Iron Project Estimated Mineral Resource at a Cut-Off Grade of 18% DTWR

Resource Category	Tonnes (billions)	%TFe (Head)	DTWR %	SiO_2 % (DTC)	TFe % (DTC)
Indicated	4.29	29.08	27.26	3.53	68.00
Inferred	1.97	29.24	26.55	3.51	68.12

The PEA is based on a large-scale open pit operation utilizing shovels and trucks to move an average of 175 million tonnes of mineralization and 125 million tonnes of waste per year over a 34 year mine life.

Concentrator

Mineral processing and metallurgical testing prior to 2009 are well documented and summarized by two WGM reports in 2005 and 2009. These reports are available on SEDAR.

The main conclusion that came from the testwork, the latest in 2010 by WISCO, is that the iron mineralization from Lac Otelnuk can be processed with stage grinding and low intensity magnetic separation. Fine grinding at 80% finer than 53 microns is required to achieve a good concentrate of 68.5% Fe with silica content of approximately 4%. The weight recovery averaged around 30%, while the magnetite recovery was around 96%.

Based on the testwork performed to date, knowledge acquired in the processing of magnetite-rich ores in the Iron Range in Northern USA, and new developments in iron ore processing equipments, a preliminary flowsheet was developed for this study. The flowsheet, designed to produce 16.4 Mtpy of iron concentrate, represents one of three modules incorporating semi-mobile primary gyratory crushing, secondary cone crushing, primary grinding, magnetic separators, concentrate dewatering, and tailings dewatering and disposal. The three modules will produce the target 49.1 Mtpy of concentrate translating to 50 Mtpy of pellets after pelletizing.

Primary grinding will be done with high pressure rolls (HPGR's). This technology is now proven and gives operating availability as high as or higher than SAG mills. HPGR's require a larger number of equipment (secondary crushers, conveyors, screens, bins, feeders), but they have a lower capital and operating cost than the large SAG mills. In terms of concentration, the plant will only make use of Low Intensity Magnetic Separators (LIMS), screening and desliming to reach an anticipated final concentrate of 68.5% Soluble Fe at 80% –53 µm.

The proposed flowsheet is preliminary requiring confirmation as the project moves into feasibility stage. Presently, it is anticipated that only the magnetite-rich horizon will be treated and that only magnetite will be recovered. Experience to date in the Iron Range in Minnesota has proved to be unsuccessful at recovering the non-magnetic portion of the feed economically.

Tailings Management

Two tailings management options proposed in the 2006 Met-Chem Report: Concession and Adanys; were re-assessed for this Study.

Preliminary assessment of tailings disposal requirements estimated 2,300 Mm^3 of tailings will be produced over the 34 year mine life. At this level of containment, the Adanys option becomes expansive covering the northern section of the deposit. Alternately, the Concession option, with the deep valley, can be dammed to facilitate the containment needed. For this reason, the Concession option was selected for this PEA.

Pellet Plant Location

A cursory study evaluating the potential location of the pellet plant, mine or port site, was performed which identified a variety of key elements to help determine the optimal location. Pros and cons for each location were summarized, and a preliminary judgment made.

Given the potential added capital and operating costs associated with transporting concentrate by rail to the port, and the need to develop a rather significant workforce for the Otelnuk site, it appears advantageous to establish a complete processing complex at the mine site. This complex would include the mining, crushing, concentrating, and pelletizing operations.

The location must be finalized during the pre-feasibility/feasibility levels as more information is gathered, and Adriana progresses with negotiations.

Pellet Plant

As with the Concentrator, the Pellet Plant will be built as three turn-key modules. Each pelletizing module will be composed of two identical lines that will include: thickeners, slurry tanks, filtering equipment, cake storage bin, mixers, balling discs with roller screen, indurating machines, and a common pellet screening, hearth layer and conveyor system. These identical lines will each have a capacity of 8.5 Mtpy of iron pellets. Appropriate dust control equipment and induration process waste gas cleaning equipment will be installed as required in the circuit.

Project Site Infrastructure

An access road from Brisay to the Otelnuk site will be constructed. The distance from Brisay to the Otelnuk site is roughly 240 km; however, there is a road already as far as Caniapiscau which means the distance of new road is roughly 175 km. Other transport-related infrastructure will include a rail yard and related facilities for offloading pellets and reception of supplies by rail, and an airstrip and facilities.

The mill complex will be constructed. It will include the concentrator and pellet plant, administration, safety and environment, infirmary, technical support, operation personnel offices, change house, warehouse, mine garage and general maintenance shops. Other site infrastructure will include fresh water supply pump house, sewage treatment plant, steam plant, fuel tank farm, incinerator plant, concrete cement plant, aggregate plant.

A camp complex including accommodations, cafeteria and recreational facilities will be erected upwind from the concentrator. It will initially accommodate construction workers and afterward site employees and guests after start up of operations.

The total estimated electrical power required at the Otelnuk site is estimated to some 635 MW when 50 million tonnes of pellets are being produced per year. It is proposed the power be received from the Brisay generating station located approximately 240 km from the Otelnuk site, and distribute electric power at the mine site at 34.5 kV. This is an industry standard voltage for projects using comparable power levels. In order to transmit upwards of 635 MW over such a long distance, a 315 kV AC transmission line will be required

Power supply to the Sept-Îles port installations will be from the existing Hydro-Québec grid at 161 kV.

The company's administration offices will be located at the Otelnuk site in a dedicated building near Processing Complex.

Rail Transportation of Pellets

Pellet transportation by railway is based on the construction of 815 km of rail between the loading loop at the mine site in Lac Otelnuk and the unloading loop at the new port facilities in Sept-Îles. Additional infrastructure required to handle and transport the pellets includes two offloading systems, for loading the rail cars at the Otelnuk site, and two tandem rotary car dumping systems for unloading at the port facilities.

The preliminary alignment for the railway line was laid out, by CANAC, entirely within the boundaries of the Province of Quebec as per the scope of work. The main purpose of the exercise at this stage was to investigate the feasibility of laying out the line to have reasonable degree of curvature, and for the line to have as few as possible bridges and other structures such as public crossings and to determine the approximate length of the route. A far more detailed analysis is needed and should be carried out at the appropriate stage in choosing the rail alignment that optimizes the layout and meets some of the key design parameters and in particular the ruling grade in the loaded direction.

Port and Shiploading

In the context of the study, the Sept-Îles Bay has been identified as the most suitable site for the Otelnuk Lake Project marine facility. This is largely due to having sheltered water for a ship loading operation without any need for breakwaters or other wave-attenuating infrastructure. The Sept-Îles Bay water depth allows safe navigation of cape-size ships without major dredging for a ship navigational channel access to the berth. The port facility located in Sept-Îles will operate year round and accommodate +400,000 DWT iron ore vessels.

In order to meet deliveries of 50 Mtpy of iron pellets, the facilities will include three stackers, two reclaimers, and two 16,000 tph shiploaders. The present study is based on the assumptions that ships in the range between 240,000 DWT 400,000 DWT will be utilized for ore shipment. In the event smaller ships will be utilized for ocean shipping, an additional ore loading berth is required to support 50 Mt/y production.

The stockyard conveying system will permit direct shiploading or stockpiling operations with no interruption to train unloading or to shiploading operations. This functionality is provided by using stackers capable of readily bypassing the stacking operation and redirecting the product back onto the yard conveyors to feed shiploaders. Stackers will have the ability to switch from direct shiploading mode to stacking mode without interruption to train unloading operation. A direct shiploading conveying system and stackers with bypass ability offer a high level of versatility in terms of shiploading and car dumper operation. In the event of interruptions to the receiving stream from the dumper, e.g. due to train or dumper breakdown, product can be reclaimed from the stockyard so the shiploading operation is not interrupted. In the case when shiploading is interrupted, stackers direct the product to the stockpiles.

This PEA did not include a study of shipping logistics. It was assumed 400,000 DWT vessels would be required and be available.

Environment Considerations

The Otelnuk Iron Project will be subjected to Provincial (Québec) and Federal Environmental Assessments. Part of the project falls within the territory governed by the James Bay and Northern Québec Agreement (JBNQA) which is administered by the Makivik Corporation. The Makivik Corporation is the lead agency regarding the administration of the JBNQA and the project environmental impact assessment will be reviewed as per Nunavik environmental guidelines.

Under the Environmental Quality Act (Québec Ministry of Sustainable Development), the Project will have to address different mechanisms of authorization for the project.

The mining, concentrating, and pelletizing activities of the Otelnuk Iron Project fall JBNQA. Several project components are expected to be subjected to this mechanism of authorization which involves the active participation of the Cree, Inuit and Naskapi communities. The Kativik Environmental Quality Commission is responsible for the evaluation and exam of the Environmental Study, the preparation of public hearings and to recommend the approbation or rejection of the project. The Southern portion of the railway is expected to require a Certificate of Authorization under Paragraph 22 of the EQA. The port facilities are expected to be subjected to the Environment Assessment Review Process for the Southern part of Quebec. Federal laws and regulations that could have significant direct impact on the proposed project include the Canadian Environmental Protection Act (CEPA), the Canadian Environmental Assessment Act (CEAA) and the Fisheries Act.

Preliminary potential impacts have been identified for the following components of the project: mine/concentrator site, pellet plant, iron pellet transportation, stockpiling and shipping. Other potential impacts such as sanitary wastewater treatment, solid waste disposal and used oil disposal are also addressed.

All environment-related contacts, studies, applications for approval should be initiated in a timely manner.

Capital Cost Estimate

Capital cost estimates are shown in Canadian dollars (CAD$) and are based on prices for equipment, materials and salary rates accurate for the first quarter of 2011. The capital cost estimate is considered to have an accuracy of ± 35%.

For an annual production of 50 Mtpy of pellets, the total capital cost is estimated at $12.9 billion.

A summary of the capital estimate, with costs to the nearest $1M, is provided in Table ES 2.

Table ES 2 – Summary of Capital Cost Estimate

Description	Total (CAD $M)
Direct Cost	
Offsite Access and Transport Infrastructure	$102
Mine Infrastructure & Equipment	$290
Site Infrastructure & Equipment	$198
Crusher – Module 1	$229
Crusher – Module 2	$224
Crusher – Module 3	$224
Concentrator – Module 1	$591
Concentrator – Module 2	$580
Concentrator – Module 3	$580
Mine Site Water Systems	$25
Tailings Disposal	$40
Railway Transport System	$2,653
Pellet Plant – Module 1	$1,520
Pellet Plant – Module 2	$1,444
Pellet Plant – Module 3	$1,368
Port Installation	$610
Electrical Power Supply	$528
Total Direct Costs	**$11,206**
Indirect Costs	
EPCM	$145
Project development costs	$25
Owner's costs	$336
Total Indirect Costs	**$506**
Contingency	$1,197
Total Cost	**$12,909**

Operating Cost Estimate

Estimated operating costs have been developed for the Project based on producing 50 million tonnes pellets annually by year 6 and continuing through the 34 year mine life. The annual OPEX, starting in year 6, is $1.6 B. This is equivalent to approximately $31 per tonne of pellets produced.

A summary of the operating costs estimate, to the nearest $1 M, based on year 6 is provided in Table ES 3. The unit operating cost for mining is $1.93 per tonne of iron mineralization mined.

Table ES 3 – Summary of Operating Costs

Description	Annual Cost CAD $M	$/t of pellets
Mine	376	7.10
Concentrator	280	5.61
Tailings	5	0.10
Otelnuk Administration	85	1.71
Pellet Plant	523	10.45
Railway	245	4.90
Shiploading	60	1.20
Total	**1,574**	**31.07**

Project Implementation Schedule

The schedule is assumed to begin as this PEA (Scoping Study) winds down. This means exploration, and pre-feasibility study activities should be underway by the end of the first quarter of 2011, and activities will extend to the end-of-year 2018 when all three modules in production.

Significant milestones for the Project are: Pre-Feasibility Study completed early first quarter of 2012; Feasibility Study completed mid-second quarter of 2013; Environmental Studies and Assessment Process completed by mid 2013 with simultaneous submission of applications for permits and start of Engineering and Procurement activities; start of construction in early 2013; and production starting from each of the three modules by the fourth quarter of 2016, first quarter of 2018, and fourth quarter of 2018, respectively.

Economic Analysis

Results of the analysis are summarized in Table ES 4. The analysis indicates the Project has a potential NPV of CAD$15 B, at an IRR of 20% with a payback period of seven (7) years.

The economic analysis of the asset indicates a solid economic performance under the conditions analyzed. The parameter that most affects the NPV is the commodity price, as opposed to capital expenditures and operating costs.

Table ES 4 – Economic Analysis Summary

Description	Units	Base Case
Production rate	Mtpy	50.0
Discount Rate	%	8%
NPV	CAD$M	15,189
IRR	%	20.0%
Payback Period	Years	7

Conclusions

Met-Chem's review of the Technical Report by WGM dated May 7, 2009 was positive in supporting the interpretation, conclusions and recommendations made by WGM regarding the Lac Otelnuk Iron Project.

Based on the Mineral Resources estimate reported by WGM, a concept was develop for mining and processing the iron mineralization to produce pellets. Met-Chem believes the current average grade (+19% MagFe) and weight recovery (27%) used in the present study will need to be supported by confirmation testwork. Further testwork on the pelletizing of the Otelnuk concentrate is also required.

In terms of tailings disposal, a final site selection will need to include environmental considerations and potential impacts of proposed sites. Experts in tailings disposal design and construction will be required to evaluate the options.

The location of the pellet plant must be finalized during the pre-feasibility/feasibility levels as more information is gathered, and Adriana progresses with negotiations.

According to Adriana, discussions with both the Quebec government and the Inuit have been supportive of a railway into northern Quebec especially in the Nunavik region inhabited by the Inuit. Further discussions with both parties are expected as the project moves forward to determine synergies to all parties associated with constructing such a railway.

Although a generalized location was considered in Sept-Îles for this study, further study will be required, and negotiations with the Sept-Îles Port Authority, to assess the concept. Other sites located south of Sept-Îles could also be considered for additional study.

There are no technical concerns at this time regarding the port installations; however, a study of shipping logistics should be performed to determine the vessel requirements and future availability of such vessels.

Environmental approvals typically involve appreciable time before they are obtained. Consequently, environmental studies should be initiated as early as possible in the project schedule. As well, discussions, consultations and negotiations with First Nations representatives should be pursued during all phases of the project.

Much of the Project Schedule depends on fast-tracking of the exploration and pre-feasibility/feasibility studies with the environmental studies and assessment. As such, this implies risk to the project schedule. Further risk is assumed by starting the engineering and procurement activities prior to completing the environmental assessment process. A number of construction activities, including the access road from Brisay and the railway, are also fast-tracked in order to accomplish this schedule.

Finally, considering the magnitude of the project at Lac Otelnuk, power supply options should be further explored as discussed with Hydro-Québec in 2006 to confirm the option retained for the present study or identify a more attractive alternative.

Recommendations

It is recommended to initiate the pre-feasibility and environmental studies in conjunction with exploration and testwork as early as possible to evaluate the Project on a more solid basis, and to make fast-tracking decisions at the earliest possible time.

In addition, the Met-Chem supports the recommendations put forth in the WGM Technical Report dated May 7, 2009.

1.0 INTRODUCTION AND TERMS OF REFERENCE

1.1 General

The present report presents a preliminary assessment of the capital and operating costs of the Lac Otelnuk Iron Property project owned by Adriana Resources Inc. ("Adriana"). This study was performed at a scoping study level based on the results of the Technical Report and Mineral Resource Estimate completed by Watts, Griffis and McOuat Limited ("WGM") in 2009. That report is compliant with Canadian Securities Administrators National Instrument 43-101 ("NI 43-101").

Adriana is developing the Lac Otelnuk iron property in the Labrador Trough, Nunavik, and Québec with interest held through direct ownership of a group of claims and acquisition of the right to earn an interest in other claims through an option agreement. The Laç Otelnuk iron property (the "Property") includes an undeveloped, gently dipping, partly outcropping taconite iron deposit first recognized and mapped in 1948.

Diamond drilling was undertaken between 1970 and 2008 on what became defined as the North Zone and the South Zone. Development work on the project included metallurgical testing, and culminated with a NI 43-101 compliant resource estimate (WGM May 2009) amounting to 4.29 billion tonnes of Indicated Resource grading 29.08% TFe and 1.97 billion tonnes of Inferred Resources at 29.24% TFe.

Adriana is a junior exploration company based in Toronto, Ontario, Canada and listed on the TSX-V Exchange.

1.2 Background

On November 30, 2005, Adriana entered into an option agreement with Bedford Resource Partners Inc. ("Bedford") whereby it could earn a 100% interest in Bedford's 129 mining claims totalling 6,219 hectares in area (the "Option Agreement"). The terms of this Option Agreement are available in an Adriana press release dated December 2, 2005. The Option Agreement was amended in July 2006, November 2006 and September 2007.

Earlier in the fall of 2005, Adriana had map-staked an additional 471 claims contiguous to the Bedford claims. Prior to the completion of the Option Agreement with Bedford, Adriana had retained the services of WGM to perform a technical review of the Lac Otelnuk Property. A report, dated November 24, 2005, documenting the technical review was issued by WGM. This report was filed on SEDAR by Adriana on December 1, 2005 and is available for public review. The WGM report format is compliant with NI 43-101 and covers all topics as prescribed by Form 43-101F for a Technical Report. The report essentially includes a review of published documentation from Québec Government sources including geological publications as well as filed assessment reports publicly available with the Ministère des Resources naturelles et de la Faune, Service du développement et du milieu miniers ("MRN"). The report was, however, not filed as a NI 43-101 Technical Report.

Previous work on the Lac Otelnuk property, as documented by WGM, includes exploration work reported initially in 1948 by Norancon Exploration (Québec) Limited, a Noranda/Conwest joint venture. The subsequent activity documented and described in the WGM 2009 report was carried out between 1970 and 1977 under King Resources Company ("King") who had staked the property. King engaged Metals, Petroleum, & Hydraulic Resources Consulting Limited (later "MPH") of Toronto to manage field work, metallurgical testwork, "mineral resources" estimates and economic studies. This activity included diamond drilling, mapping, bulk sampling and metallurgical testwork for the most part at Lakefield Research Limited of Canada ("Lakefield") but also for limited work at a German laboratory. In 1981, further metallurgical testwork was carried out by Lakefield. This work was commissioned by MPH on behalf of Phoenix Resources Company ("Phoenix") presumed to be a successor company to King.

In late February 2006, Met-Chem Canada Inc. ("Met-Chem") was retained by Adriana to produce a Scoping Study of the Lac Otelnuk Iron Property. As relevant data to produce a NI 43-101 compliant mineral resource estimate would not be available before the fall of 2007, the scope of that Study was a preliminary technical design and preliminary capital and operating costs estimate of all areas not dependent upon the mineral resource estimate. The Study, dated July 4, 2006, compared the CAPEX and OPEX at two levels of pellet production: 10 and 15 Mtpy. It also offered a number of comments and recommendations to help progress the Project including defining NI 43-101 inferred mineral resources.

In 2007, Adriana initiated its first exploration program on the Property focused on the South Zone. This program consisted of the diamond drilling of 27 vertical drillholes aggregating 2,195 m. Diamond drilling resumed in summer 2008 and continued through to the fall. The 2008 program consisted of 41 vertical drillholes aggregating 5,203 m. The purpose of the 2007 and 2008 drilling was to complete the drilling of a rectangular area of the South Zone, approximately 9.0 km long by 2.5 km wide with holes on 500 m by 600 m. The program was successful in meeting this goal.

In December 2008, WGM was retained by Adriana to complete an independent Mineral Resource estimate for the Property and document its findings in a Technical Report compliant with NI 43-101 guidelines and standards and Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") definitions.

At the end of its report, WGM recommended a phased work program to Adriana to advance the project. This program includes field work, geological mapping and sampling, diamond drilling, metallurgical testwork, etc. and preliminary engineering to progress this Project towards pre-feasibility.

The present Scoping Study is intended to fulfill the preliminary engineering needs.

1.3 Scope of Work

In November 2010, Met-Chem was retained by Adriana to produce a NI 43-101 Preliminary Economic Assessment of the Lac Otelnuk Iron Property. This scoping level is intended to evaluate options, based on the present limited data, to establish the viability of the Project at a production rate of 50 million tonnes of pellets per year in order to justify proceeding with other phases of project development.

Areas covered in this Report are similar to those conceptualized in the 2006 Report for 10 and 15 million tonnes per year of pellets. These areas include:

- Geology and Resources Review;
- Mine, Concentrator, and Pellet Plant;
- Tailings Management;
- Mine Site Infrastructure;
- Rail Transportation of Pellets;
- Port Facility;
- Environmental Aspects;
- Manpower;
- Capital Costs Estimate;
- Operating Costs Estimate;
- Project Implementation Schedule; and
- Economic Analysis

Specialized firms assisted Met-Chem in the execution of the scope for the following areas are:

- Railway: CANAC Inc.;
- Port Facilities: BH&T Engineering.

1.4 Basis of Study

The present study is based on the assumption that an open pit mine and concentrator operation will be constructed at Lac Otelnuk together with the required tailings disposal works and site infrastructure. Pellet production is also included in the concept with an assessment of site location at either the mine or port site included within this Study. The Project also includes construction of a railway to allow transport of either concentrate or pellets, to a newly constructed port facility. In either case, the end product will be pellets to be loaded on ocean-going, iron ore vessels using shiploading facilities at the Sept-Isle Port.

The technical review and annual capacities considered for the base case are approximately 182 million tonnes of mineralization generating 49 million tonnes of concentrate to produce 50 million tonnes of pellets. Cost estimates are developed on the basis of three modules producing 16.6 million tonnes of pellets per year.

1.5 Currency

All prices and costs in this report are expressed in Canadian dollars CAD($).

1.6 Glossary

Table 1.1 – List of Abbreviations

List of Abbreviations	
Acid Rock Drainage	ARD
Adriana Resources Inc.	Adriana
Bedford Resource Partners Inc.	Bedford
Canadian dollar	CAD$
Canadian Environmental Assessment Act	CEAA
Canadian Environmental Protection Act	CEPA
Commission de la qualité de l'environnement Kativik	CQEK
Cubic meter	m^3
Cubic meter per hour	m^3/h
Davis Tube	DT
Davis Tube Concentrate	DTC
Davis Tube Weight Recovery	DTWR
Dead Weight Tonnage	DWT
Direct Reduction	DR
Canadian Environmental Assessment Agency	CEAA
Environmental Effect Monitoring	EEM
Environmental Effects Monitoring Studies	EEMS
Environmental Impact Assessment	EIA
Environmental Impact Statement	EIS
Environmental Quality Act	EQA
General and Administration	G & A
Government of Québec	GQ
Gram per liter	g/L
Grams	g
Grams/tonne or parts per million	g/t
Hectare	ha
High Pressure Grinding Rolls	HPGRs
Horsepower	hp

List of Abbreviations	
Impact Benefit Agreements	IBA
James Bay and Northern Québec Agreement	JBNQA
Journeaux, Bédard & Assoc. inc.	JBA
Kativik Environmental Quality Commission	CQEK
Kilogram per liter	kg/L
Kilograms	kg
Kilometers	km
Kilovolt	kV
Kilowatt	kW
Kilowatt per hour per tonne	kWh/t
King Resources Company	King
Lakefield Research Limited of Canada	Lakefield
Liter per hour	L/h
Long Ton	Lt
Megawatt	MW
Megawatt per hour per day	MWh/d
Metal Leaching	ML
Metal Mining Effluent Regulation	MMER
Metals, Petroleum, & Hydraulic Resources Consulting Limited	MPH
Meters	m
Metric tonnes	Tonnes or t
Microns	µm
Milligram per liter	mg/L
Million of cubic meter	Mm^3
Millions of metric tonnes	Mt
Millions of metric tonnes per year	Mtpy
Ministère des Resources naturelles et de la Faune, Service du développement et du milieu miniers	MRN
Ministry of Sustainable Development, Environment and Parks	MSDEP
National Energy Board	NEB
National Instrument 43-101	NI 43-101
Parts per million, parts per billion	ppm, ppb
Percent Weight Recovery	%WtRec
Phoenix Resources Company	Phoenix

List of Abbreviations	
Preliminary Economic Assessment	PEA
Quėbec North Shore and Labrador Railway	QNS&L
Return on Equity	ROE
Run of Mine	ROM
Specific gravity	s.g.
Square meter	m^2
Tonnes per cubic meter	t/m^3
Tonnes per day	tpd
Tonnes per hour	tph
Tonnes per month	tpm
Tonnes per year	tpy
US dollar	$USD
Volt	V
Watts, Griffis and McOuat Limited	WGM
Weight Recovery %	WR %

2.0 RELIANCE ON OTHER EXPERTS

Met-Chem performed a cursory review of the information provided by other consultants for completion of this 43-101 report; however, each consultant remains fully responsible for their own work, and Certificates of Authors that comply with NI 43-101 regulation are included in this report.

The portions of this study by Met-Chem relating to geology and mineral resource were prepared using essentially the NI 43-101 Technical Report prepared for Adriana Resources Inc. by WGM dated May 7, 2009, and the report on the 2008 drilling prepared by M.-A. Léonard and G. A. Tremblay, Gestion Otelnuk Inc., dated January 31, 2010.

Met-Chem has not independently verified legal title to the Property and is relying on information provided by Adriana for our descriptions of title and status of the Property agreements.

Met-Chem has not carried out any independent geological surveys of the Property, did not visit the site and did not review drill core and results. Met-Chem has relied for the geological descriptions and program results solely on the basis of reports, notes and communications completed by or for Adriana.

Met-Chem is responsible for the development of the Sections 2, 15, 17.1 – 17.6, 17.7, 17.8, 17.9 – 17.13, and 18 through 21. Met-Chem is also responsible for the assembly of this NI 43-101 Report for the PEA study made for the Otelnuk Project.

CANAC and BH&T Engineering have provided their support to Section 17.7 and 17.8 under the supervision of Met-Chem.

WGM has reviewed Sections 1, 3 to 14, 15.1 to 15.3, 16, 18 and 19 of the Report as well as part of the Executive Summary.

Met-Chem has not researched legal ownership information such as property title and mineral rights and has relied on information provided by Adriana.

This report is intended to be used by Adriana resources Inc. as a Technical Report with Canadian Securities Regulatory Authorities pursuant to provincial securities legislation.

3.0 PROPERTY DESCRIPTION AND LOCATION

3.1 Property Location

The Lac Otelnuk Property is situated in Nunavik, Quebec, approximately 165 km northwest of the town of Schefferville and 225 km south of Kuujjuaq. A map showing this location is presented in Figure 3.1. Schefferville is located approximately 1,200 km by air northeast of Montreal. The Property is situated in unsurveyed and unorganized territory, straddling NTS map sheets 23N16, 24C01 and 24C02, and centered on 68°21'W and 56°00'N.

There has been no mining activity on the Property or in the surrounding area, and, as such, there are no mine workings, tailings impoundment areas, waste piles or other infrastructure on or near the Property.

3.2 Property Description and Ownership

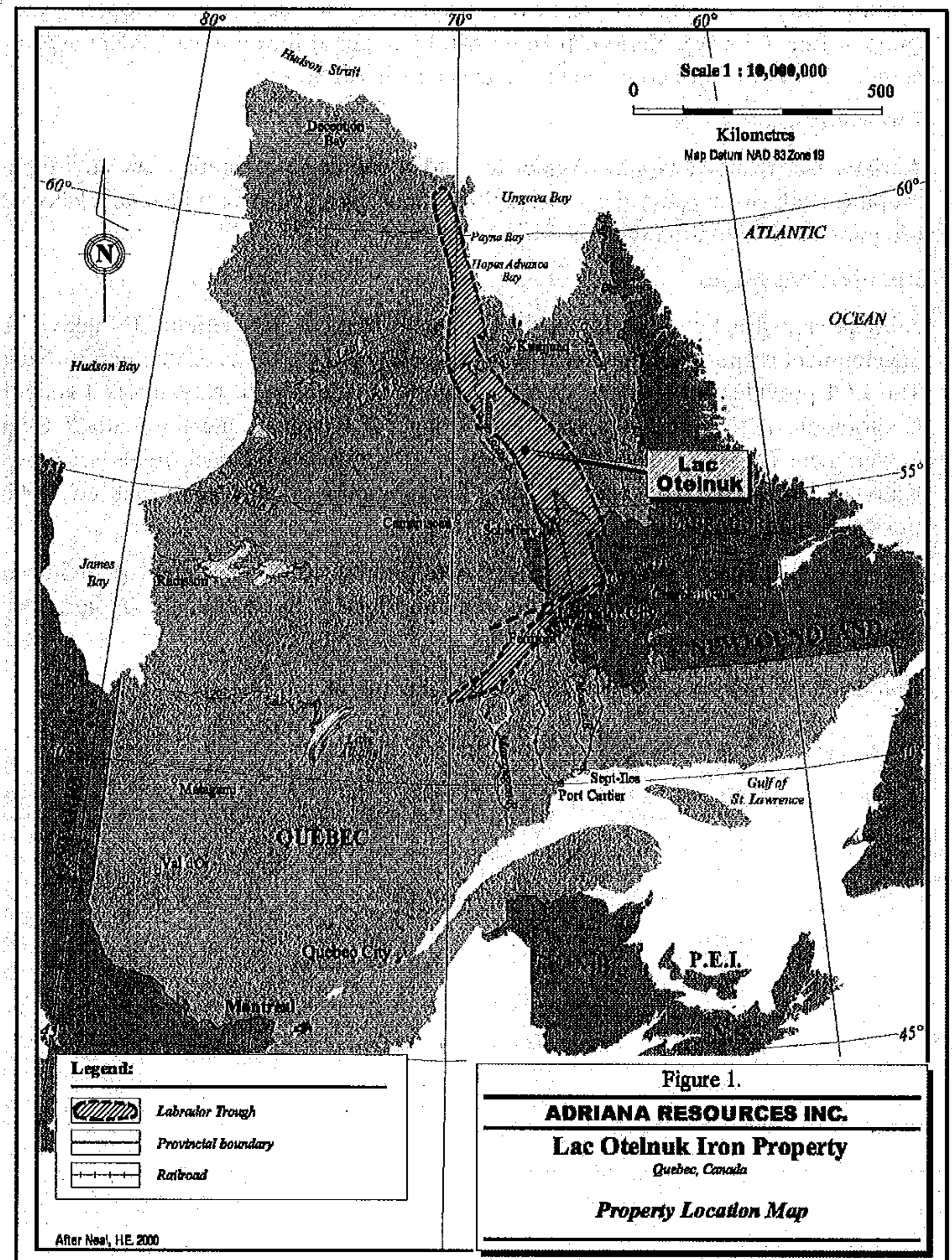
As per information supplied recently by Adriana, the Lac Otelnuk Property consists of 898 contiguous mineral claims totaling approximately 433 km^2. 129 of the 898 claims are subject to the Option Agreement as amended giving Adriana the right to earn a 100% interest in such claims. Another 185 of the 898 claims are within an area of common interest pursuant to the Option Agreement. Adriana may exercise its option pursuant to the Option Agreement by satisfying certain conditions including the payment of a combination of cash and shares and the completion of certain work commitments. On the exercise of the option, the optionor retains a royalty from the sale of iron ore products and from the sale of any other minerals mined from the claims. Pursuant to the Option Agreement, Adriana may buy back one-half of the optionor's royalty.

Met-Chem has not verified the details on the agreements and transactions affecting the Lac Otelnuk Property.

The claims can be renewed, but the payment of a fee and acceptable work expenditures (assessment work) have to be the filed with the Ministry of Natural Resources to be maintained in good standing. Excess work on one claim may be spread to other claims held by the same owner within a radius of 4.5 km. The claims convey only the mining rights, but no surface rights.

Met-Chem has not verified the validity of the title and the status of the claims. Details on the list and status of Adriana's claims can be found on the Ministry of Natural Resources claims website.

Figure 3.1 – Location of the Property



3.3 Permits

Work permits are required to carry out diamond drilling activities and operate the base camp at Baie Gignard. Various permits will be required for all development and mining activities. No timber of commercial value occurs in the area.

3.4 Environmental Issues

Adriana has retained Golder Associates Ltd. ("Golder") to prepare an environmental scoping study to support the project. Provisions have been provided to elaborate the program in collaboration with the First Nations.

3.5 First Nations Issues

Adriana signed a Letter of Intent ("LOI") with Makivik Corporation ("Makivik"), the development corporation mandated to manage the heritage funds of the Inuit of Nunavik. The LOI provides for Adriana to foster communications with Nayumivik Landholding Corporation of Kuujjuaq, the Northern Village of Kuujjuaq and the Kativik Regional Government ("KRG"). The Naskapi Nation of Kawawachikamach holds a seat on the Kativik Board. Nayumivik Land Holding Corporation is an affiliate of Makivik that holds title to the Inuit Lands.

The general purpose of the agreements is to address issues that may be of interest or concern to all stakeholders of the region affected by Adriana's exploration and development work.

Details on the LOI are provided in WGM's 2009 report.

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Accessibility

There is no road access to the Property. Several lakes on the north and south parts of the Property, and are accessible from Schefferville and Kuujjuaq via fixed-wing float or ski-equipped aircraft. Access to Schefferville and Kuujjuaq is provided by daily scheduled air service from Québec City, Montréal and Sept- Îles. There is also once-a-week round-trip passenger and freight train service between Schefferville and Sept-Îles.

The village of Caniapiscau, situated about 160 km southwest of the Property, provides an alternative access route. The village is connected by road from Val d'Or via Matagami and Radisson.

4.2 Climate

The Property area has a sub-Arctic climate with temperatures averaging 12°C in July and -25°C in December. The average annual temperature is -6°C. Average annual rainfall is approximately 410 mm and snowfall 440 cm. Winters are harsh and often lead to poor flying conditions. Exploration programs are carried out from June through September, not in the winter months.

4.3 Physiography

Topography in the property area is generally flat to gently rolling. A northwest-southeast trending, several km long, 5-10 m high cliff face representing the surface exposure of the iron formation occurs on the northern half of the Property. The elevation varies from 260 to 380 m above sea level. The Property is poorly drained, has extensive swampy areas, and is covered by sparse northern boreal forest consisting of stunted spruce, alders and willows.

4.4 Local Resources and Infrastructure

The Property is not inhabited and only a few seasonal hunting/fishing cabins are scattered within 40 km of the Property. There is a 25 m high water falls, with hydro-electricity generating potential, 15 km north of the centre of the Property, on a river west of Lac Otelnuk; however, the nearest Hydro-Québec transmission lines are in Schefferville, where local needs are served by hydro-electric power from the Menihek Lake power plant located nearby in Labrador. There seems to be more than adequate supply of water available for exploration and mining purposes. No harvestable timber is present on the Property. Ample space seems to be available on the Property for the establishment of the infrastructure for a mining and processing operation.

The Inuit village of Kuujjuaq located north of the Property is the largest nearby community and has a population of approximately 2,200. Kuujjuaq is the administration center of Nunavik and head offices for Makivik Corporation, Kativik Regional

Government, Kativik development Council, and Nunavik Board of Health and Social Services. Kuujjuaq has a modern hospital, schools several stores and banking facilities. First Air and Air Inuit provide daily service to the modern airport in Kuujjuaq and charter fixed wing and helicopter services are available. Kuujjuaq and other Inuit villages in Nunavik are a potential source for employment.

Schefferville, in the Québec Province, is the closest centre and has a population of approximately 300. The Matimekosh (Montagnais) Indian Reserve is contiguous with the town. The total Schefferville area population, including that of the Kawawachikamach (Naskapi) Indian Reserve, a few kilometers east of Schefferville, is approximately 1,500. The town is served by a reliable source of electricity. A very small pool of skilled labour exists in Schefferville. Several stores, accommodation, restaurant, a health clinic, some services are available, as well as primary and secondary schools.

Schefferville lies at the northern terminus of the Quebec North Shore & Labrador Railway ("QNS&LR"). The town is serviced by once-a-week rail trips to Sept-Îles via Ross Bay Junction (the Wabush corner, 228 km to the south) and on to Sept-Îles, a further 360.5 km.

The rail bed from Ross Bay Junction to Schefferville has deteriorated since 1982 when IOC closed its Schefferville operation and heavy-duty rail was replaced by lighter-gauge rail. A consortium of First Nations groups has purchased this portion of the line.

5.0 HISTORY

For details on the Otelnuk property history, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

The Otelnuk Lake iron formation was recognized during a regional exploration program conducted in 1948. A significant amount of exploration and development work has been completed since, as summarized in Table 5.1.

Table 5.1 – Summary of Exploration and Developmental Work

1948	Norancon Exploration (Québec) Limited	• Discovery; and • Regional iron exploration, mapping.
1970-71	King Resources Company	• Line cutting; • Geological mapping; • Ground magnetometer survey; • Diamond drilling of 10 holes totalling 702.86 m (north zone); • Elevation survey; • Preliminary resource estimate; and • Metallurgical tests at Lakefield research limited of Canada ("Lakefield").
1973	King Resources Company	• 21 fill-in holes totalling 645.66 m (North Zone); • Elevation survey; and • Update of preliminary resource estimate
1974-75	King Resources Company	• Metallurgical tests at Lakefield; • Resource estimate; • South line grid established; • Mapping, sampling; and • Preliminary economic analysis.
1976	King Resources Company	• Diamond drilling: 5 holes, totalling 307.85 m; • Elevation survey; • Preliminary resource estimate (South Zone): 1,127 million long tons grading 25.76% magnetic Fe (33.06% soluble Fe) (Figures of historical interest only, non-compliant with the NI 43-101 requirements, do not rely on); and • 18-long ton bulk sample tested at Lakefield and in Germany in 1977.

1981	Phoenix Resources Company	• Pilot plant, pelletizing tests at Lakefield and in Germany.
2005-07	Adriana Resources Inc.	• Claim staking (456) and optioning (129); • Line-cutting; • Diamond drilling: 27 holes totalling 2194.74 m (part of s grid); • Elevation survey; and • WGM NI 43-101 Technical Report. • Met-Chem, Unpublished PEA Report
2008		• 41 diamond drill holes totalling 5,203 m (S Zone); • Density determination of the rock units; • Aerial photographic survey; • Ground Differential GPS survey; • Baseline monitoring and environmental studies; and • Conceptual open pit planning.
2009	Watts, Griffis and McOuat Limited	• Technical Report and Mineral Resource Estimate for the Lac Otelnuk Iron Property; May 7, 2009. • Resource estimate (by WGM, to NI 43-101 standards, based on DTWR cut-off grade of 18%): – Indicated: 4.29 billion t grading 29.08 %TFe – Inferred: 1.97 billion t grading 29.24 %TFe
2010	Adriana Resources Inc.	• Diamond drilling 40 holes totalling 5,680 m

6.0 GEOLOGICAL SETTING

For details on the Otelnuk property geological setting, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

6.1 Regional Geology

The Property is situated in the Labrador Trough, also referred to as the Labrador Québec Fold Belt, or the "Trough", adjacent to Archean basement gneiss. The Trough extends for more than 1,000 km along the eastern margin of the Superior Craton from Ungava Bay to Lake Pletipi, Québec. The belt is about 100 km wide in its central part and narrows considerably to the north and south.

The Trough comprises a sequence of Proterozoic sedimentary rocks, including iron formation, volcanic rocks and mafic intrusions. The southern part of the Trough is crossed by the Grenville Front representing a contact with highly metamorphosed and complexly folded rocks. Adriana's Lac Otelnuk Property is located north of the Grenville Front in the Churchill Province where the principal iron formation unit is known as the Sokoman Formation. Iron deposits in this part of the Trough are taconite, or weakly metamorphosed iron formation. Taconite iron deposits in the Trough include New Millennium's KéMag and LabMag deposits (Howells River Deposit) and the December Lake deposit.

6.2 Property Geology

The Property is situated on the western edge of the Trough. The Archean gneiss basement dips gently east and is unconformably overlain by the gently northeast dipping sedimentary succession, which includes the iron-bearing units belonging to the Sokoman Formation. Towards the western edge of the Trough, the older, lower units of the sequence are successively exposed as the upper younger units have been removed by erosion. The iron formation is generally northwest-southeast striking, very flat-lying to gently inclined and rolling, with an average easterly dip of 5°. The individual members of the sedimentary succession are exposed as a series of benches in the west-central portion of the northern half of the Property. The iron formation forms the top of the column in the eastern part of the Property and is mainly covered by glacial drift.

The units were affected by a northeast-trending fault and folded in an east-west direction in the far northern portion of the Property. Such complex structures often lead to repetition and thickening of units. Regional metamorphism appears to be of low to moderate grade, meaning that related changes in grain size and rock texture are not visually detectable. The most distinguishable compositional feature within oxide iron formation units is the rather abrupt changes from dominantly magnetite to dominantly hematite, and corresponding change of the silica from chert over to jasper. These variations and changes in iron grade define the lithological sub-units or members. The iron carbonate minerals, principally siderite and ferro-dolomite, are widespread but are more abundant in the upper and middle iron formation units.

7.0 DEPOSIT TYPES

The Lac Otelnuk deposits are of the moderately metamorphosed or weathered type referred to as taconite. Two factors play a role in making this a potentially economical deposit. First, the iron formation needs to contain a minimum iron, to be amenable to concentration (beneficiation); it must also be low in deleterious elements to be mined economically. Non-economic rock types interbedded with the iron formation must be sufficiently segregated from the economic iron-bearing areas.

8.0 MINERALIZATION

For details on the Otelnuk property mineralization, the reader should refer to the WGM (2009) report. The following paragraph summarizes information from that report.

Mineralization of interest on the Lac Otelnuk property is the iron formation that consists mainly of magnetite (Fe_3O_4) and hematite (Fe_2O_3) in bands alternating with chert or jasper.

9.0 EXPLORATION

For details on the Otelnuk property exploration, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

9.1 General

Adriana's exploration programs completed in 2007 and 2008 on the Property consisted mostly of diamond drilling. The field work included core logging and sampling, a Differential GPS ("DGPS") survey of the drillhole collars and drill sections and aerial photographic survey of the Property.

WGM was retained to provide technical input into the program to ensure all work was being carried out in accordance with NI 43-101 standards.

9.2 Historical Exploration

Additional information is found under the section "History" of this report and in the WGM 2009 report.

10.0 DRILLING

For details on the Otelnuk property drilling, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

10.1 Drilling

The reports detailing the historic programs, including drill logs and assays, are filed with MNRF.

Drilling prior to the 2007 program was mostly with AQ core size (2.70 cm diameter), while the size used in the 2007-2008 programs was BTW (4.20 cm diameter).

Apparently, no down-hole surveys were carried out in the pre-2007 programs and most casings were removed. No down-hole deviational surveys were completed for the 2007-2008 Adriana's drillholes.

The collar coordinates for Adriana's 2007 and 2008 drillholes were determined by a DGPS survey conducted by Cadoret in 2008. Based on the survey of one historic hole collar, it was found that the collar elevations for the historic drillholes had to be adjusted by + 5.74 m, or 10 m, to tie them in with the recent holes.

Most of the 2007 drilling targeted only the upper magnetite-rich iron formation.

10.2 WGM Comment on Adriana Drilling Programs

No down-hole attitude surveys were completed for the 2007-2008 Adriana's drillholes (68 holes totaling 7,398 m) and apparently this also applies to all pre-2007 holes. WGM agrees such surveys were not warranted considering the bulk nature of the iron deposits and that all of Adriana's drillholes were vertical.

Cadoret, a professional survey company, completed a DGPS survey of Adriana's drillholes. Only one of the historic drillhole collars was positively identified by Cadoret. The discrepancy found between the elevation of the new and old drillholes indicates that more of the historic collars need to be located and re-surveyed to place them on a reliable basis.

In addition, it is suspected that historic collars were surveyed at the top of the casing whereas the collars of Adriana's holes were surveyed at ground level. WGM also understands that the above ground projections for the Adriana drillholes casings were not measured.

Although a small adjustment should probably have been made for collar elevation, this error makes little significant difference. WGM agreed the drilling and surveying was completed at a standard in accordance with good practice adequate to support a Mineral Resource estimate.

11.0 SAMPLING METHOD AND APPROACH

For details on the Otelnuk property sampling method and approach, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

11.1 Pre-2007 Programs

Drill core was split and half core was sent to Lakefield for assay and Satmagan testwork. The other half core from the samples and the un-sampled material was retained in the core trays. The historic drill core is in very good condition and is now stored on racks in buildings recently erected at Adriana's campsite, along with the core drilled in 2007 and 2008. The assessment reports including drill logs for the King programs are available from the MNRF.

11.2 2007 and 2008 Adriana Programs

Core logging included Rock Quality Index ("RQD"), magnetic susceptibility measurements and core photography. The sample lengths were based on geological criteria and averaged 4 m. These sample intervals are similar to those of the King programs.

Field duplicates were inserted into the routine samples stream of the 2007 and 2008 programs. Core splitting was done using a manual splitter in 2007, which resulted in a quality of the split core samples that was less than ideal, especially for the quarter core splits used to produce field duplicate samples. Most of the cores were split using a hydraulic splitter in 2008, and sample quality was greatly improved. In 2008, core splitting to provide quarter core field duplicate samples were prepared using a diamond saw.

The samples were sent to SGS-Lakefield, Lakefield, Ontario.

11.3 WGM Comments on Phase I Drill Core Logging and Sampling

WGM made two site visits to the Property and found that the core handling and splitting (2008 Program) was done to adequate standards, but descriptive core logging and core splitting (2007 Program) could have been improved upon.

12.0 SAMPLING PREPARATION, ANALYSIS AND SECURITY

For details on the Otelnuk property sampling preparation, analysis and security, the reader should refer to the WGM (2009) report. The following sections summarize information from that report.

12.1 Preparation and Analysis

12.1.1 Pre-2007 Programs

At the time of the King programs, Lakefield was a well-known and respected facility, as it remains today (as SGS-Lakefield). It is safe to assume that all work was carried out in a professional manner meeting industry standards of the day. Lakefield had internal QA/QC procedures in place, but it is not known if any QA/QC work was carried out at a second laboratory.

Assay certificates appended to King drill logs and the historic reports indicate that the drill core and surface samples were assayed for Soluble Fe, using Lakefield's standard dissolution with titration of the ferrous iron. Magnetic iron was determined using Satmagan.

12.1.2 2007 and 2008 Adriana Programs

a) General

SGS-Lakefield was designated as the Primary Laboratory for the 2007 sample assay program. WGM also recommended the use of Midland Research Center ("MRC") in Nashwauk, Minnesota, as a Secondary Laboratory (Umpire Lab) for Check Assaying of selected samples first assayed at SGS-Lakefield.

Prior to processing of the routine samples, a limited grinding testwork program was carried out in order to determine the grinding time required to optimize magnetite liberation. The analysis of the Heads and DTCs was by X-Ray Fluorescence ("XRF") methods on metaborate beads.

b) Routine Assaying and Testwork

All 1,575 routine samples generated by the 2007 and 2008 programs were submitted to Head (Crude) analysis and preparation of DTCs. XRF Analysis of Heads and DTCs included the following:

- Fe, SiO_2, Al_2O_3, CaO, Na_2O, K_2O, TiO_2, MgO, Mn, P and LOI;
- Sulphur, by LECO, on Heads (496) and DTCs (167); Heads analyses for the 2007 samples, discontinued for the 2008 program; and
- Phosphorus, initially determined by Inductively Coupled Plasma ("ICP") on re-dissolved metaborate beads, replaced by XRF later in the program.

In addition to standard major element determinations completed on all DTCs, low level sulphur and phosphorus determinations were also completed on selected DTCs (167) from four drillholes across the South Zone.

The following determinations were also performed:

- Specific gravity (SG), by gas comparison pycnometer (313 pulp samples); and
- Bulk Density determinations, by weight-in-water/weight-in-air immersion technique (19 samples from the 2008 program only) on coarse material from split core.

WGM's recommendation that Head assays be completed on the samples, for which bulk density was determined, was not followed; however, %TFe versus bulk density results correlate reasonably well with pycnometer results and %TFe on Heads.

c) Quality Assurance/ Quality ("QA/QC") Program

i) General

The 2007-2008 QA/QC system consisted of the following components.

Adriana's QA-QC system, with the insertion of:

- Prepared Blanks and Standards (2007 program); and
- Field duplicate samples (2007 and 2008).

Internal QA-QC protocol of the primary laboratory (SGS-Lakefield), including assay of:

- Preparation Duplicates;
- Analysis Replicates; and
- Certified Standards and Blanks.

Use of a Secondary laboratory (MRC) selected by WGM, consisting of:

- Check assaying of DTCs produced by SGS;
- Head assaying of -10 mesh sub-samples produced by SGS; and
- Davis Tube testing and assaying of DTCs made by MRC from -10 mesh reject material provided by SGS.

Independent sampling by WGM involved sampling of field duplicates.

Sampling by Adriana

During the 2007 program, quartz samples were inserted into the sample stream to serve as Blanks. The Standards consisted of pulverized material produced by Consortium de Recherches Minérales ("COREM"), based in

Québec City, and Certified Reference Materials ('CRM"). Both Head assays and DT tests were completed on most, but not all, of these Standards. The CRM were not blind to the laboratory because they were not from split drill core samples; they were pulps.

WGM determined that the COREM materials performed satisfactorily for both Heads and DTCs. The CRMs performance was within the range of values for these Standards, but these ranges are large, so the results have little significance. No sample sequencing errors were detected.

ii) Field Duplicate Samples

Field duplicate samples were collected through the 2007 and 2008 drilling programs. WGM recommended that these duplicates consist of second half core; however, the field geologists substituted quarter core sampling. Particularly for the 2007 program, quarter core represented a significant problem because of the poor splitting capability of the manual core splitter. For the 2008 program, the duplicates were sawn producing more representative samples.

Although there is a reasonable degree of correlation between the original and duplicate assays for many of the Adriana samples, a number of them show imperfect correlations. WGM believes this low correlation is due to poor sample splitting using the manual core splitter to re-split half core to provide quarter core samples.

iii) WGM Field Duplicate Samples

WGM independently collected samples of half split core during both of its Property site visits in 2007 and 2008 as part of its independent corroboration responsibilities. These samples were collected to represent a range of iron grades and types of material. WGM's samples were independently sent for assaying at SGS-Lakefield.

The results for WGM's samples are in general more tightly correlated to results for original samples than results for the field duplicates sampled by Adriana. WGM believes the tighter pattern is due to the fact that the WGM samples were half core, while the Adriana samples were quarter core.

The strongly correlated assay results for WGM samples indicate no sampling or laboratory sample sequencing errors.

d) Primary laboratory internal QA/QC

i) General

SGS-Lakefield participates in international accreditation programs. Its in-laboratory QA/QC programs include the insertion of CRMs, Blanks, and

Preparation Duplicates into the sample stream, as well as analysis of replicates (lab duplicates).

ii) Preparation of Duplicates

The assays on the preparation duplicates are strongly correlated to the results for the original sample fractions. The data for %TFe for DTCs show that most duplicate results are within 1% Fe of the results for the original samples. Most duplicate results for %SiO_2 for DTCs are within 10%, compared with results on original portions.

iii) Analytical Duplicates

As expected, the results for the analytical replicates pairs are highly correlated and more strongly so than for the preparation duplicate pairs. The %TFe Head replicate analyses for almost all samples show differences within the ±1% shell. The DTC results for SiO_2, are much better than ±5%.

Also as expected, most variance in the results can be attributed to field sampling rather than in-laboratory preparation and analysis.

e) Certified Reference Standards and Blanks

The analytical results for the CRMs indicate that SGS-Lakefield assays on sample Heads and DTCs are accurate. The SGS-Lakefield Blanks for the analysis of sample Heads and DTCs returned low values.

f) Secondary Laboratory Check Assay Program

After almost all of the analytical work at SGS-Lakefield had been completed for the 2007 and 2008 programs, WGM independently selected samples for Check Assaying at MRC.

Rejects (-10 mesh) and magnetic DTCs archived at SGS were selected. SGS-Lakefield riffled out approximately 100 g of -10 mesh material from rejects, and sent the remaining DTC pulp to WGM to be forwarded on to MRC.

g) Davis Tube Concentrates

MRC was requested to determine iron and silica in each magnetic Davis Tube Concentrate (DTC). MRC uses wet chemical methods of analysis, as opposed to instrumental methods applied at SGS-Lakefield.

The results returned by MRC from %TFe in DTCs are on average slightly higher than SGS-Lakefield assays. The difference is, however, less than 0.5% TFe. Iron assays remain strongly correlated and assays on duplicates mostly fall within the ±1% limits.

The results for DTCs originally assayed by SGS-Lakefield indicate that no assay bias is apparent for silica. Most of the sample pairs plot within the ±5% envelopes.

i) -10 Mesh Rejects

MRC completed a TFe analysis of Head and extracted a DTC for each sample and analyzed the concentrates for %TFe and $\%SiO_2$.

For the 2007 program samples, WGM requested that MRC attempt to create DT feed samples that were 85 to 90% -325 mesh. For the 2008 program samples, WGM requested that MRC pulverize each sample to 100% -325 mesh. MRC uses a multi-stage, mechanical mortar and pestle grinding method with dry screening between stages to reach the point where 100% of the sample passes the prescribed screen.

The results for the testwork and analysis of the -10 mesh rejects show that MRC and SGS-Lakefield assays on %TFe on Heads and %DTWR are strongly correlated and that no assay bias is apparent.

Poorer correlation is observed for both iron and silica in DTCs. This was expected and is a function of the different grinding routines used by the two labs that generate DT feeds and concentrates with different particle size distributions. MRC grinding adapts to the changing hardness of the rock.

Iron concentrations in DTCs prepared by MRC are on average slightly higher than for SGS-Lakefield's. Silica is lower in MRC prepared DTCs than in SGS-Lakefield prepared concentrates. These results suggest that the degree of liberation of the concentrates at MRC is slightly better than those from SGS-Lakefield.

The results for calculated magnetic iron between the two labs are strongly correlated and exhibit no significant bias.

h) Assay Database

Drill logs and assay results were compiled by Adriana under the direction of a certified GIS/Database Analyst. Dedicated software (DataShed, SQL Server) was used for the compilation and verification/validation of the drill results

12.1.3 WGM General Comments on Sampling, Assaying, and QA/QC

Assay results for SGS-Lakefield internal Standards and MRC Check Assays of Heads and DT concentrates, originally assayed at SGS-Lakefield, indicates that no significant systematic bias is apparent for routine SGS-Lakefield assays. SGS-Lakefield assays consequently are accurate.

Comparison of DT test results for DT tests done at SGS-Lakefield with results for tests performed at MRC indicates SGS-Lakefield DT test results are accurate. Differences in DT test results between MRC and SGS-Lakefield are largely due to differing grinding methods.

Preparation duplicates and results for analytical replicates performed internally by SGS-Lakefield indicate SGS-Lakefield assay and test results are precise. Assay results for drill core samples independently collected by WGM, submitted blind to SGS-Lakefield indicate that Adriana's sampling was well done, and there are no indications that any of the samples were mixed-up in the field or at SGS-Lakefield.

Results for WGM independent sampling also indicate SGS-Lakefield assaying and DT tests are precise. A few unexplained assay results were found but they proved to be random, not systematic.

Adriana substituted prepared Blanks and Standards in place of non-mineralized split core that WGM had recommended for field sampling QC. WGM has no strong issue with this but believes that submitting QA/QC samples that are blind to the lab represents superior practice.

Adriana also substituted quarter core sampling for second half core sampling for field duplicates. In WGM's opinion, this substitution diminished the value of the field duplicate sampling program. Variance associated with routine core sampling could not be determined and explanation for divergence between assay results for original and duplicate was indeterminate, due to either lab error or poor field sampling. No Blanks were inserted in the sample stream for the 2008 program. WGM recommends that natural Blanks consisting of split core, be inserted into the field sample stream. Such samples would be blind to the lab and assist detecting possible sample mix-ups at the lab.

Adriana built a database to contain all project data, but although this database seems to be robust, it was largely built after the 2008 program was completed. WGM believes the first line for assessment for the quality of data should be in the field.

13.0 DATA CORROBORATION (VERIFICATION)

For details on the Otelnuk property data corroboration, the reader should refer to the WGM (2009) report. The following section summarizes information from that report.

WGM geologists have made three relevantly recent visits to the Property (in 2005, 2007 and 2008).

Geology and lithological units in drill core were found to match the drill core logs and sample intervals marked in core trays matched sampling records. WGM recommended more description in the core logs and better qualification of contacts between units. Coordinates for drillhole collars were found to reasonably match Adriana records.

Results for original and WGM independent second half core samples correlate well. Results indicate that Adriana sampling is reliable and no sample sequencing errors are apparent.

The results also provide a measure of field sampling variance.

14.0 ADJACENT PROPERTIES

For details on properties adjacent to the Otelnuk property sampling preparation, analysis and security, the reader should refer to the WGM (2009) report. The following paragraphs summarize information from that report.

There are a number of claims in the immediate vicinity of the Property, both contiguous and non-contiguous with the Property. As of 2009, WGM understands that there has been no exploration activity on any of these claims, in the proximity of the Property.

New Millennium, owned nearly 20% by Tata Steel, holds a group of claims on the south boundary of the Property along the extensions to the KéMag and LabMag deposits. New Millennium has recently announced that a Feasibility Study will be initiated in 2011.

Recently filed work and status for these claims can be tracked on the Québec ministry database Gestim.

15.0 MINERAL PROCESSING AND METALLURGICAL TESTING

15.1 General

Mineral processing and metallurgical testing prior to 2009 are well documented and summarized by two WGM reports in 2005 and 2009. These reports are available on SEDAR.

The main conclusion that came from the testwork is that the iron mineralization from Lac Otelnuk can be processed with stage grinding and low intensity magnetic separation. Fine grinding at 80% finer than 53 microns is required to achieve a good concentrate of 68.5% Fe with silica content of approximately 4%. The weight recovery averaged around 30%, while the magnetite recovery was around 96%. A brief summary of the testwork, including those performed by WISCO in 2010, follows.

15.2 Historical Testing

King Resources Company carried out metallurgical testwork on North Zone drill core at Lakefield in 1971 and 1974 and on a bulk sample at a German laboratory in 1977. These programs are more fully summarized in WGM's 2005 report available on SEDAR.

The work in Germany in 1977 was aimed at independently confirming the results obtained by Lakefield. This was also the first test undertaken to determine the pelletizing characteristics of Lac Otelnuk North Zone concentrates. The pelletizing testwork was successful.

In 1981, Lakefield carried out further metallurgical testwork on the bulk sample. This work consisted of a pilot plant test using six composite samples aimed at determining the grinding and liberation characteristics of an overall composite and producing a magnetic concentrate for future pelletizing tests.

Six tests were run using a rod mill and ball mill followed by laboratory drum magnetic separators.

Details on the results can be found in WGM's 2009 report.

The main conclusion that came from these testwork programs is that the iron mineralization from Lac Otelnuk can be processed with stage grinding and low intensity magnetic separation. Fine grinding at 80% finer than 53 microns is required to achieve a good concentrate of 68.5% Fe with silica content of approximately 4%. The weight recovery averaged around 30%, while the magnetite recovery was around 96%.

15.3 Adriana 2007 and 2008

All testwork completed by Adriana to-date was done on drill core samples. This work started with a grinding optimization testwork program to determine the optimal grinding times in a ring pulverizer to provide magnetite liberation for drill core samples. The test was done on six samples collected from the first Adriana 2007 program and selected to be reasonably representative of the deposit. All of the samples are from Unit 2.

The varying grinding time of 90 and 120 seconds was found to have little effect on DWTR %. The tests showed that the %TFe in DTC generally decreased with increasing grinding time. The results for silica are mixed.

More representative samples could likely have been selected, but in the early stages of the 2007 program emphasis for drilling was mainly aimed at evaluating Unit 2 potential.

Detailed results from these tests are provided in WGM's 2009 report.

15.4 2010 Laboratory Testwork at WISCO

A total of 42 drill core samples from five separate geologic units were studied at WISCO Kaisheng Engineering Design & Research Co., Ltd. The half-cores were crushed to 2 mm separately, and arranged according to the five geologic units, as shown in Table 15.1.

Table 15.1 – Weight Statistic Table of Five Geologic Unit Samples

Units	No. of Samples	Weight kg	Weight %	% Fe Total	% Fe Magnetite	% of MagFe in TFe
2A	4	25.08	9.09	29.50	21.07	71.42
2B	15	98.31	35.64	33.15	24.58	74.15
2C	9	62.67	22.72	27.25	16.58	60.84
3A	2	11.14	4.04	27.67	14.74	53.27
3B	12	78.65	28.51	28.80	18.82	65.35
Total	**42**	**275.85**	**100.00**			

The five geologic unit samples can be divided into five natural types of mineralization:

Type I: laminated iron ore, iron mineral grain is over 70% mainly magnetite, secondly hematite, which grain morphology is complete and with strong metamorphism. Iron mineral grain which is over 32 m accounts for 65.91%. This mineralization belongs to free milling ore type.

Type II: fragmented iron ore. Iron mineralization grain mainly concentrated at rudaceous and psammitic gangue is mainly magnetite, secondly hematite, which grain morphology is complete and with strong metamorphism. Iron mineral grain which is over 32 m accounts for 59.88%. This mineralization belongs to free milling ore type.

Type III: ball or ring iron ore. The mineralization is ochre and the color is produced by fine grain hematite, less than 2 m, precipitated from ferrous carbonate phase grains. This type is mainly magnetite, secondly hematite with most morphology which is regular and with strong metamorphism. Iron mineral over 32 m accounts for 47.93%. The mineralization is free milling but recovery is low, 14.1%.

Type IV: Crystalline iron ore. The main feature is the fine mineral grain size; 16 m is 78.91%, which is mainly hematite.

Type V: Disseminated crystalline iron ore mainly in gangue and has many features the same as Type IV.

Distribution of five natural type mineralizations in each geologic unit is as follows:

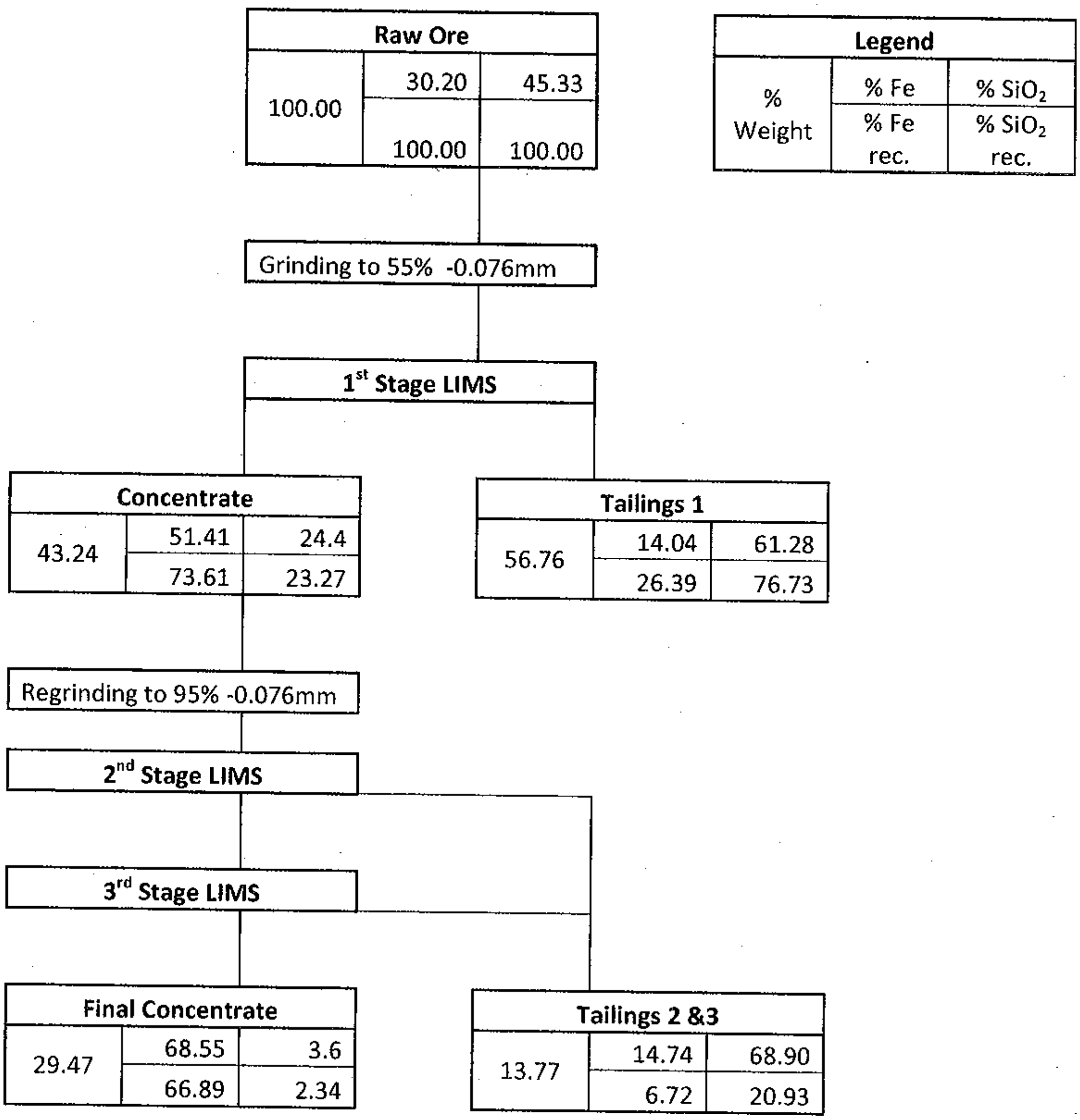
- 2A is mainly Type II and secondly it is Type I. Both of them account for 82.8% of the geologic unit;
- 2B is mainly Type III and secondly Types I and II. Types I, II and III account for 97.8% of the mineralization;
- 2C is mainly Type II and secondly it is Type I. Both of them account for 67% of the mineralization, but Types IV and V account for 33% and have an obvious effect on iron recovery;
- 3A is mainly Type II; Types I & II account for 96.7% of geologic unit; and
- 3B is mainly Type II: Types I & II account for 98% of the geologic unit.

These conclusions can draw from the above mineralogy that the 5 geologic units all belong to free milling mineralization. The 2B and 2C units are complex and may be more problematic in the beneficiation process.

Results of the investigation on the integrated sample of the raw mineralization show that the iron mineral is mainly present in the form of magnetite, and will be recovered by low intensity magnetic separation. Iron in the form of iron carbonate and hematite-limonite mineralization with Fe content of 3.22% and 3.64% respectively account for 10.66% and 12.05% of the total iron. The magnetite is easily up-gradable with low intensity magnetic separation as long as the liberation grind is established. The non-magnetite iron was treated after removal of the magnetite with wet high intensity magnetic separation. Concentrate grade from high intensity separation is high in silicon and is not up to the desired quality. This is because the hematite has a much finer liberation size, and hematite-gangue intergrowth exits.

The block diagram flowsheet below is a suggested method for beneficiating this deposit in this report. In concept, if not in exact numbers, it matches the actual proposed flowsheet.

Figure 15.1 – Proposed Beneficiation Scheme



16.0 MINERAL RESOURCE ESTIMATE

There are no N1 43-101 compliant Mineral Reserves at this stage on this Project. Pit optimization was prepared as part of the PEA using indicated and inferred resources and results are discussed in Section 17.0.

16.1 WGM Mineral Resources Estimate Statement

WGM has prepared a Mineral Resource estimate for the Lac Otelnuk Iron Property mineralized zones that have sufficient data to allow for continuity of geology and grades. WGM modeled the upper five geological sub-units (2a, 2b, 2c, 3a and 3b) of the Lac Otelnuk iron formation for the Mineral Resource estimate. Indicated Mineral Resources are defined as locks being within 350 m of a drillhole intercept. Inferred Mineral Resources are interpolated out to a nominal 1,000 m on the fringe and at depth, as the entire 600 m x 500 m grid was not completed and some drillholes did not penetrate the entire stratigraphy, however, the units show excellent continuity. A summary of the Mineral Resources is provided in Table 16.1 and Table 16.2.

Table 16.1 – Lac Otelnuk Iron Project Estimated Resource (Cut-off of 18% DTWR)

Resource Category	Tonnes (billions)	%TFe (Head)	DTWR %	SiO_2 % (DTC)	TFe % (DTC)
Indicated	4.29	29.08	27.26	3.53	68.00
Inferred	1.97	29.24	26.55	3.51	68.12

Table 16.2 – Categorized Mineral Resources by Sub-unit
Lac Otelnuk Iron Project (Cut-off of 18% DTWR)

	Tonnage (t)	TFe%	DTWR%	SiO_2% (DTC)	TFe% (DTC)
Indicated					
Sub-unit 2a	400,951,317	33.26	34.88	3.56	68.20
Sub-unit 2b	1,356,468,139	31.20	27.89	3.41	68.51
Sub-unit 2c	1,144,803,690	27.71	24.36	3.16	68.75
Sub-unit 3a	266,219,889	26.40	23.24	3.85	67.73
Sub-unit 3b	1,122,988,110	27.06	27.69	3.97	66.61
Total Indicated	**4,291,431,147**	**29.08**	**27.26**	**3.53**	**68.00**
Inferred					
Sub-unit 2a	93,846,334	31.88	32.40	3.46	68.05
Sub-unit 2b	665,681,442	32.59	28.31	3.26	68.60
Sub-unit 2c	464,077,895	27.41	24.06	3.27	68.61
Sub-unit 3a	144,243,915	26.63	22.74	3.64	68.41
Sub-unit 3b	601,530,569	27.15	26.53	3.93	67.14
Total Inferred	**1,969,380,158**	**29.24**	**26.55**	**3.51**	**68.12**

Note: Numbers may not add up due to rounding

The classification of Mineral Resources used by WGM in this report conforms to the definitions provided in the final version of NI 43-101, which came into effect on February 1, 2001, as revised on December 11, 2005. WGM further confirms that, in arriving at our classification, we have followed the guidelines adopted by the Council of the Canadian Institute of Mining Metallurgy and Petroleum ("CIM") Standards.

The relevant definitions for the CIM Standards/NI 43-101 can be found on the CIM website.

16.2 General Mineral Resource Estimation Procedures

The block model Mineral Resource estimate procedure included:

- Importation and validation of digital data into Gemcom Software International Inc.'s ("Gemcom") geological software package to create a Project database;
- Generation of cross sections and plans to be used for geological interpretations;
- Basic statistical analyses to assess cutoff grades, compositing and cutting capping) factors;
- Development of 3-D wireframe models for zones with continuity of geology / mineralization, using available assays for each drillhole sample interval; and
- Generation of block models for Mineral Resource estimates for each defined zone and categorizing the results according to NI 43-101 and CIM definitions.

16.3 Database

16.3.1 Drillhole Data

Data used to generate the Mineral Resource estimate originated from digital spreadsheet / database files supplied to WGM by Adriana technical personnel. A Gemcom project was established to hold all the data necessary for the completion of the Mineral Resource estimate.

The Gemcom drillhole database consisted of 104 drillholes, 67 of which were used for the Mineral Resource estimate. Only drillholes completed by Adriana in 2007-08 were used for the Mineral Resource estimate and totalled 7,375 m covering approximately 9 km of strike length, referred to as the South Zone. These holes were drilled on a nominal drill spacing of 600 m by 500 m. The remaining holes in the database were predominantly old holes in the North Zone or holes outside the current area of interest.

The drillholes contained geological codes for each unit and sub-unit and multi-element assay data for Head and Davis Tube concentrate analyses for the sampled intervals (total of 1,555 intervals) that ranged from 0.66 m to 6.30 m, averaging 4.14 m.

16.3.2 Data Validation

Upon receipt of the data, WGM performed the following steps in the data validation:

- Checking for location and elevation discrepancies by comparing collar coordinates with the original drill logs;
- Checking the minimum and maximum values for each quality value field;
- Checking for inconsistencies in lithological unit terminology;
- Spot checking of original assay certificates against information entered in the database; and
- Checking gaps, overlaps and out-of-sequence intervals for both assays and lithology tables.

The database tables contained minor errors and these were corrected before proceeding with the Mineral Resource estimate. In general, WGM found the database to be in good order and accurate and no errors were identified that would have a significant impact on the Mineral Resource estimate.

16.4 Geological Modeling Procedures

16.4.1 Cross Section Definition

Fifteen vertical cross sections were defined for the Property at a spacing of 600 m along the drillhole lines to mimic those defined by Adriana personnel for its internal geological interpretations. Each cross section contained four or five holes on a nominal 500 m spacing.

16.4.2 Geological Interpretation and 3-D Wire frame Creation

WGM used Adriana's internal geological interpretations from the cross sections as a guide to define the boundaries of the mineralized sub-zones / sub-units. Zone boundaries were digitized from drillhole to drillhole that showed continuity of strike, dip and grade, generally from 500 m to 600 m in extent, and up to a nominal 1,000 m on the ends of the zones and at depth where there was no drillhole information, if the interpretation was supported by drillhole information on adjacent cross sections. WGM modeled the upper five geological sub-units (2a, 2b, 2c, 3a and 3b) of the Lac Otelnuk iron formation for the Mineral Resource estimate.

Sub-unit 2a has an average thickness of approximately 14.4 m, 2b averages 21.0 m, 2c averages 19.8 m, 3a averages 8.9 m and 3b averages 17.7 m. WGM decided that the sub-units logged as transitional were to be combined with the overlying sub-zones in an effort to simplify the interpretation and to eliminate thin intervals of transitional material, as transitional material was not identified in every drillhole.

The extensions of the sub-units on the fringes and at depth were due to the fact that the entire 600 m x 500 m grid was not completed and some drillholes did not penetrate the entire stratigraphy. Internally, the continuity of the sub-units was excellent, so WGM had no issues with extending the interpretation beyond the 600 m distance, as long as there was supporting data from adjacent sections. This extension was taken into consideration when classifying the Mineral Resources and these areas were given a lower confidence category.

16.4.3 Topographic Surface Creation

A topographic surface or triangulated irregular network ("TIN") was created using collar elevations of the drillholes in the Property area. In 2008, a Differential GPS survey of all Adriana drillhole collars was completed and the drill logs were updated with the new GPS coordinates, so this was not seen as being a crucial aspect for this stage of the Mineral Resource estimate.

16.5 Statistical Analysis, Composting, Capping and Specific Gravity

16.5.1 Back-Coding of Rock Code Field

The 3-D wireframes / solids that represented the interpreted mineralized sub-zones were used to back-code a rock code field into the drillhole workspace, and these were checked against the logs and Adriana's initial interpretation. Each interval in the original assay and the WGM generated composite tables was assigned a new rock code value (if necessary) based on the rock type wireframe that the interval midpoint fell within.

As mentioned above, the transition zones were logged in the field, but WGM was of the opinion that they would have little value in the Mineral Resource estimate, so they were combined with the sub-unit above them and the intervals were back-coded based on the new "combined" rock code.

16.5.2 Statistical Analysis and Composting

In order to carry out the Mineral Resource grade interpolation, a set of equal length composites of 3.0 m was generated from the raw drillhole intervals, as the original assay intervals were of different lengths.

Regular down-the-drillhole compositing was used. If, however, the last composite was less than 1 m, WGM discarded it for the grade interpolation in order to retain a relative constant representative length and weighting.

16.5.3 Grade Capping

The statistical distributions of the modeled elements show fairly good lognormal distributions for most of the units that have a sufficient number of samples. Sub-units 2a and 2b are the highest grade, and 2c, 3a and 3b exhibit similar behavior of grade distributions.

Grade capping, also referred to as top cutting is commonly used in the Mineral Resource estimation process to limit the effect associated with extremely high assay values. Considering the nature of the mineralization and the continuity of the zones, WGM determined that capping was not required for the Lac Otelnuk mineralization.

16.5.4 Density / Specific Gravity

The 2007/2008 assaying and testwork protocol called for the determination of bulk density on a number of split drill core samples using the water immersion technique and the determination of specific gravity (SG) using a gas comparison pycnometer on pulps of 1/3 of all routine samples (313).

The results for the bulk density and SG determinations plotted against the Iron Head grades show that the pycnometer and bulk density points are fairly consistent and define the same trend.

The pycnometer SGs completed on pulps has the disadvantage of not reflecting any internal porosity that might have existed in the rocks prior to pulverization. However, the fact that the bulk density and pycnometer results follow a similar curve graphed against %TFe in Heads indicates, as expected, that there is no significant internal porosity in these rocks.

16.6 Block Model Parameters, Grade Interpolation and Categorization of Mineral Resources

16.6.1 General

The Lac Otelnuk Mineral Resource estimate was completed using a block modeling method and for the purpose of this study, the grades have been interpolated using an Inverse Distance ("ID") estimation technique.

For comparison and cross checking purposes, the ID2 and ID10 methods, which closely resembles a Nearest Neighbor ("NN") technique, was used. All interpolation methods gave similar results, as the grades were well constrained within the wireframes, and the results of the interpolation approximated the average grade of the all the composites used for the estimate.

WGM's experience with similar types of deposits showed that geostatistical methods, like Kriging, gave very similar results when compared to ID interpolation; therefore, WGM is of the opinion that ID interpolation is appropriate.

16.6.2 Block Model Setup and Parameters

The block model was created using the Gemcom software package to create a grid of regular blocks to estimate tonnes and grades. The deposit specific parameters used for the block modelling are summarized in.

The block sizes used were

- Width of columns = 100 m;
- Width of rows = 100 m; and
- Height of blocks = 5 m.

The specific parameters for each block model are as follows:

- Number of columns in model: 40;
- Number of rows in model: 112; and
- Number of levels: 80.

16.6.3 Grade Interpolation

The geology and geometry of the sub-units is fairly well understood and consistent, so the search ellipse size and orientation for the grade interpolation were based on this geological knowledge. The following lists the grade interpolation parameters for the ID Search Ellipsoid:

- 1,500 m in the East-West direction;
- 2,000 m in the North-South direction;
- 50 m in the Vertical direction;
- Minimum / Maximum number of composites used to estimate a block: 2 / 12;
- Maximum number of composites coming from a single hole: 3; and
- Ellipsoidal search strategy with rotation about Z, Y, Z: 0°, 5°, 0°.

A large search ellipse was used in order to inform all the blocks in the block model with grade; however, the classification of the Mineral Resources was based on drillhole density (or drilling pattern), geological knowledge and interpretation of the sub-units and WGM's experience with similar deposits. Since WGM did not use the percent model approach, a block height of 5 m was selected in order to achieve better resolution on the geological coding for portions of the thinner subunits.

16.6.4 Mineral Resource Categorization

Mineral Resource classification is based on certainty and continuity of geology and grades, and this is almost always directly related to the drilling density. WGM has abundant experience with similar types of mineralization to the Lac Otelnuk deposit; therefore, we used this knowledge to assist us with our categorization of the Mineral Resources. Since the entire 600 m x 500 m grid was not completed and some drillholes did not penetrate the entire stratigraphy, the sub-units were extended on the fringes and at depth.

Internally, the continuity of the sub-units was excellent, so WGM had no issues with extending the interpretation beyond the more densely drilled parts of the deposit, as long as there was supporting data from adjacent sections. This extension was taken into consideration when classifying the Mineral Resources and these areas were given a lower confidence category. Variograms were also generated along strike and across the deposit in support of these distances.

WGM has not classified any of the Lac Otelnuk mineralization as Measured at this stage of exploration.

Because the search ellipses were large enough to ensure that all the blocks in the model were interpolated with grade, WGM generated a distance model (distance from actual data point to the block centroid) and reported the estimated Mineral Resources by distances which represented the category or classification. WGM chose to use the blocks within the 3-D wireframes of the sub-units that had a distance of 350 m or less to be Indicated category and +350 m to be Inferred category. The average distances and categories for the most of the zones were similar (especially for the Indicated category) and are shown in Table 16.3.

Table 16.3 – Average Interpolation Distance for Resource Categorization

Zones	Average Distance for Indicated	Average Distance for Inferred
Unit 2a	214 m	485m
Unit 2b	214 m	532 m
Unit 2c	214 m	528 m
Unit 3a	213 m	549 m
Unit 3b	216 m	532 m

For the Mineral Resource estimate, previously shown in Table 16.1 and Table 16.2 , a cutoff of 18% DTWR was determined to be appropriate at this stage of the project. This cutoff was chosen based on a preliminary review of the parameters that would likely determine the economic viability of a large open pit operation and compares well to similar projects in the area that are currently at a more advanced stage of study.

17.0 OTHER RELEVANT DATA AND INFORMATION

MPH (on behalf of King) carried out preliminary economic studies of a possible iron mining, processing and transportation operation at Lac Otelnuk. A preliminary economic/cash flow evaluation was completed in March 1975, prior to any drilling on the South Zone, and concluded that there were no technical fatal flaws with the project, and that a profitable 20-year operation could be supported by the North Zone, although the payback period would be very long (assuming debt financing).

While the monetary estimates used in the study would not stand up to scrutiny today, it is interesting to note that electric power, transportation and taxation issues were identified as being the key parameters in determining the economic viability of the Lac Otelnuk deposits. These same issues remain of critical importance today.

The following sections describe the conceptual operations required to produce 50 Mtpy of iron pellets. This includes mining the deposit, processing the iron mineralization to produce pellets, transporting the pellets by rail to Sept-Îles, and loading the pellets on to ocean-going iron ore vessels. Other relevant information also includes the capital and operating costs, as well as an economic analysis of the Project at this scoping level.

17.1 Mining

The Lac Otelnuk Preliminary Economic Assessment is based on a large-scale open pit operation utilizing shovels and trucks to move an average of 175 million tonnes of iron mineralization and 125 million tonnes of waste per year over a 34 year mine life.

17.1.1 Inpit Mineral Resources

In order to determine the inpit mineral resources, Met-Chem used the geological block model produced by WGM in 2009. This block model was discussed in section 16.0 of this report. It is to be noted that the mineral resource base for this PEA includes inferred resources and therefore, mineral reserves cannot be reported, as additional drilling will be required.

a) Pit Optimization

Met-Chem used the MineSight® Version 6.0 software's Lerchs-Grossman 3-Dimensional pit optimization algorithm to determine the economic limits of the resource. Since the project is at the preliminary economic assessment stage, Measured, Indicated and Inferred Resources were included in the economic evaluation.

Using the economic parameters presented in Table 17.1, a net value (revenue minus cost) was calculated for each block in the model. The net values along with the maximum pit slope were used by the pit optimizer to determine the economic limits of the resources. The economic parameters were derived from Met-Chem's internal database and are comparable to similar operations in the region.

Table 17.1 – Economic Parameters

Item	Units	Value
Sales Price	US$/t of pellets	100
Mining Cost – Waste	$/t mined	1.6
Mining Cost – Ore	$/t mined	2.15
Processing Cost	$/t of pellets	15
Transportation and Port Costs	$/t of pellets	10
General and Administration Costs	$/t of pellets	3
Weight Recovery Cut-off	%	> 18
Overall Pit Slope	Degree	48

The pit optimization showed that the entire geological resource identified in the block model is economic for these parameters. It is important to mention that the pit optimization evaluates the deposit solely on an operating cost basis only and does not account for capital investment.

b) Pit Design

A detailed pit design was carried out based on the optimum pit outline obtained from the Lerchs-Grossman pit optimization described above. Detailed pit design accounts for pit walls that include catch benches and ensures that there is an access ramp to the bottom of the pit which is required for the haul trucks.

In order to achieve an overall pit slope of 48°, Met-Chem incorporated a triple benching strategy of 3, 15 m high benches, a face angle of 70° and a catch bench width of 24.1 m. Figure 17.1 illustrates a typical cross section showing the final pit wall on the East side of the pit.

No access ramp was required in the pit design since the deposit daylights at the surface on the West side of the pit. The haul trucks will access the mining areas by following the pit floor which dips at an average of 5°. Temporary ramps will be required during the mining operation to access the different benches and dump areas. These ramps should be 40 m wide to accommodate 2 way haul truck traffic. The maximum recommended ramp gradient is 8%.

Figure 17.2 shows the general layout of the pit design.

c) Dilution and Mineralization Loss

Met-Chem assumed an average mineralization loss of 2% for the deposit. This mineralization loss reflects the fact that the large mining equipment will be unable to mine precisely along the mineralization waste contacts. The 2% was estimated assuming 1 m is lost at the top of the deposit and 1m at the bottom. The average thickness of the mineralization is 100 m.

Figure 17.1 –Pit Wall Layout

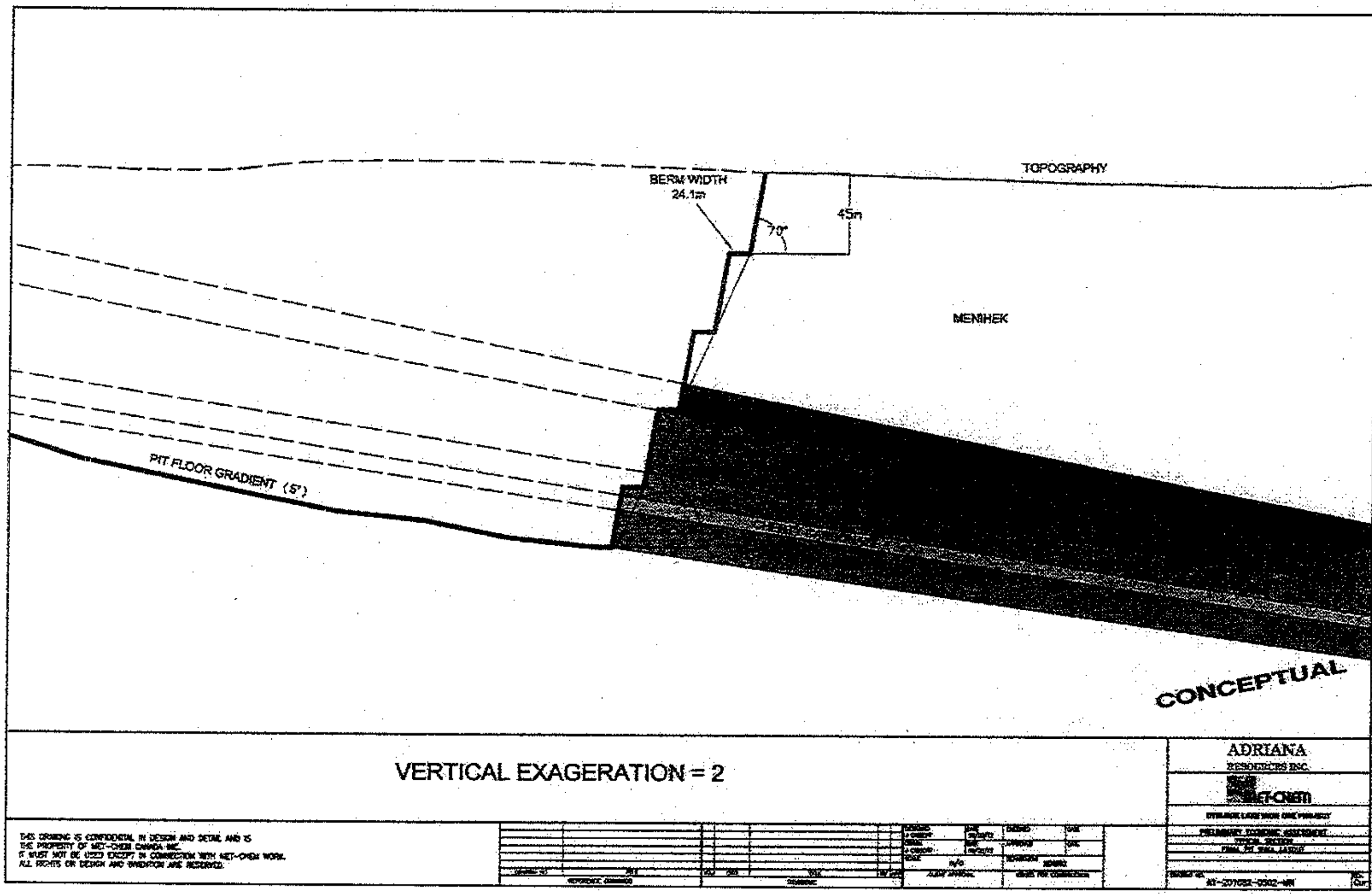
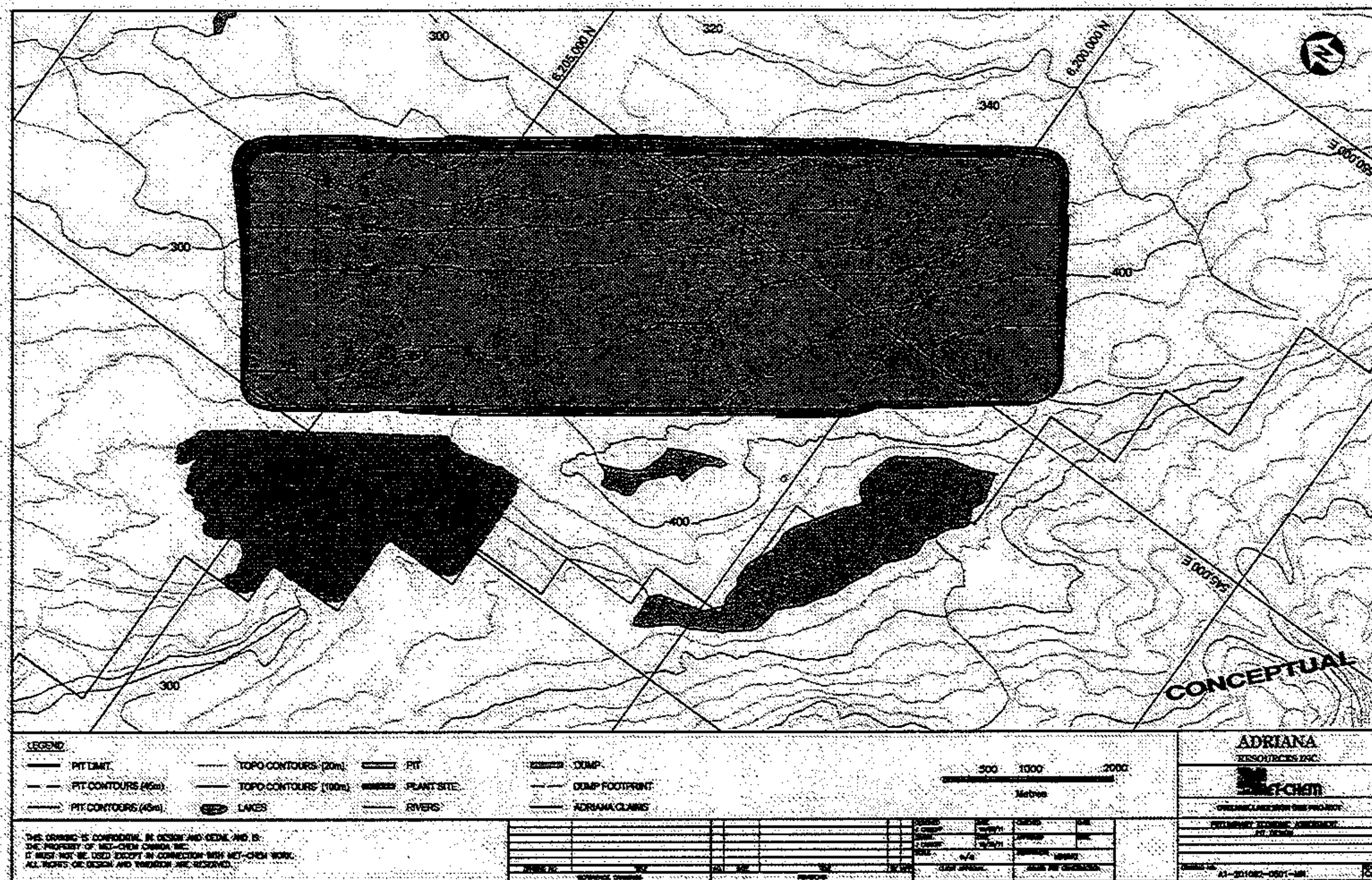


Figure 17.2 – Pit Design



d) Inpit Mineral Resources

The inpit mineral resources for the Lac Otelnuk Project are 5,975 million tonnes of mineralization at an average weight recovery of 27%. A total of 4,367 million tonnes of waste must be mined to access the resources. This results in a stripping ratio of 0.73 to 1.

Table 17.2 presents the inpit mineral resources by seam. The tonnages are reported as dry in-situ. The tonnages account for the 2% mineralization loss.

Table 17.2 –Inpit Mineral Resources

	Mineralization (Mt)	**Weight Recovery (%)**	**SiO_2 (%)**
2a	465	35.0	3.6
2b	1,912	28.0	3.4
2c	1,672	24.3	3.2
3a	289	21.3	3.8
3b	1,761	27.3	4.0
Total	**5,975**	**27.0**	**3.5**

17.1.2 Mine Planning

a) Mining Method

The Lac Otelnuk deposit will be mined using conventional open pit mining methods based on truck and shovel operations. The rock will be drilled, blasted and loaded into haul trucks that will deliver run of mine mineralization to the primary crushers. The semi-mobile primary crushers will be relocated approximately every 5 years in order to stay close to the active mining areas thus minimizing haulage distances.

b) Annual Production Requirement

The pellet production required ramps up during the first 6 years until it reaches 50 Mt per year.

Table 17.3 – Pellet Production Ramp Up

Year	**Pellets (Mt)**
1	8.3
2	16.7
3	30.0
4	33.3
5	48.3
6	50.0

In order to produce the nominal capacity of 50 Mt of pellets, 49.140 Mt of concentrate are required each year. To produce this tonnage of concentrate, approximately 187.5 Mt of run of mine ore are required. This tonnage is calculated assuming the average deposit weight recovery of 27% and a moisture content of 3%.

c) Blending

The geological model for the Lac Otelnuk deposit identified 6 mineralization seams, each seam containing different physical and chemical characteristics. Blending of material from the different seams will be carried out in order to accomplish the following.

- Reduce the amount of SiO_2 contained in the concentrate on a regular basis;
- Optimize the use of high weight recovery to maximize the concentration ratio and optimize the Project's net present value; and
- Feed the mill with a constant mineralization hardness to facilitate stable process plant operations.

d) Waste Dumps

Met-Chem has designed an out of pit waste dump as well as an in-pit waste dump for the Lac Otelnuk project. The external dump will be used until enough floor space is exposed to allow for in-pit backfilling.

The external waste dump is located close to the Northwest corner of the pit, where mining will begin. The dump has been designed with an overall slope of 27° and the toe is a minimum of 200 m from the pit limits. The external waste dump has been designed with a capacity of 150 Mm^3.

The in-pit waste dump has been designed with the following parameters:

- Overall slope: 15°;
- Lift height: 60 m;
- Lift face angle: 27°;
- Berm width: 105 m; and
- Swell factor: 25%.

To avoid sterilizing future pit expansions, the toe of the in-pit waste dump has been designed to be a minimum of 100 m from the North, South and East pit walls. The in-pit waste dump has a capacity of 1,500 Mm^3. Figure 17.3 shows a typical cross section with both the external waste dump and the in-pit waste dump.

e) Tailings

Throughout the 34 year mine life, a total of 2,300 Mm^3 of tailings will be produced. This number has been estimated under the assumption that 75% of the water pumped to the tailings facility will be either recycled back to the plant or discharged to the environment.

Met-Chem has identified a valley to the Northwest of the pit that will used to contain this volume of tailings. The tailings will be pumped to the containment facility up to an elevation of 340 m. Even though the topography will be used to assist with containment, several dykes are required to be constructed.

The total dyke construction material required is approximately 125 Mm^3. Waste material from the pit will be hauled to construct the dykes. The haul distance is approximately 20 km. The dykes have been designed with the following parameters:

- Freeboard – 2 m;
- Slope: 3h: 1v;
- Width at top – 50 m.

A polishing pond has been designed at the North end of the tailings facility prior to discharging water to the environment. The polishing pond has been designed for a capacity of 23 Mm^3, which is equal to 1% of the tailings storage capacity. A dyke of approximately 10 Mm^3 is required to be constructed.

Figure 17.4 presents the tailings disposal configuration as described above.

Figure 17.3 – Dump Layout

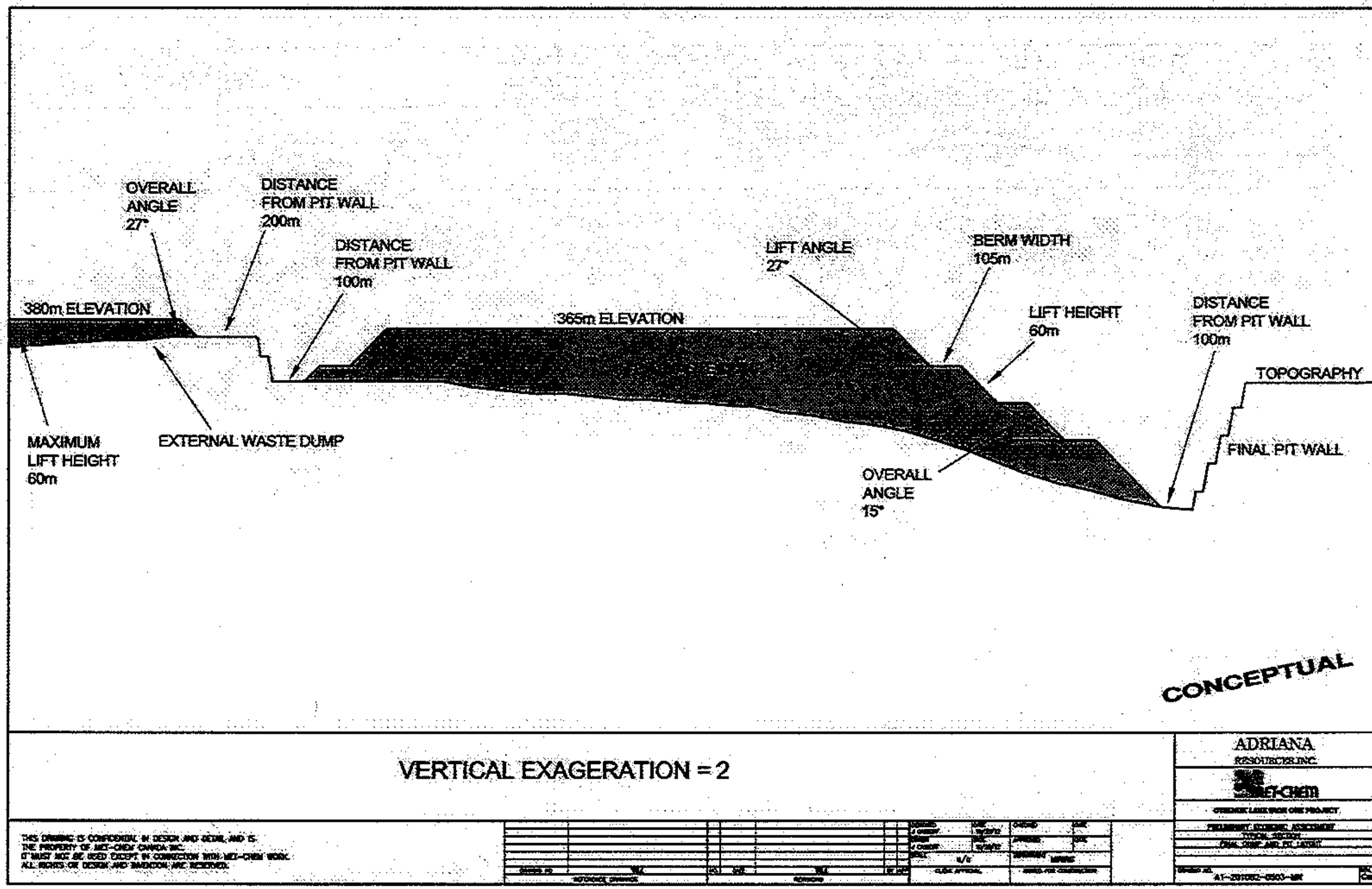
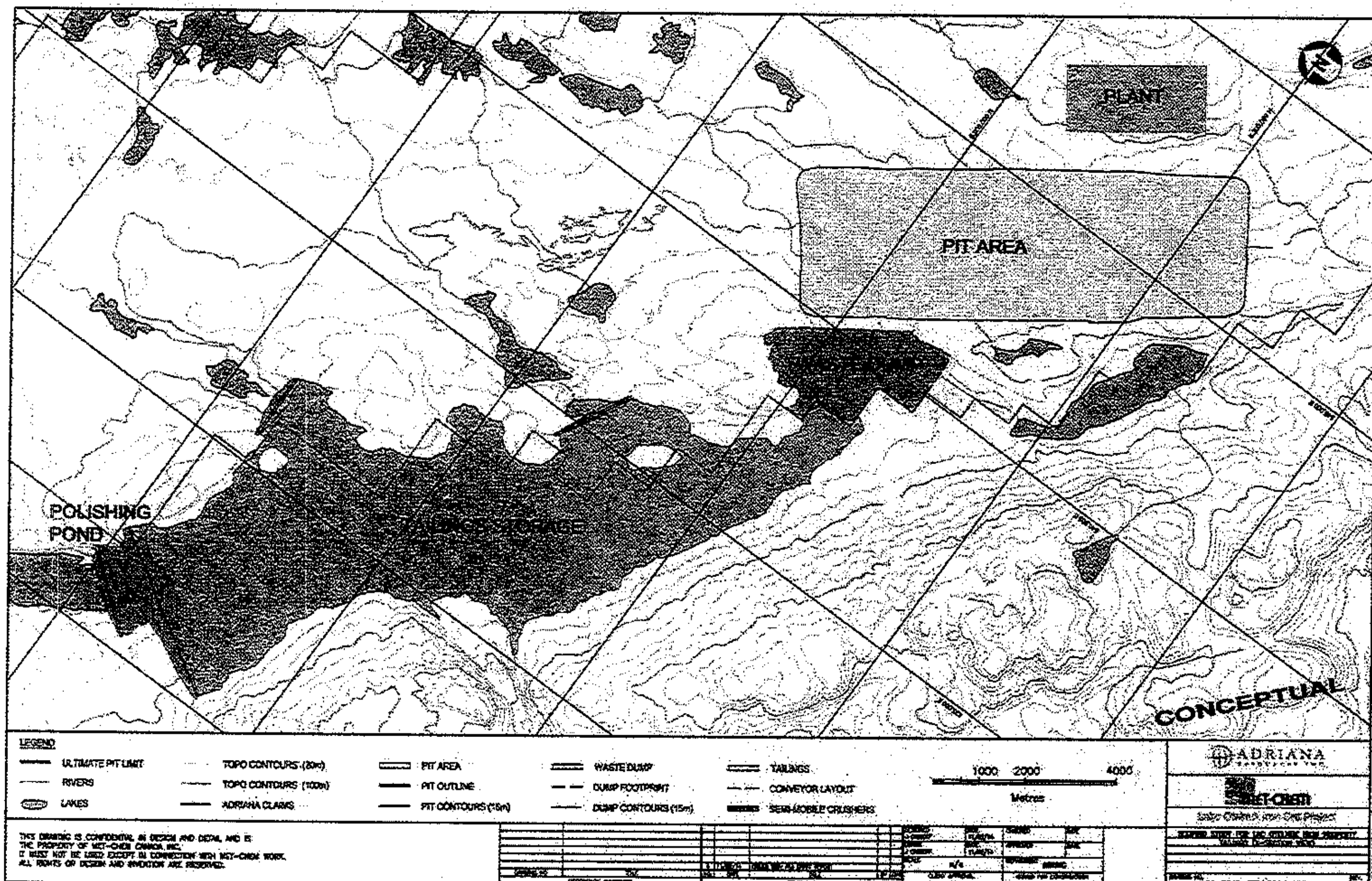


Figure 17.4 – Tailings Layout



f) Mine Production Schedule

A mine plan has been developed for the life of the deposit, meeting the production targets. In order to facilitate in-pit backfilling of waste, mining begins at one end of the pit and progresses towards to the other end. As the pit floor is exposed, waste is backfilled behind the advancing mining face. In order to reduce the haul distance to construct the tailings dykes, it was decided that mining should begin at the North end, closest to the tailings facility. The pit has been divided into 1,000 m wide panels which will be mined from West to East. These panels are wide enough to provide enough working space for the mine equipment. The pushback mining technique will be used, stripping waste in the following panel while mineralized rock is being mined in the current panel.

The 34 year mine production schedule is presented below in Table 17.4. The schedule is broken out into a pre-production phase, followed by 5, 1 year increments, 3, 3 year increments and 4, 5 year increments. End of period maps are presented in Appendix B, which illustrate the pit and dump status as well as the primary crusher location for each mining period.

A pre-production phase of 2.5 years has been included in order to pre-strip the initial mining area and to construct the tailings dykes and haul roads. 75 Mt of waste is mined during pre-production.

In order to reduce initial tailings dyke construction requirements, the tailings dykes are built in 2 Stages. Stage 1 lasts until Year 8 when the tailings containment reaches an elevation of 280 m. The dyke construction requirements for Stage 1 of 28 Mm^3 are met in pre-production. Stage 2 lasts from Year 9 until the end of the mine life when the tailings containment will reach the 340 m elevation. Dyke rising for this stage lasts from Year 3 until Year 9. The 107 Mm^3 of dyke construction material was spread over 7 years in order to smooth the equipment fleet.

Waste is hauled to the external waste dump for the first 7 years of production. Beginning in Year 8, waste is hauled to the in-pit waste dump.

The total material mined each year ramps up from an average of 30 Mt per year in pre-production to a peak of 355 Mt per year in Year 20.

Table 17.4 – Mine Production Schedule

TOTAL PRODUCTION

Description	Units	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-8	Year 9-11	Year 12-14	Year 15-19	Year 20-24	Year 25-29	Year 30-34	Total
Pellet	Mt	0	8	17	38	33	48	150	150	151	251	256	249	254	1,593
Concentrate	Mt	0	8	17	38	33	47	144	147	148	247	247	245	250	1,565
Total Mineralization	Mt	0	35	66	116	123	194	583	526	578	934	969	929	915	5,977
WR	%	0.0	24.7	26.1	26.7	27.5	24.9	26.1	28.3	26.4	27.2	26.3	27.2	28.1	27.0
SiO_2	%	0.0	2.6	2.5	2.8	3.8	2.9	3.4	3.7	3.2	3.4	3.4	4.2	3.6	3.5
Total Waste	Mt	75	25	27	50	71	94	418	452	399	719	807	696	535	4,367
Total Material	Mt	75	60	94	165	194	285	1,001	979	977	1,653	1,776	1,624	1,450	10,344
Total (Annualized)	Mt	30	60	94	165	194	285	334	330	326	331	355	325	286	
Strip Ratio		n/a	0.7	0.4	0.4	0.6	0.5	0.7	0.8	0.7	0.8	0.8	0.7	0.6	0.7

A mineralization loss of 2% is included.

17.1.3 Fleet Requirements

The following section discusses equipment sizing and fleet requirements in order to carry out the mine plan presented in the previous section.

a) Haul Trucks

The haul truck selected for the Lac Otelnuk Project is of the 363 t class. This large scale mining truck with a nominal payload of 363 tonnes resulted in a manageable fleet size for a project of this magnitude.

The following parameters were used to calculate the number of trucks required to carry out the mine plan:

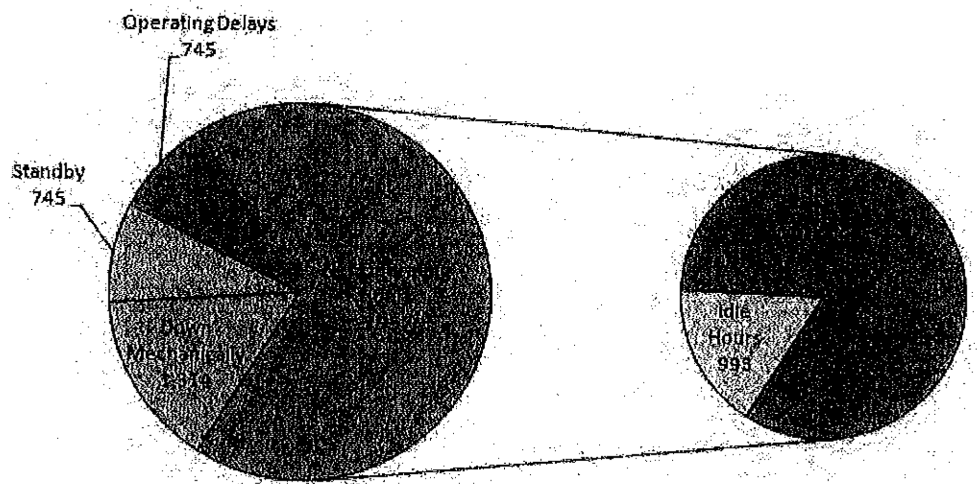
- Mechanical Availability – 85%;
- Utilization – 90%;
- Payload – 363 tonne;
- Shift Schedule – Two (2), 12 hour shifts per day;
- Operational Delays – 80 min/shift (this includes 15 minutes for shift change, 15 minutes for equipment inspection, 40 minutes for lunch and coffee breaks and 10 minutes for fuelling);
- Job Efficiency – 83% (50 min/hr; this represents lost time due to queuing at the shovel and dump as well as interference along the haul route); and
- Rolling Resistance – 3%.

Table 17.5 summarizes the annual hours of a haul truck based on the specified parameters. Figure 17.5 displays these hours in a graphical format.

Table 17.5 – Tabulated Truck Hours

Total Scheduled Hours	8,760	hr/yr	365 days per year, 24 hours per day
Down Mechanically	1,314	hr/yr	15% of Total Scheduled Hours
Available	7,446	hr/yr	Total Scheduled Hours minus Hours Down Mechanically
Standby	745	hr/yr	10% of Available Hours (Represents 90% Utilization)
Operating	6,701	hr/yr	Available Hours minus Standby Hours
Operating Delays	745	hr/yr	80 min/shift (this time is incurred only when the truck is available)
Net Operating Hours	5,957	hr/yr	Operating Hours - Operating Delays
Working Hours	4,964	hr/yr	83% of Net Operating Hours (Reflects Job Efficiency)

Figure 17.5 – Truck hours



The following four typical haul routes were generated for the project; run of mine mineralization to crusher, waste to external dump, waste to in-pit dump and waste to tailings dykes. These haul routes were imported into Talpac©, a commercially available truck simulation software package that Met-Chem has validated with mining operations. Talpac© calculated the travel time required for a 363 tonne truck to complete each route. Table 17.6 shows the various components of a truck's cycle time. The load time is calculated using an electric rope shovel with 109 tonne bucket as the loading unit. This shovel which is discussed in the following section, loads a 363 tonne truck in 4 passes. The haul productivity for each route was calculated using the truck payload and cycle time. Table 17.7 shows the haul productivities for each route.

Table 17.6 – Truck Cycle Time

Spot @ Shovel	0.75	min
Load Time	2.13	min
Travel Time	Calculated by Talpac©	min
Spot @ Dump	0.50	min
Dump Time	0.50	min

Table 17.7 – Truck Productivities

Haul	Cycle Time (minutes)						Productivity	
	Talpac © Travel Time	Spot Time	Load Time	Dump Time	Total Time	Loads / hr	Payload (t)	t/hr
ROM to Crusher	10	0.75	2.13	1.00	13.88	4.32	363	1,569
Waste to external Dump	16	0.75	2.13	1.00	19.88	3.02	363	1,005
Waste to in-Pit Dump	10	0.75	2.13	1.00	13.88	4.32	363	1,569
Waste to Dykes	40	0.75	2.13	1.00	43.88	1.37	363	496

Truck hour requirements were calculated by applying the tonnages hauled to the productivity for each haul route. The number of trucks required was calculated assuming each truck has 4,964 hours available to work in a full year. A fleet of 12 trucks is required during pre-production and the first 2 years of production. The truck requirements increase to 34 in Year 3, 39 in Year 4 and 49 in Year 5. The truck requirements by year are presented in Table 17.8 at the end of the fleet requirements section.

b) Shovels

The loading machine selected for the Lac Otelnuk Project is an electric rope shovel in the 109 tonne bucket payload class. This large scale shovel was selected due to its capability to load the 363 tonne truck and be able to manage the 15 m face height.

The following parameters were used to calculate the number of shovels required to carry out the mine plan:

- Mechanical Availability – 85%;
- Utilization – 90%;
- Bucket Capacity – 109 tonne;
- Bucket Fill Factor – 90%;
- Shift Schedule – Two (2), 12 hour shifts per day;
- Operational Delays – 70 min/shift; and
- Job Efficiency – 67% (40 min/hr; this represents lost time due to waiting for trucks, cleaning up the loading area and relocating).

This class of shovel can load a 363 tonne haul trucks in 4, 32 second passes for a total load time of 2.13 minutes. Assuming there are trucks available to load, the excavator can load 28, 363 tonne trucks per hour for a theoretical productivity of

10,209 t/hr. Accounting for mechanical availability, utilization, operational delays and job efficiency, each loader has 4,033 available work hours in a full year. In order to mine the tonnages presented in the mine plan, the shovel fleets increases from 2 shovels in pre-production to a fleet of 8 by Year 6. The shovel requirements by year are presented in Table 17.8 at the end of the fleet requirements section.

c) Drilling and Blasting

Both mineralized rock and waste will be drilled using 15" (381 mm) diameter holes with a drilling pattern of 9.5 m x 9.5 m. Drilling will be done on a single pass on 15 m bench height and 1.5 m sub-drilling. The drill pattern will be reviewed as more data on blast fragmentation and rock characteristics become available. The drill selected for the Lac Otelnuk Project is an electric drill with a pull down force in the range of 68,000 kg.

To calculate the required number of drills, Met-Chem assumed a penetration rate of 18 m/hr. This resulted in a drilling productivity of 4,874 t/hr. Assuming each drill has 5,042 available work hours in a full year, 2 drills are required in pre-production, 4 in Year's 1 and 2, ramping up to 13 drills required by Year 6. The drill requirements by year are presented in Table 17.8 at the end of the fleet requirements section. Blasting will be executed under contract with an explosives supplier that will store all the blasting materials and technology required by the mine. During full production, there will be three blasts per week, each producing about 1.5 Mt of material. Using a 6 m collar, the Powder Factor will be 1.3 kg/m^3 (or 0.37 kg/tonne). Given the nature of the material, blasting costs will be 1 $/m3.

d) Auxiliary Equipment

A fleet of support and service equipment was included to carry out the mine plan. The number of units required by period is presented in Table 17.8 at the end of the fleet requirements section. The following list describes the use of each piece of support equipment.

- Track Dozer (850 hp) – the dozers are used for construction of the waste dumps as well as pit and road maintenance;
- Road Grader (24 ft blade) – the graders are used for road maintenance;
- Wheel Dozer (904 hp) – the wheel dozers are used for shovel pit cleanup. Each wheel dozer will cover 2 shovels;
- Wheel Loader (53 yd^3 bucket) – the wheel loaders are required as auxiliary loading equipment. They will be used for stockpile re-handling and must be able to efficiently load the 363 tonne haul trucks;
- Backhoe Excavator (404 hp) – the backhoe excavators will be used for road maintenance and to establish the dewatering network;
- Water Truck – the water trucks will be used for dust abatement;

- Sand Truck – the sand trucks will be used during snow and rain falls;
- Cable Reeler (687 hp) – the cable reelers will be used to manipulate the electric trailing cables for the shovels and drills;
- Utility Haul Truck (90 tonne) – these trucks will be used for road maintenance and dewatering activities;
- Tow Truck – the tow truck will be used for transporting the 363 tonne trucks to the maintenance shop when they are broken down;
- Secondary Drills (8") – these diesel powered drills will be used for secondary blasting, bench levelling and ramp preparation; and
- Tailings Equipment – the tailings crew will be supplied with pipelayers and track dozers to manage the tailings facility.

Table 17.8 – Equipment List Summary

Description	Units	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-8	Year 9-11	Year 12-14	Year 15-19	Year 20-24	Year 25-29	Year 30-34
MAJOR EQUIPMENT														
Truck - CAT 797	#	12	12	12	34	39	49	49	49	46	46	48	46	39
Shovel - P&H4100	#	2	2	3	4	5	7	8	8	8	8	8	8	7
Drill - P&H320	#	2	4	4	7	6	12	13	13	13	12	13	13	12
SUPPORT EQUIPMENT														
Track Dozer - CAT D11	#	5	5	5	10	10	10	10	10	10	10	10	10	10
Graders - CAT 24M	#	3	3	3	5	5	5	5	5	5	5	5	5	5
Wheel Dozer - CAT 854K	#	2	2	2	4	4	4	4	4	4	4	4	4	4
Wheel Loader - L2350	#	1	1	1	2	2	2	2	2	2	2	2	2	2
Excavator - CAT 374	#	2	2	2	2	2	2	2	2	2	2	2	2	2
Water Truck - CAT 785	#	2	2	2	2	2	2	2	2	2	2	2	2	2
Sand Truck - CAT 789	#	2	2	2	2	2	2	2	2	2	2	2	2	2
Cable Reeler - CAT 854K	#	2	2	2	4	4	4	4	4	4	4	4	4	4
Utility Truck - CAT 777	#	6	6	6	6	6	6	6	6	6	6	6	6	6
Secondary Drill - Sandvik QXR920	#	1	1	1	2	2	2	2	2	2	2	2	2	2
Pipelayer - CAT 587	#	0	3	3	6	6	6	6	6	6	6	6	6	6
Utility Track Dozer - CAT D10	#	0	3	3	6	6	6	6	6	6	6	6	6	6
Tow Truck - CAT 785	#	1	1	1	1	1	1	1	1	1	1	1	1	1
SERVICE EQUIPMENT														
Fuel / Lube Truck - Site Star	#	2	2	2	3	3	3	3	3	3	3	3	3	3
Blaster Truck -	#	1	1	1	2	2	2	2	2	2	2	2	2	2
Explosives Truck - International 7300	#	1	1	1	2	2	2	2	2	2	2	2	2	2
Mechanic Truck - Dominator 1	#	4	4	4	6	6	6	6	6	6	6	6	6	6
Tire Handler - TH3555	#	1	1	1	2	2	2	2	2	2	2	2	2	2
Boom Truck - 165DL (14.5t)	#	2	2	2	4	4	4	4	4	4	4	4	4	4
Pick-up Truck - 3/4 ton	#	20	20	20	30	30	30	30	30	30	30	30	30	30
LowBoy - 150t	#	2	2	2	3	3	3	3	3	3	3	3	3	3
Transport Bus - 20 per.	#	2	2	2	4	4	4	4	4	4	4	4	4	4

17.1.4 Manpower Requirements

During full production (following Year 6), the total mine workforce will be 613. This work force is comprised of the following 2 groups

- Engineering, Administration and Day Operations; and
- Operations.

The Engineering, Administration and Day Operations group includes the mine manager, the area superintendents, engineers, geologists, surveyors and technicians as well as the dewatering, blasting, power distribution and tailings crews. This group of employees is made up of 2 crews working on a 2 week rotation. This will provide 12 hour coverage, 7 days per week.

The Operations group includes the foremen, equipment operators and mechanics. This group is made up of 4 crews working on a 2 week rotation. This will provide 24 hour coverage, 7 days per week. Requirements for equipment operators were based on the number of operating units. Maintenance personnel were estimated based on the size of the equipment fleet.

For camp capacity calculations, it has been estimated that half of the workforce will be on-site at any given time.

Table 17.9 summarizes the mine manpower requirements during peak production.

Table 17.9 – Mine Manpower Requirements

Description	
SUPERVISION AND ENGINEERING	
Mine Manager	1
Mine Superintendent	2
Maintenance Superintendent	2
Engineering Superintendent	2
Geotechnical Engineer	2
Mining Engineer	6
Geologist	4
Tailings Planner	4
Environmental Engineer	4
Maintenance Planner	8
Surveyor	8
MINE OPERATIONS	
Supervision	
Pit Foreman	16
Maintenance Foreman	12
Tailings Foreman	8
Blasting Foreman	4
Equipment Operators	
Truck Operator	168
Shovel Operator	28
Drill Operator	44
Dozer Operator	36
Grader Operator	16
Water/Sand Truck Operator	8
Service Personnel	
Dispatch	4
Dewatering Crew	10
Blasting Crew	8
Shovel Oilers	32
Fuel and Lube Crew	16
Power Distribution Crew	4
Tailings Crew	16
Trainer	4
Labourer	16
Mining Clerk	4
Maintenance Personnel	
Mechanic	56
Electrician	28
Welder	28
Maintenance Clerk	4
TOTAL	**613**
ON-SITE WORKFORCE	**307**

17.2 Concentrator

17.2.1 Flowsheet selection

Based on the testwork performed to date, and described in section 15.0, the knowledge acquired in the processing of magnetite-rich ores in the Iron Range in Northern USA, and new developments in iron ore processing equipments, a preliminary flowsheet was developed for the present study. The flowsheet is presented in Figure 17.6 and Figure 17.7, and further described in 17.2.2c)

Primary grinding will be done with high pressure rolls (HPGR's). This is now a proven method of size reduction in the minerals industry. This technology is now proven and gives operating availability as high as or higher than SAG mills. HPGR's require a larger number of equipment (secondary crushers, conveyors, screens, bins, feeders), but they have a lower capital and operating cost than the large SAG mills.

The concentration plant will only make use of Low Intensity Magnetic Separators, screens and deslimer to reach an anticipated final concentrate of 68.5% Soluble Fe at 80% –53 µm.

The proposed flowsheet is preliminary, and will require confirmation, if the project moves into feasibility stage. Presently, it is anticipated that only the magnetite-rich horizon will be treated and that only magnetite will be recovered. Experience to date in the Iron Range in Minnesota has proved to be unsuccessful at recovering the non-magnetic portion of the feed economically.

Figure 17.6 – Concentrator Flow – Crushing and Grinding

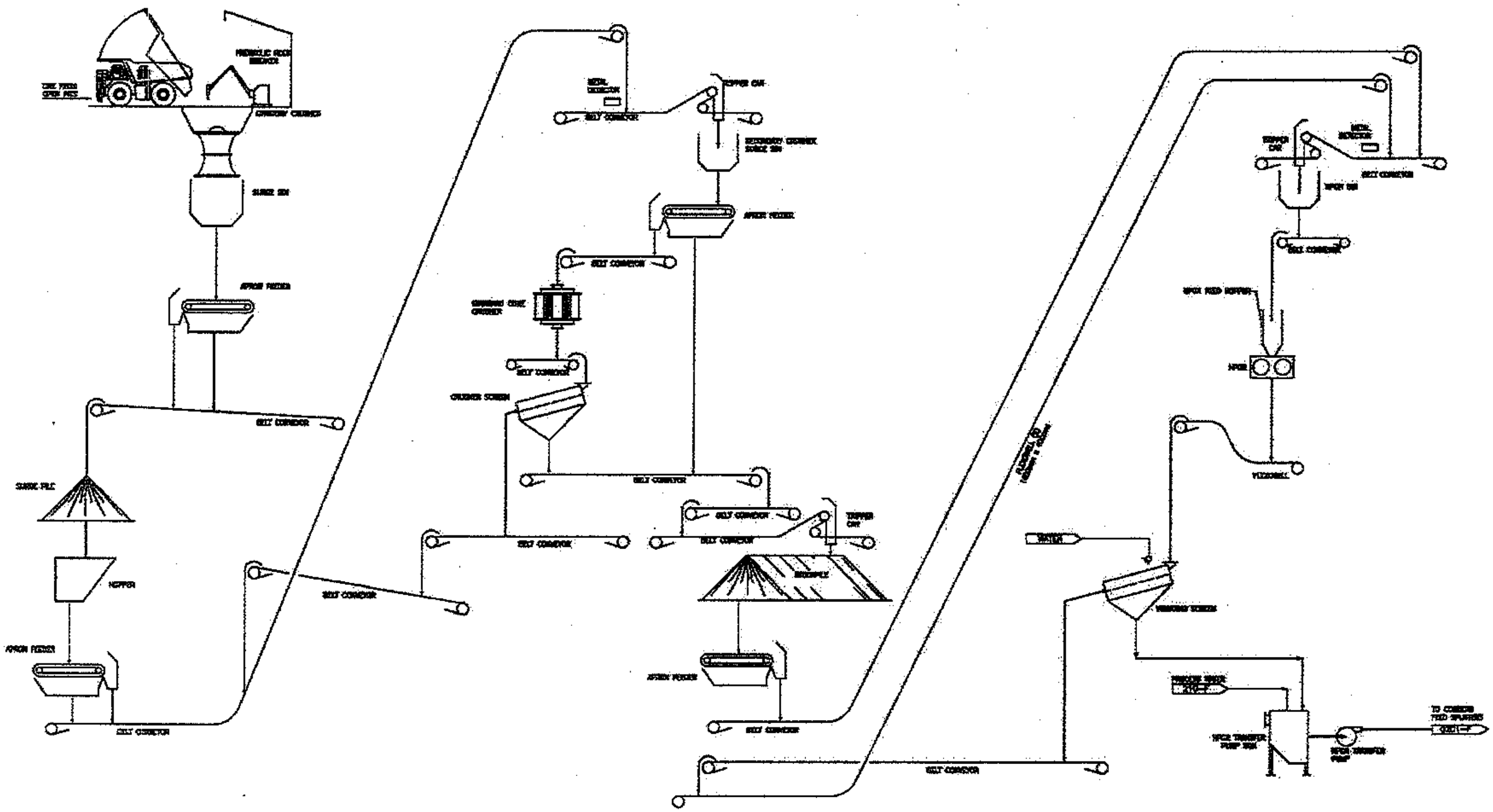
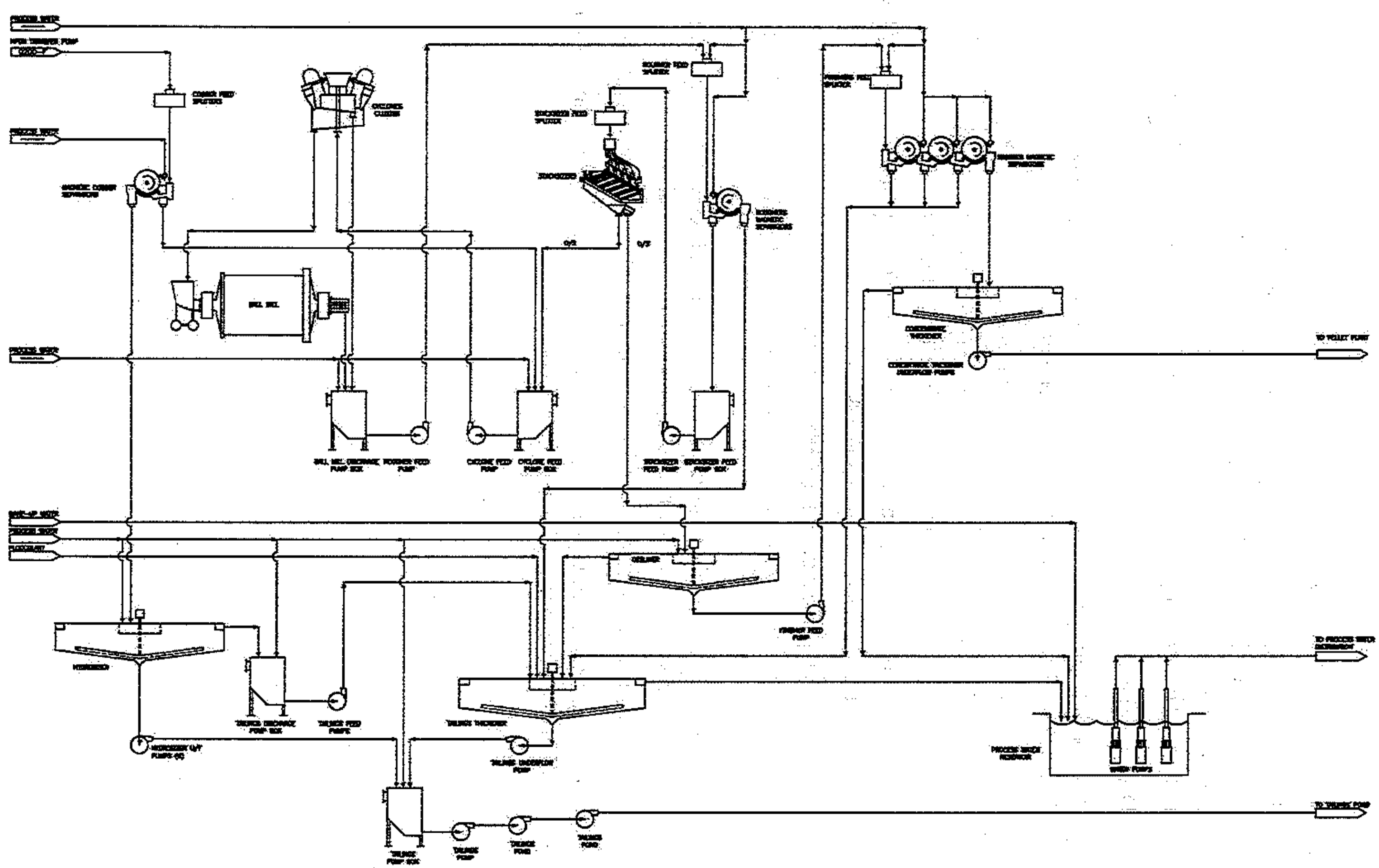


Figure 17.7 – Concentrator Flow – Concentrating



17.2.2 Process Development and Plant Description

a) Design Iron Mineralization Type

The mineralization that will feed the concentrator is a cherty magnetite with an average of 19-20% MagFe content according to drill core samples. Testwork to date has shown some variations of the MagFe content in the mineralization. The average drill core value has been taken for the purpose of concentrator design.

b) Design Criteria

Adriana has provided some basic process criteria and others have been assumed. These design criteria are summarized hereunder:

- The capacity of the plant for the base case will be of 50 million tonnes per year of pellets or 49,140,000 tonnes per year of concentrate.
- The % SiO_2 in the concentrate will be approximately 4%;
- The weight recovery, as concentrate, is 27% (approximated from drill cores);
- The final concentrate grade is 68.5%;
- The final grind size will be 80% -53 μm;
- Primary grinding energy requirement is 3.5 kWh/t (HPGRs – from manufacturer);
- Secondary grinding energy requirement is 9.3 kWh/t of crude mineralized rock (ball mills – from testwork and experience); and
- The plant will operate 365 days a year with 90% equipment availability.

A mass balance summary for the concentrator is presented in Table 17.10 and a detailed mass balance is provided in Appendix C.

Table 17.10 – Lac Otelnuk Concentrator Mass Balance Summary

Item	% Weight	% Fe	Iron Units	% Fe Distr.
Feed	100.0	19.27	1,927.0	100.0
Cobber Magnet Concentrate	60.0	31.47	1,888.2	98.0
Cobber Magnet Tailings	40.0	0.97	38.8	2.0
Cobber Magnet Concentrate	60.0	31.47	1,888.2	98.0
Rougher Screen Oversize	36.0	53.00	1,908.0	99.0
Dewatering Cyclone Feed	96.0	39.54	3,796.2	197.0
Dewatering Cyclones Overflow	11.9	39.54	470.5	24.4
Dewatering Cyclones Underflow	84.1	39.54	3,325.7	172.6
Total Ball Mill Feed	**84.1**	**39.54**	**3,325.7**	**172.6**
Ball Mill Discharge	84.1	39.54	3,325.7	172.6
Dewatering Cyclones Overflow	11.9	39.54	470.5	24.4
Rougher Magnet Feed	96.0	39.54	3,796.2	197.0
Rougher Magnet Concentrate	68.0	55.40	3,767.3	195.5
Rougher Magnet Tailings	28.0	1.03	28.9	1.5
Rougher Screen Feed	68.0	55.40	3,767.3	195.5
Rougher Screen Undersize	32.0	58.10	1,859.3	96.5
Rougher Screen Oversize	36.0	53.00	1,908.0	99.0
Hydroseparator Feed	32.0	58.10	1,859.3	96.5
Hydroseparator Overflow	1.5	1.40	2.1	0.1
Hydroseparator Underflow	30.5	63.60	1,857.2	96.4
Finisher Magnet Feed	30.5	63.60	1,857.2	96.4
Finisher Magnet Tailings	3.5	2.06	7.2	0.4
Finisher Magnet Concentrate	27.0	68.50	1,850.0	96.0
Total Tailings	**73.0**	**1.05**	**77.0**	**4.0**

c) Flowsheet Description

The flowsheet presented in Figure 17.6 and Figure 17.7 is described below.

i) Preamble

The plant has been subdivided into three (3) equal modules. Each module will be complete from the primary crushers to pellet load-out; therefore, each module will produce one third of 50,000,000 tonnes or 16.7 million tonnes of pellets. The write-up below will, for the sake of simplicity, confine the description to one (1) module.

ii) Primary Crushing

The ROM comes from the mine by trucks to two primary gyratory crushers. Each crusher has two dump positions for the trucks which dump directly into the crusher feed pocket. Crushed ore, from each crusher, falls into a crushed ore bin under the crusher and is fed by an apron feeder onto a belt conveyor which brings the crushed ore to one common collecting conveyor. Three collecting conveyors transport the crushed minus 200 mm ore to one 80,000 tonnes (live) surge pile prior to the secondary crushing operation.

Auxiliary equipment like a dust collector, pneumatic rock breakers, overhead cranes and monorails will support the operation and maintenance of the primary crushers and related equipment.

iii) Secondary Crushing and Ore Storage

From the surge pile after primary crushing, the ore will be reclaimed by three apron feeders and be conveyed to four secondary crusher feed bins (1,700 tonnes capacity, each). The bottom of the crusher feed bins will have a heating system to prevent freezing of the material during winter. Four secondary crusher double-deck screens, 3.6 m x 8.5 m, one for each crusher, will each be fed by a variable speed apron feeder and belt with weigh scale from the respective bin. The oversize from each screen will flow through a chute to the respective cone crusher. There will be four MP 1250 crushing machines. The crusher product will be recycled to the feed bins. The screen undersize, minus 50 mm, will be collected on a single conveyor and will feed a storage stockpile, with 100,000 tonnes capacity, ahead of the HPGR plant.

Auxiliary equipment like dust collectors, overhead cranes and monorails will support the operation and maintenance of the secondary crushers, screens and related equipment.

iv) Primary Grinding (HPGR's)

The ore will be withdrawn from the stockpile by apron feeders onto a conveyor that will take it to the HPGR's feed bins. There will be five HPGR machines, 2.4 m diameter x 1.7 m wide. Each unit will have a variable speed belt feeder to control the level in a feed chute on top of each roll press for optimum results. The discharge from each HPGR will be collected on a Flexowell® conveyor that will transfer the pressed material to two dedicated 3m x 8m screens with 6.35 mm openings. The screening will be wet and the oversize will be collected by a conveyor and recycled to the HPGR feed bins. The undersize slurry of each set of two screens will be collected in a pumpbox, and pumped to one three-way slurry distributor ahead of the cobber magnetic separators.

v) Cobber Magnetic Separation

Three process lines will be used in each module to produce the required 16.38 million tonnes of concentrates per year. The HPGR screen undersize will be pumped to one three-way distributor to divide the slurry to each of the three lines. There will be a total of 42 single drum LIMS (low intensity wet drum magnetic separators), or fourteen per line. Each line from the three-way distributor will feed the fourteen LIMS through a 28-way distributor. Each separator will have a counter-rotation tank for maximum recovery of magnetic iron values. The cobber concentrate will be too dilute to feed directly to the ball mill. The concentrate will, therefore, be first pumped to densifying cyclones.

The cobber tails, because they have a top size of 6.3mm, should not be fed to the tailings thickener; therefore, from each line, cobber tailings will flow by gravity to an 11.7 m diameter hydro-classifier to be classified at about 180 m. The overflow, or fines, will be pumped to the tailings thickener. The hydro-classifier underflow, or coarse fraction, will be pumped directly to the tailings pond pumpbox and by-pass the thickener.

vi) Ball Mill Circuit

There will be three ball mills per module. Each ball mill line will operate in closed circuit with rougher magnetic separators and fine screens. The magnetic separators in closed circuit with the ball mill are there to remove any non-magnetic or gangue particles as soon as they are liberated and thus save on grinding energy. The closing of the ball mill circuit with screens instead of cyclones leads to a more efficient size separation and therefore prevents overgrinding and loss of efficiency.

Thickened densifying cyclone underflow will flow by gravity to the ball mill feed spout. Each ball mill will be 8.5 m diameter x 16 m long, wet overflow mill on shell supported bearings with a 25,000 kW wrap-around motor. The ball mill discharge and the densifying cyclone overflow will collect in the ball mill discharge pumpbox and will be pumped to rougher LIMS. There will be 16 single drum LIMS per ball mill. The non-magnetic portion, or tailings, will be collected in by launders that will transfer them to the tailings thickener. The magnetic concentrate from the separators will be collected in the Stacksizer® pumpbox. There will be 24 Derrick Stacksizer® screens per ball mill with 75 µm screen opening urethane cloths. The oversize of all screens will be collected in a pump box together with the cobber concentrates and pumped to dewatering cyclones to remove excess water and then ground in the ball mill before being returned to the rougher magnetic separators. The screen undersize will be directed to the finisher circuit.

Overhead cranes will be provided for the ball mills and the rougher magnetic separators for maintenance. Where access is not possible with the overhead cranes, monorails will be installed.

vii) Finisher Circuit

The undersize flows from all the Stacksizer® screens will be collected into one deslimer tank. There will be one 16.3 m diameter tank per line. Water will be added to the deslimer to control the upward flow velocity in the deslimer tank and thus maximize the removal of very fine silica slimes that adversely affect concentrate quality. A magnetic material interface probe is placed in the tank to monitor the slurry magnetic interface to prevent losses in magnetite. The deslimer overflow is transferred to the tailings launder and the underflow feeds the finisher magnetic separators. There will be nine finisher LIMS per ball mill line. Each finisher separator unit will have three drums and a Steffensen tank design to better clean the fine magnetic concentrate. Tails of the finisher separators are collected in the tailings launder and transferred to the tailings thickener while the concentrate of each separator goes to the concentrate thickener.

An overhead crane will be provided for the finisher magnetic separators maintenance. Where access is not possible with the overhead cranes, monorails will be installed.

viii) Thickeners and Process Water System

There will be three 28.4 m diameter concentrate thickeners per module or one per ball mill line. The thickener overflow will flow by gravity to the process water reservoir.

There will be one 87 m diameter tailings thickener per module. The thickener feed will have flocculant addition to produce clear process water. The thickener overflow will flow by gravity to the process water reservoir. The thickener underflow will be pumped to the tailings pond pumpbox.

There will be one process water reservoir per module. It will be a subterranean concrete water holder. The reason for having the reservoir below grade is to allow the large volumes from the thickener overflows to flow into it by gravity and thus avoid pumping. The reservoir will have enough capacity to contain the entire water capacity of the plant. This allows for a quick restart after power failure or such other difficulties. Make-up water will be supplied to take care of the water losses in the process.

Vertical turbine pumps will supply process water to all plant uses. A pressure sensor and controller will vary the speed of a pump to maintain the same pressure in the plant process water piping distribution system.

ix) Plant Services

The plant will have air compressors and an instrument air compressor to provide compressed air for services and equipment. A diesel generator will be on stand-by to provide emergency power to operate critical equipment in case of power outage.

Mobile plant equipments will be provided (bobcats, lifts and front-end loader) to clean-up the diverse areas of the concentrator and to handle material as required by the operation.

d) Instrumentation and Control

The concentrator will be fully automated with operation controlled from control rooms in the various areas of operation (primary crushing, secondary crushing, grinding and concentration). Operator manipulation will be kept to a minimum to limit manpower requirements.

Conveyors will be equipped with weigh scales at the primary crusher, secondary crushers and HPGR feed to totalize material tonnages into the mill. The concentrate tonnage will be monitored with density and flow meters to totalize the concentrator output.

17.3 Tailings Management

17.3.1 Design Criteria and Assumptions

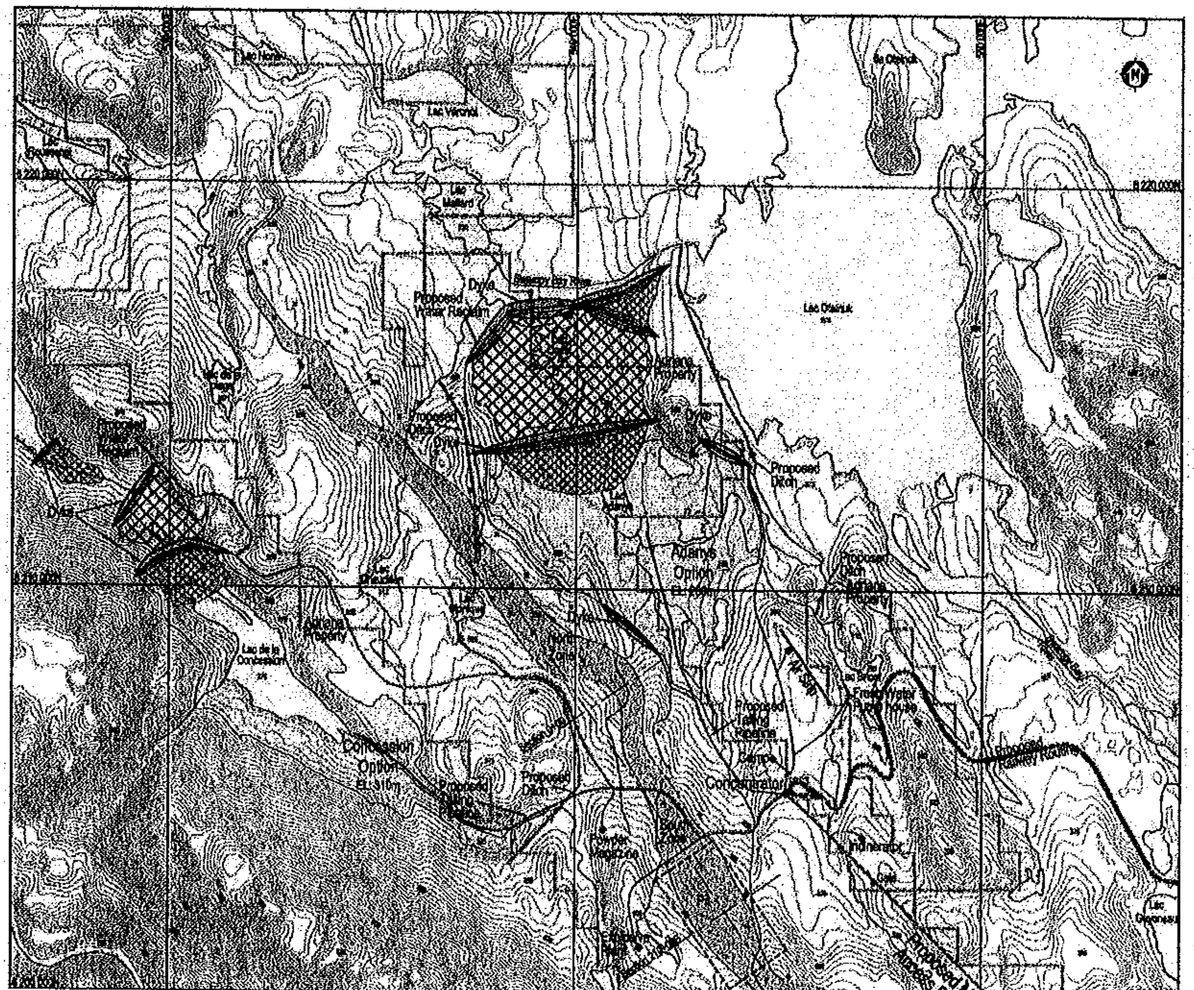
Tailings storage design and construction was described in section 17.1.2e) of this report. The design is based, in part, on the earlier study in 2006 (Lac Otelnuk Iron Property Preliminary Capital and Operating Costs Estimate, Project 26004, June 2006) conducted for Adriana at 10 and 15 Mtpy levels of pellet production. That study contained a preliminary assessment of tailings disposal requirements to contain and manage the tailings and process water for 20 years of exploitation of the Lac Otelnuk Iron project as performed by JBA, experts in tailings management retained, at the time, by Met-Chem.

The 2006 study provided two options for tailings storage: Concessions; and Adanys. No attempt was made to evaluate other potential tailings disposal options. It is also cautioned that experts in tailings management are recommended in future phases of this project.

17.3.2 Tailings Storage Option Selection

Two (2) tailings storage options, Concession and Adanys, were considered in this preliminary evaluation taken from the 2006 study noted above. Preliminary assessment of site selection indicates that considering the local topography, the presence of numerous lakes and river, the relatively large volume of tailings to store, and construction costs it will be difficult not to select a disposal site located in the area of existing water bodies. The final site selection will need to include environmental considerations and potential impacts of proposed sites.

Figure 17.8 – Tailings Storage Options Considered



(From Project 26004 – Lac Otelnuk Property Preliminary Capital and Operating Costs Estimate)

a) Concession Option

This option is located on the north-west side of the mining operations described in this study, and west of future mining operations. Bounded by high ridges along the east and west creates a large valley at the bottom of which Concession Lake is located. This option corresponds to the smallest footprint; however, a significant amount of watershed area cannot be diverted outside the impoundment thus increasing water treatment volumes.

b) Adanys Option

This site is located on the north-east side of mining operations described in this study, and east of future mining operations. It is also north of the proposed concentrator location in an area scattered with small ponds and Adanys Lake. In this option, the area of the tailings impoundment is larger because there is less available free height so more dykes would be needed. The operation is also expected to require several more deposition points and beaches to protect the side dykes. The better part of the watershed area can be diverted around the tailings impoundment, leaving only the surface area of the impoundment to precipitation.

Given the production level in this study is roughly five times that for the 2006 study, the volume of tailings is similarly 4-5 times greater. This level of containment meant the Adanys option becomes expansive covering the northern section of the deposit. The Concession option, with the deep valley, can be dammed accordingly to facilitate the containment needed. For this reason, the Concession option was selected for this PEA.

17.4 Pellet Plant

17.4.1 Design Criteria

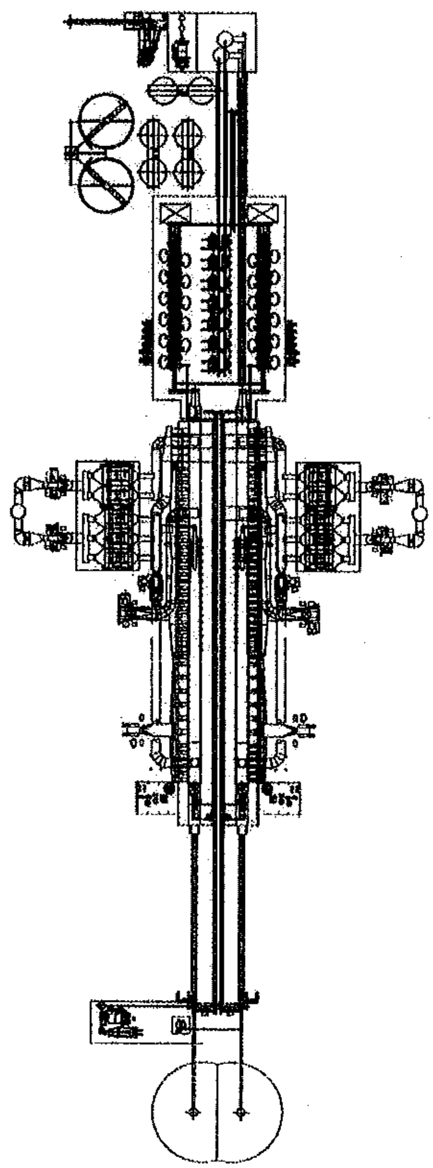
The new Lac Otelnuk Iron Property will produce 50 Mtpy of pellets from concentrate from the nearby concentrator. The pellets will be produced in three (3) modules of two (2) pelletizing lines of 8.5 Mtpy per line to match the concentrator three-module capacity. Each pair of pelletizing lines will have adequate space to accommodate: slurry reception from the pipeline from the nearby concentrator, pellet plant including electrostatic precipitators and related facilities. Additives and chips regrind facilities are also included. Pellet stockpiles and underground reclaim system to a train continuous loading system are included, but are not part of the pellet plant scope of supply. Each pelletizing module will be composed of two (2) identical lines that will include: thickeners, slurry tanks, filtering equipment, cake storage bin, mixers, balling discs with roller screen, indurating machines, and a common pellet screening, hearth layer and conveyor system. Each line will have a capacity of 8.5 million tonnes per year of Blast Furnace (BF) or Direct Reduction (DR) pellets. A typical plant layout is shown in Figure 17.9.

This preliminary assessment considers a straight grate induration line. A grate kiln could also be used to produce equally high quality pellet; however, due to their capacity limitation of 6 Mtpy maximum, more than eight (8) units would be required. We have considered an aggressive utilization factor of 92% (336 day or 8,064 operating hours per year) with a grate factor of 30 tonnes per square meter per day. This is achieved, and surpassed, by most existing Québec North Shore plants. Each induration machine would have an effective grate area of about 848 m^2 and a net production rate of 1,055 tonnes per hour. The largest straight grates in operation presently have 768 m^2 of grate area on produce over 7.5 million tons per year. An 848 m^2 grate was selected because of the logistical difficulties associated with installing eight (8) induration units of lesser production capacity. From a pellet plant supplier point of view, designing a machine with such an area is not a problem. A different straight grate supplier suggested a slightly smaller grate with a higher gate factor.

The expected pellet characteristics should be:

Sizing 92% (min.)	+9.5 mm - 16 mm;
Tumble +6.3 mm	95% min;
Abrasion	4.5% (max); and
Compression strength	250 kg (min.) average.

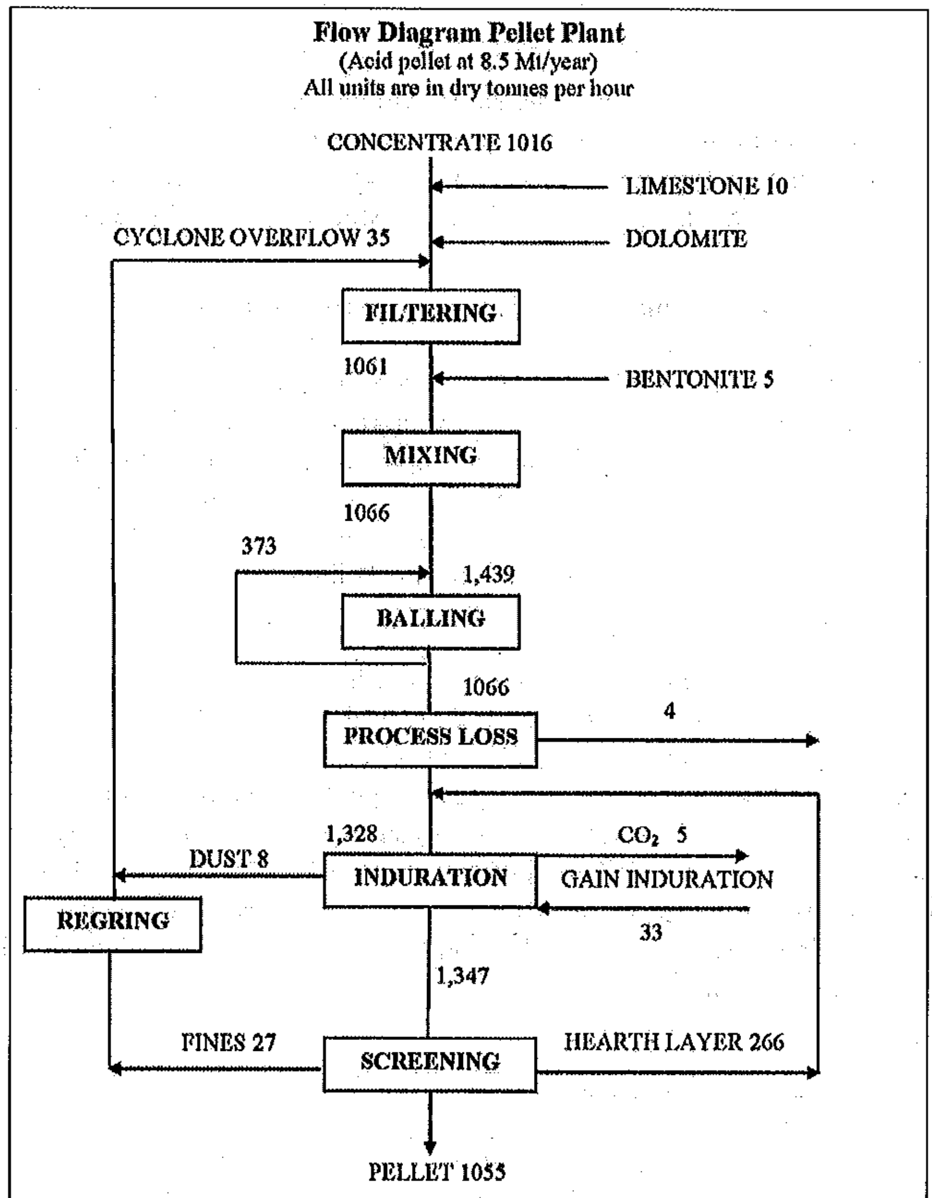
Figure 17.9 – Typical Plant Layout



17.4.2 Plant Mass Balance

Based on previous studies, the mass balance shown in Figure 17.10 is expected while producing acid pellet. For this preliminary assessment, losses on ignition were assumed at 0.5% while the gain from magnetite conversion was assumed to 3.1%. At the feasibility level, pot grate test will permit evaluation of the production rate, product quality and gain/loss on ignition.

Figure 17.10 – Pellet Plant Mass Balance



17.4.3 Slurry Reception

The slurry will be received from the pipeline at 70% solids in a transfer tower and will generally go to either one of two (2) thickeners along with reground pellet chips. The thickeners underflow will be pumped at 70 to 72% solids to two agitated and heated slurry tanks having a capacity of 8 hours of production. These tanks serve as a surge capacity between the concentrator and the pellet plant as well as receive the limestone additive. Each of the 2 agitated slurry tanks per line will be 16 meter in diameter and 17 meter high. Live steam will be sparged directly into each tank to heat the slurry to about 40 C to help filtration and lower the cake moisture.

17.4.4 Filtering

From the two tanks, the concentrate slurry will be pumped to a pressure distributor with an overpressure return line to the slurry tanks. A level controller will maintain a constant slurry level in each filter booth through a pinch valve on the feed line from the pressure distributor. The filters overflow and filter booth drains will be returned to the slurry tanks.

This preliminary assessment considers using seven disc filters per line. Each filter will be 2.74 m in diameter and has area of 120 m^2. It is likely that, due to the fineness of the concentrate received (> 90% -325 Mesh) from the concentrator, disc filters will give a higher moisture than generally preferred; and pressure filters might be required to yield a more acceptable moisture level. This will have to be investigated during pilot plant test work in a future phase of the project. Filter cake from each line will be conveyed to a cake bin of about 1,800 tonnes of storage capacity or 1.7 hours of operation. This provides a surge capacity between filtering and balling.

17.4.5 Cake Mixing

The filter cake will be extracted from the cake bin by two (2) parallel belt feeders each with variable speed and a scale to control the feed rate to the mixers. Each line will have one high intensity mixer (Litlleford/Lodige type) of 18,000 litres volume. A spare third mixer, located between the two primary mixers, will be fed by a short shuttle conveyor. It will mix cake for either pelletizing line. Bentonite extracted from a day bin besides the filter cake bins, will be added in proportion to the cake feed rate for each line. If required, water can also be added to each mixer. The mixers are used to blend intimately the Bentonite binder with the filter cake, and to fluff the material making it a better, more effective, feed for the balling discs.

17.4.6 Balling

The mixed material will be conveyed by a series of conveyors to a flat conveyor running above the feed bins for each balling disc. A plough at each bin will divert the mixed feed to the bin. Each induration line will have eleven (11) 7.5 m diameter balling discs including one spare disc per line. Each disc will have variable speed drive, and will be fed by a variable speed feeder. The disc discharge will be screened on a roller screen conveyor in order to remove the undersized green balls which will be cycled back to the discs feed conveyors system. The oversized balls discharged from each roller screen will be disintegrated by a rotating cylinder, and also returned to the balling discs feed system. The on-size green balls from all the discs in one line are collected on a conveyor, and transferred to a reciprocating conveyor at the induration machine.

17.4.7 Indurating

The reciprocating conveyor is perpendicular to the wide belt feeding the machine roller screen. As reciprocating conveyor moves across the wide belt, it lays parallel rows of green balls on the wide belt that feeds the roller screen. The roller screen removes the green balls which may have been damaged in transit. About 10% of the feed is returned to the balling feed bins in this last cleaning step. The sized product from the roller screen is eased down as a 400 mm layer on top of a 100 mm thick bed of hearth layer for a total thickness of about 500 mm. These previously fired pellets were returned from the screening house, and are used to protect the grate and the pallet sidewall from extreme temperature in the firing and after firing zone and to help hot gas distribution. A chute on each side of the grate lays a layer of fired pellets between the pallet sidewalls and the green balls.

The following description of the process, gas and pellet flow is adapted from an induration equipment supplier's description. The straight grate machine is composed of an endless chain of four (4) meter wide pallet cars pushed by a main drive through the updraft drying; downdraft drying; preheat; firing; after firing; first cooling; second cooling zones of the induration machine.

Sensors on the bridge at the entrance of the machine modulate the machine speed to maintain a constant bed depth. The hearth layer depth is adjusted by a gate from 75 mm to 500 mm. If a significant change to the green pellet feed rate occurs (for example, one disc stopped), the hearth layer depth can be reset to maintain the bed depth for the desired operating grate speed. The hearth layer performs three functions during normal operation. First, it creates a temperature gradient between the bottom of the green pellet layer and the metal grate components. This permits the bottom green pellets to be fully fired in the firing zone and still protect the grate from higher temperature. Second, it permits gases passing up through the openings in the grate to be diffused into a uniformly distributed flow before encountering the green pellet layer. Third, it will act as a heat storage mass, collecting heat in the hotter zones for recovery in the two cooling zones.

The freshly charged material (green pellets on hearth layer) first travel through the Updraft Drying Zone. In this zone, free moisture will be removed from the lower half of the green pellet bed. The drying strengthens the lower green pellets and helps to prevent deformation of the green balls during subsequent downdraft processing. Additionally, the lower green pellets in the bed will, in the Updraft Drying Zone, be raised to a temperature sufficient to prevent condensation from occurring when gas flow reversal takes place as the material moves into the Downdraft Drying Zone. In Downdraft Drying, the gas moving down through the green ball bed will dry up the upper zone, and removal of free moisture will be essentially complete. The material will then move into the Preheat Zone.

In the first portion of the Preheat Zone the downward blast of gas moderated to approximately 620°C will effectively eliminate chemically bound water. The second portion of the Preheat Zone will consist of two (2) sub-zones of combustion temperature controlled in which burners will be used to provide intermediate heating before the Firing Zone. This stepping up of temperature will prevent thermal shock effects and spalling of green balls in the Firing Zone. The Firing Zone will consist of several zones of controlled combustion temperature in which burners will be used to increase and maintain hood temperatures up to 1,360°C; although, significantly lower operating temperatures will be used. By the end of this zone, the upper layers (more than half the bed depth) of the green pellets will have reached the desired indurating temperature to produce good strength pellets. The pellets will then enter the After Firing Zone providing temperature control which gives a step down in temperature.

Cooler gases in the After Firing Zone will transfer heat from the already fired upper layers to the lowest layers of the green pellet bed. The pellet bed will then pass through the First and Second Cooling Zones. The updraft cooling air will quickly cool the grate components as well as the pellet bed. From there, the pellets will be transported to the end of the grate where the tipping wheel will move the casting to the return strand, and dump the pellets into the Discharge Hopper.

a) Screening of Products and Hearth Layer

Two product conveyors fed from each machine will convey the fired pellets to a screening house where a segregation bin will separate part of the coarser pellets recirculating them, by conveyor, to the Hearth Layer Bin at the feed end of each Indurating machine. A second, lower outlet on the segregation bin will discharge the bulk of the fired pellets to the surge pile conveyors. Finally, the bottom outlet of the segregation bin will discharge finer pellets to two double deck screens (1 operating) thereby removing the – 6.3 mm fines for regrinding. The excess of hearth layer size pellets and all the rest of the +6.3 mm pellets will join on a conveyor, and be transported to a surge pile. The -6.3 mm pellet chips will be conveyed to a bin and fed to a ball mill to be ground and recycled to the thickeners. Since hearth layer must be available at all times, an emergency pile is provided. A conveyor will stack hearth layer quality pellet on a pile from where, they will be reclaimed by mobile equipment to a hopper above the hearth layer conveyor.

b) Dedusting and Gas Cleaning

In order to minimize fugitive dust emissions to atmosphere, and provide protection to the workforce and equipment, the material handling systems such as the hearth layer, machine discharge and screening house are equipped with Ducon type wet dust collectors. The dust collected from the systems, consisting primarily of iron oxide, is recycled and pumped to the concentrate thickener, and mixed with the fresh concentrate slurry coming from the pipeline.

The indurating process waste gas will be cleaned in a multiclone to remove coarse dust, and an electrostatic precipitator (ESP) to remove fine dust and clean the waste gas. Dust collected by the precipitator and multiclone will be slurried, and pumped to the concentrate thickeners.

c) Auxiliary Heating/Cooling System

The lintel cooling system is a closed loop, and recirculates treated water from the furnace lintels to an indirect heat exchanger where cooling water chills the lintel water for reuse back in the lintel. There is one operating, and one stand-by, heat exchanger for the lintel cooling water system for each pelletizing line.

All the pipe lines are insulated, and heat traced from the suction heater at the bunker C tanks through to the burners with either steam or heating cables to help the oil flowing.

The steam will be generated in bunker C fired boilers located in a separate building. It will supply heat for the pellet plant slurry heating as well as heating pellet plant offices and other service buildings.

17.4.8 Auxiliary Systems

a) Additive Grinding

Bentonite will be received, at -50 mm, by ship at the Port of Sept-Îles and will be delivered to the pellet plant bentonite storage building at Lac Otelnuk by railroad cars. It will be reclaimed by mobile equipment, as needed, to fill the grinding mill day bin. Two dry grinding roller mills (one spare) of 35 tph capacity per mill are provided for each of the two-pelletizing-line module to grind the Bentonite to 80% minus 200 Mesh. The grinding mills have been sized to have enough capacity to grind Bentonite only on one shift (12 hours). The ground product will be stored in a bin at the grinding mill location from where it will be transferred to the mixing area day bins by Fuller-Kinyon pumps. The bentonite will be metered out from the day bins in the desired ratio to concentrate tonnage for each mixer.

b) Chips Regrind and Limestone Preparation

Induration plant clean-up material and broken pellet chips will be ground on a batch basis. Chips will meter out of the surge bin and fed to a ball mill in closed circuit with a cyclone. The cyclone overflow slurry will be pumped to the concentrate thickeners while cyclone underflow will be returned to the ball mill for further grinding. It is likely that, at the feasibility level of this project, the chip regrind will be deleted, and pellet chips be sold along with the regular pellets. In so doing, the recirculating load will be removed allowing for a proportionate reduction in feed tonnage for the same final production. With balling discs in closed circuit with a roller screen, a very tight size distribution is expected and chips should not exceed 0.5%.

Crushed limestone will be stored in a silo and ground on a batch basis in the ball mill. The ground limestone will be pumped to an agitated storage tank for metering out as required to the slurry tanks.

c) Water Balance

The 1,054 tph of concentrate per pelletizing line will be received from Adriana's concentrator at 70% solids and include 435 m^3/h of water. This slurry will go to the agitated slurry tanks where it will join the thickener underflow composed of reground chips, slurry from the precipitators, scrubbers, and floor wash-downs collected through sump pumps. The thickener will overflow to a process water tank and some of the water will be used in the plant. The only loss out of the system is through evaporation during the induration process. This loss is calculated at 105 m^3/h per induration line with cake at 10% humidity. The evaporation loses from the thickeners and the slurry tanks are negligible. The excess of process water will return to the concentrator process water tanks.

Fresh water usage is estimated at 400 m^3/h. per pelletizing module. Most of the fresh water will be used to cool the lintel water, and in various heat exchangers, gland seal, vacuum pumps etc. Some will also be sparged directly in the slurry tanks as steam to warm up the slurry and improve filtration. Material and water balances for a single 8.5 Mtpy pellet plant are shown in Table 17.11.

Table 17.11 – Material and Water Balance at 8.5 Mtpy

Adriana Resources Inc.										
Material Balance										
Concentrator Slurry Feed per 8.5 Mtpy Indurating Line										
Flow No.	ITEM	Solids t/h	Water t/h	Solids %	Total t/h	Solids sp.gr.	Pulp m^3/h	Pulp gpm	Pulp sp.gr.	Process Water M^3/h
	Blast Furnace Acid Pellet									
	Pellet Plant Slurry tanks									
	Transfer from concentrator	1016	435	70.0	1451	4.93	642	2829	2.26	435
	Recirculation PP Thickener	35	15	70.0	50	4.93	22	97	2.26	
	Limestone	10	19	34.2	29	2.70	23	101	1.27	
	Dolomite									
	Filter Feed	1061	470	69.3	1531	4.93	687	3028	2.23	
	Filter Cake (9% moisture)	1061	105	91.0	1166	4.93	320	1412	3.64	
	Filtrate	0	365	0.00	365	4.93	366	1616	1.00	
	Water Balance	Water in	435	m^3/h, from slurry pipeline						
		Water out	105	m^3/h, evaporated in induration						
		Surplus Min.	330	m^3/h	1455	usgpm				
		Fresh Water to PP	200	m^3/h	881	usgpm				
		Total to Process Water	530	m^3/h	2336	usgpm				
	Note 1: Steam plant make up water will need to be added.									
	Note 2: Precipitators, Scrubbers, ball mill and balling drums will use recycled process water									

17.4.9 Pellet Handling

a) Surge Pile

To simplify the surge pile arrangement, we have assumed that each pelletizing module (2 lines) will produce the same type of pellets, and each pair of pelletizing lines will share a surge pile with a live capacity exceeding one train load of about 25,000 tons. Two pellet ladders in the center of the pile will support the head end of each product conveyor. Deflectors at various heights in the structure will break the fall distance of the pellets, thereby minimizing pellet degradation. In case of a problem with the reclaim conveyors or train loading system, a bulldozer can push the pellets away from surge pile allowing the plant to be kept in operation. Seven gravity feeders, including one directly under each pellet ladder will feed a conveyor running in a tunnel under the surge pile. This conveyor will feed a train loading conveyor moving the pellet to the small hopper of the continuous train loading system. There will be two (2) train loadout stations. Pelletizing modules 1 and 3 will be dedicated to loadout 1 and 2, respectively, while module 2 will be able to feed either loadout 1 or 2 depending on train loading demand.

17.5 Pellet Plant Location Study

a) Scope of the Comparison

Although the previous study, performed in 2006, transported concentrate from the mine site to a pellet plant located at the port facilities in Sept Îles, the tonnages were one fifth the amount in the current study. This led to brief analysis comparing the pros and cons of situating the pellet plant at either the mine or the port site. Although not exhaustive, a summary of items that should be evaluated before finalizing at the site location was compiled. This list was boiled down to items identified as key elements for the comparison for this PEA.

17.5.1 Factors to Consider

Items of interest can be categorized into twelve (12) main topics that cover a range of concerns.

a) Material Handling and Storage

The location of the pellet plant will determine what and how the material is handled and stored. This could have a significant impact on capital and operating costs if, for instance, the material must be dried to very low (< 3%) moisture contents before transporting. This would, in fact, be the case for rail transport of concentrate during sub-zero months. Concentrate would need to be dried to levels to prevent freezing in the cars. The alternative would be to use thaw sheds at the port facilities; this too could be very expensive.

There are other concerns during storage, transport and handing operations. Potential issues could include degradation of intermediate or final product that could affect product quality, add to dust emissions that could pose health and environmental concerns, or simply increase the recycle load. Any or all of these will have some impact on cost whether capital or operating.

b) Energy Availability

The availability of electricity is probably the most obvious concern when evaluating a location. A plant requiring significant amounts of power would be more suited for locations close to a power source. Even if an existing source is nearby, the availability of adequate capacity must be evaluated.

Other energies include process fuel, bulk reagents, and gasoline. All these must be made available. Remote locations could require significant storage capacities depending on the transportation services available.

c) Meteorological Data

The climate plays a significant role when determining location from both human as well as plant operations perspectives. Extremities in temperature and humidity pose obvious threats, and require proper protection both to the people and the equipment. Factors such as wind and wind chill, snowfall, and rainfall must also be taken into consideration.

d) Transportation Facilities

Although transport was mentioned in sub-section a) above, transportation facilities deals with the general infrastructure required to support the operation and community resulting from the plant. This would include evaluating all existing services such rail, road or air services, if existing or required.

e) Water Supply

Water is needed for both human survival and process operations. The availability of an adequate supply of must be assessed, and the cost of that supply compared. Local water supply might be suitable for the operation; however, could require purification for human consumption.

f) Waste Disposal

The impact of a new plant on existing, if any, waste disposal capacity must be assessed. This includes evaluating the local permissible tolerances.

g) Labour Supply

Availability of a suitable labour supply is a critical factor for operating a pellet plant. The level of training required will depend on the skill level of those attracted to the site. Remote locations, such as northern Quebec, tend to follow a fly-in/fly-out format as the labour force is usually small, if existent. Other issues to consider when evaluating locations can include prevailing pay scales, turnover rates, any restrictions on work hours, local culture, and competing industries.

h) Taxation and Legal Restrictions

Although excluded in this level of study, there could be tax and legal implications that might make one location favourable over another. This could come in the form of government tax relief or other incentives to encourage economic growth. Other issues to evaluate would include zoning and building codes.

i) Site Characteristics

Site characteristics are related to the lay of the land, and costs associated with providing reasonable living conditions. Factors to consider include topography, soils, cost of land, local building costs, and availability of space for the project including any future expansion.

j) Safety and Environmental Measures

The occurrence of natural events should be evaluated to determine the potential hazards to people, environment and the operations. Responses to those events will provide insight into the infrastructure that exists, and additional needs.

k) Community Factors

The existence of a local community can be helpful in attracting a workforce. If none exists, the owner must consider establishing cultural facilities. Other factors to assess include the local government, and municipal debt.

17.5.2 Comparison of Key Elements

The factors listed in section 17.5.1 were reviewed in the context of this level of study. Information gathered was compiled, and is presented in Appendix D. Key elements from that list were identified, and the pros and cons assessed for locating the pellet plant at either the mine or port site. The comparison for considering a pellet plant located at the mine site along with the concentrator is presented below in Table 17.12. The alternative location at the port site is presented in Table 17.13.

At this stage of the project, the process flow is conceptual. Many details will need to be developed further; however, certain aspects can be highlighted in the flow depending on where the pellet plant is located. First, the material, whether concentrate or pellets, will be transported by rail to the port site where it will be either stockpiled or loaded directly to bulk-carrying vessels. The differences in flow associated with the two methodologies are highlighted in Figure 17.12.

Most notable is the fact that four additional steps, highlighted in red, are required if the pellet plant is located at the port site. The first and foremost is drying of the concentrate at the mine in order to transport by rail. There would be similar stockpiling and offloading steps at the mine site, highlighted in yellow, only the form of the material changes. Additional stockpiling at the port site would, however, be required for the concentrate to disconnect the railcar unloading to the pellet plant. Another important consideration in having the pellet plant located at the port is the need to re-wet the concentrate. If located at the mine, feed to the pellet plant can leave the concentrator and remain stored in slurry form until ready for filtering. This is obviously not the case when the concentrate is transported dry to the port site. Beyond inclusion of the extra operations, it also seems wasteful to have used energy to dry the concentrate only to re-wet, and use similar energy to actually produce the pellet.

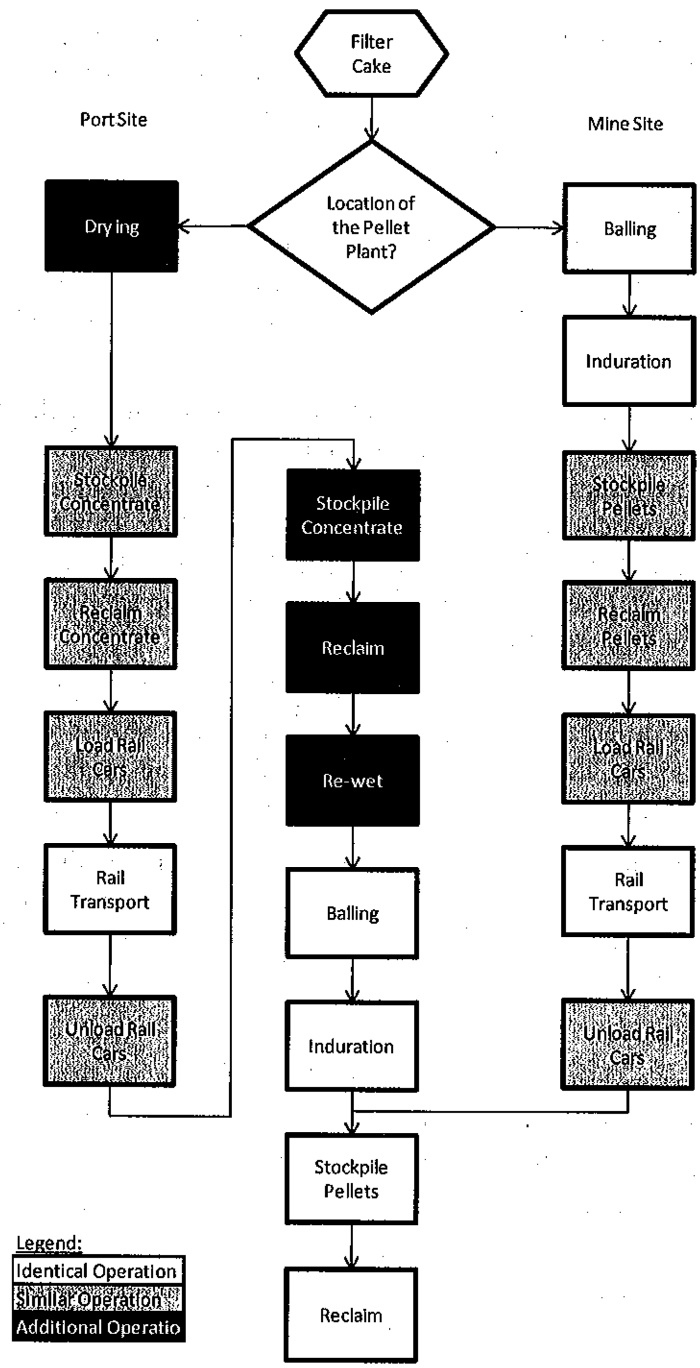
Table 17.12 – Pros & Cons of Pellet Plant Located at Mine Site

	Pellet Plant at Mine Site	
	Pros	Cons
Material Transport and Storage	Concentrate fed directly to Pellet Plant Thaw sheds not required. Either stockpile pellets or concentrator at mine site basically similar costs. No additional reclaiming Slurry filtered and fed directly to balling equipment helps provides good quality control.	Extra handling of pellets
Energy Availability		Incremental cost of Bentonite transport to mine site (offset by return of empty cars) Cost of Fuel Oil transport to mine site Need fuel cars (approximately 9 car loads per day) Potential incremental cost of fuel storage and heating
Site	Land availability does not appear to be an issue.	Harsh living conditions
Tax & Legal		
Meteorological		Winters are slightly harsher
Infrastructure	Infrastructure must be developed for Mine and Concentrator regardless.	Incremental cost associated with Pellet Plant
Labour & Comm.	Already need to establish community and draw labour for mine and concentrator	None locally; closest is Schefferville

Table 17.13 – Pros & Cons of Pellet Plant Located at Port Site

	Pellet Plant at Port Site	
	Pros	Cons
Material Transport and Storage	Stockpile pellets once	Need to dry concentrate to low moisture level for transport which adds capital and operating costs. Thaw sheds required if concentrate not dried. Extra concentrate stockpile at port site adds capital and some operating cost. Extra reclaiming operations add costs. Need to re-wet concentrate for balling Quality of balling might suffer due to transport and handling of the concentrate.
Energy Availability	Raw material offloaded at Port Pellet Plant close to oil offloading	Still need to transport some fuel to mine site for dryers. Need fuel cars (approximately 8 car loads per day during winter months)
Site	Not as harsh; established	Potential difficulties obtaining land (competing companies; environmental concerns)
Tax & Legal		Potential difficulties obtaining permits for large Pellet Plant facility and fuel oil storage.
Meteorlogical		Heavier rainfall along coast
Infrastructure	Established infrastructure	Might already be stressed
Labour & Comm.	Community of Sept-Iles establsihed with skilled labour.	Competition for the skilled labour.

Figure 17.11 – Process Flow Relating to Location of Pellet Plant.



In terms of material handling, the one questionable downside of locating the pellet plant at the mine site is extra handling of the pellets. This could result in some degradation of the pellets thereby increasing recycle and dusting; however, pellet strength should be sufficient to minimize the effect. Although seen as a minor risk, it would be reasonable to consider the risk. One thing that does help is that pellets can be unloaded from ore cars and convey directly to the shiploading (bypassing the stockpile). Benefits are: reduction of the required storage capacity at the port, reduction of pellets degradation, less dust at the port, lower operating cost, attaining high shiploading rate (reclaiming rate plus flow the pellets flow from the car dumper).

As noted previously, energy required to dry the concentrate prior to rail transport is a con for locating the pellet plant at the port. In terms of energy, locating the plant at the mine has the added cost of transporting and storage of fuel oil for the induration furnace; however, these will be incremental costs as fuel would be required for the kiln dryers if located at the port.

Another significant issue relates to labour. There is an established community with skilled labour around Sept-Îles unlike the Lac Otelnuk region which is sparsely populated with the closest community being Schefferville. The problem might be competing with similar iron ore producers in the Sept-Îles area for labour. One advantage with including the pellet plant in the north, at the mine site, is increasing the level of community in that region. There will already need to be a substantial camp site so the addition of the pellet plant workforce is incremental.

Land availability, and permitting, could be an issue if a pellet plant capable of producing 50 Mtpy were to be constructed around Sept-Îles. There is certainly sufficient land available for developing around the mine site. Permitting could take time, but should not be an issue if locating the pellet plant at the mine.

A big hurdle for attracting workers to the mine site will be climate. Most significant is the harsh winters in the northern environs. No data is available for the Lac Otelnuk. The closest meteorological station is Schefferville where the winters are reported as slightly harsher than Sept-Îles. Average rainfall, however, is heavier along the coast.

17.5.3 Conclusions

There are pros and cons for locating the pellet plant at either the mine or port site. Potential added capital and operating costs associated with transporting concentrate by rail to the port is a definite negative for the project.

It might be easier to attract workers to the Sept-Îles area; however, the magnitude of the project will require attracting a large workforce to the Otelnuk site regardless. This should increase the momentum for developing a community in that region. It might also provide Adriana with leverage with the local, municipal, provincial and federal governments to help support the project.

For the purpose of this PEA, it was decided to assume the pellet plant would be located at the mine site. The location can be finalized as the project is further detailed.

17.6 Site Infrastructure

The general site layout of the Lac Otelnuk project showing future pit location, concentrator, tailings disposal and other infrastructure is shown in Figure 17.12.

17.6.1 Design Criteria

The infrastructure for the Otelnuk mine site is based on a base case scenario of 50 Mtpy of iron pellets per year produced at the Otelnuk mine site with rail loadout and transportation of the pellets to a port facility located in Sept-Îles. The same annual tonnage applies to the design capacity of the port infrastructure including pellet unloading, stockyard and reclaiming, deep water port, and ship loading.

The present study is based on a 34-year production schedule. Infrastructure for the project includes: access road, campsite, site roads, airstrip, potable water, sewage water treatment, mine site camp including catering services and other infrastructure required in a remote location such as Lac Otelnuk.

17.6.2 Offsite Access and Transport Infrastructure

a) Access Road

There are two options for access roads to the Otelnuk site: Schefferville or Brisay. For the purposes of this assessment, it was decided to follow a route from Brisay. The main reason is a power transmission line will need to be constructed running from Brisay. This means an access road will need to be constructed regardless. The distance from Brisay to the Otelnuk site is roughly 240 km; however, there is a road already as far as Caniapiscau which means the distance of new road is roughly the same as from Schefferville.

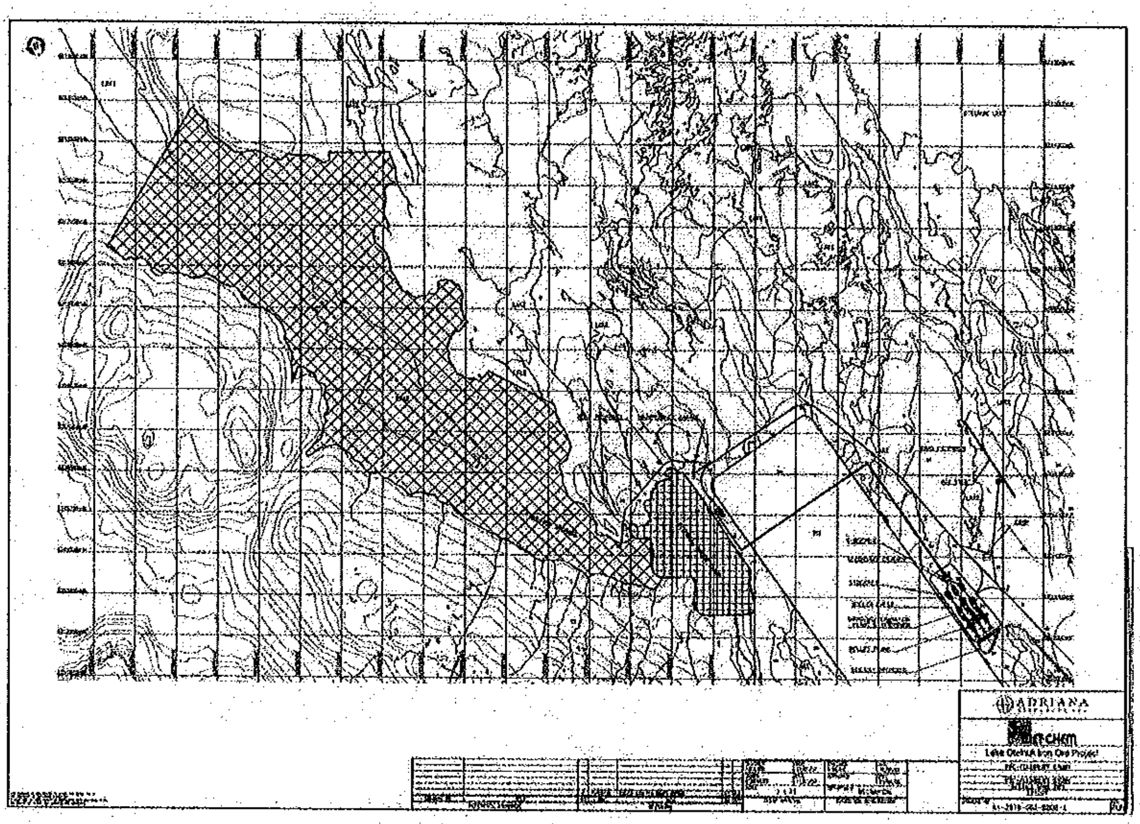
It should be noted that neither the condition of the road to Brisay nor onward to Caniapiscau were investigated at this level of study. The road from Schefferville was anticipated to require no major bridge construction whereas it was noted in the 2006 report the potential for at least one bridge if using the Caniapiscau option. Neither routes were fully investigated, and will require detailed evaluations in subsequent phases of the project.

The road will be used to truck supplies from the southern locations in Quebec to the mining site during construction of the railway.

b) Railway Train Station and Freight Yard

Once the railway construction is completed, all supplies will arrive by rail from Sept-Îles requiring a rail yard with a fuel unloading station, a pipeline to the tank farm and a rail siding to allow for the unloading of merchandise without interfering with the concentrate loading operation.

Figure 17.12 – Lac Otelnuk Overall Site Layout



c) Airstrip and Facilities

As in the 2006 study, a 2,350 m long gravel landing strip capable of accommodating fully loaded Boeing 737-200 Combie (76 passengers or cargo) will be built at the Otelnuk mine site. It will serve for the transportation of personnel and the transit of material. The only difference is a helicopter is not required for inspecting the slurry pipeline; therefore, not included in this present study.

It is assumed that waste material from the mine pre-production, crushed rock and sandy sill will be available as fill material.

A small building with all facilities will be erected for incoming and departing personnel. The building will also house a communication office with weather station, communication tower and airstrip lighting.

A jet engine fuel truck will refuel the airplane from a reservoir located at the fuel farm.

17.6.3 Mine Infrastructure and Equipment

For the purpose of the present study, it has been assumed that mining will take place in the South Zone of the Lac Otelnuk Iron mineralized zone. Mine equipment was discussed in section 17.1.3 of this report. A variety of support infrastructure is also necessary for a safe and efficient mining operation.

a) Mine Site Preparation

The mine site preparation includes clearing, grubbing, overburden removal, rock drilling, blasting and removal, excavation, levelling, general fill or mine waste fill.

b) Mine Site Facilities

Facilities included in the mining infrastructure concept:

- Mine dispatch (included in the Mine Garage);
- Explosives batch plant including security and fencing would be contracted to explosives specialists;
- Explosives storage including security and fencing would also be contracted to the explosives specialists; and
- Washing, tooling, racking, etc.

Buildings included in the mining infrastructure concept:

- Garage;
- Maintenance building;
- Shops building;
- Warehouses (heated & cold storage); and
- Dry which is anticipated to be included as part of the warehouse.

17.6.4 Otelnuk Complex Site Infrastructure and Equipment

a) Otelnuk Site Preparation

The Otelnuk site preparation includes clearing, grubbing, overburden removal, rock drilling, blasting and removal, excavation, levelling, general fill or mine waste fill.

b) Otelnuk Camp Site

The Otelnuk camp site will be erected upwind from the concentrator and train loading station. It will be built to accommodate 2,000 workers, including catering. It is expected the camp will include all the amenities associated with a typical remote fly in/fly out operation such as the Raglan model used by Xstrata Nickel.

c) Otelnuk Site Roads

All site roads will be built to the same standard used for the access road. Site roads are required for communication to and from the gatehouse to the camp, the airport, the water pumping station, the steam plant, the concrete batch plant, the rail yard, the rail car loading station, the incinerator and the water sewage treatment stations.

d) Tank Farm

A tank farm holding sufficient supply of No. 2 diesel fuel, No. 6 Bunker C fuel oil and gasoline will be erected south of the mill complex.

e) Warehouse

The warehouses noted in mine infrastructure will also service the mill and pellet plant complexes (crushers, concentrator, pellet plant, Otelnuk administration, mine offices, change house, mine dispatch, mine garage and general maintenance).

f) Otelnuk Administration Offices

The Otelnuk administration offices will be located at the mill complex above the warehouse. It will house the general manager, personnel management, local accounting, security, safety & environment, and infirmary and offices for visitors. There will also be similar offices associated with the pellet plant complex downstream.

g) Gatehouse

The gatehouse located along the access road and to the south end of the property will host the security guard in function and receive all remote cameras, security, fire and safety systems information and data. It will also direct incoming traffic.

h) Incinerator Plant

The incinerator plant requires a climate controlled enclosure. It will be capable of handling daily waste and sewage sludge. The system typically operates in a batch style, fully automated, and burns No. 2 oil.

i) Fresh Water Supply

Fresh water will be sourced from Lac Bricot about 3.5 km northeast of the concentrator. Two pipelines originating from a pumphouse on the lake shore will feed the makeup water tank at the concentrator.

This makeup water tank will also be used to feed the potable water treatment plant (membrane filtration type), and provide water for fire protection. The upper part of the tanks will be used for concentrator make up water, the middle part of the tank will be used to feed the potable water treatment plant, and the lower part of the tank will provide a constant volume of water available for fire water.

A ventilated and heated building is required for pumps and controls for the supply of drinking water. The building first installed at Lac Bricot during construction will be moved to the mill when the mill make up water pumps are installed.

j) Water Sewage Treatment Plant

The plant will be built east of the concentrator and will have sufficient capacity to treat sewage water from the site. The plant will require a heated and ventilated building for pumps and controls.

k) Used Oil Treatment

The used oil treatment tank will be located near the garage and treated oil recuperated will be delivered to the boilers day tank.

l) Steam Plant

The steam plant includes three boilers and piping for the concentrator, garage, offices, maintenance complex, and concrete cement plant. It must also supply steam for the Bunker C No. 6 rail unloading station, pipeline to the tank farm, tank unloading, and pipe line to the steam plant.

m) Concrete Cement Plant

It is proposed to use a semi portable concrete mix plant having a capacity of 91.7 cubic meters per hour discharging into buckets, pumps or open top hauling vehicles.

Cold weather operation will require that aggregate and sand stockpiles be laid over steam heated cement slabs covered with a tarp building. Provisions are made for two steam heated slabs each one having a capacity of 25,000 tonnes be constructed, using the Bunker C oil steam heater.

n) Aggregate Plant

It is proposed that the aggregate plant be supplied by others for roads construction and civil work, and that sufficient stockpile be built at critical locations for road maintenance and construction work.

o) Service Equipment;

Typical service equipment that is expected to support such an operation would include:

- Graders;
- Hydraulic cranes;
- Various service trucks;
- Dump trucks;
- Fuel carriers;
- Water trucks;
- Loaders;
- Bobcats;

- Forklifts;
- Ambulances;
- Fire trucks;
- Passenger vehicles (buses, crew cabs, pick-up trucks, and management vehicles).

17.6.5 Electrical Power Supply

a) Design Basis

i) Mine Site

The total estimated electrical power required at the mine site for the mine, crusher, concentrator, pellet plant, main slurry pumping station and all associated infrastructure is estimated to some 635 MW when 50 million tonnes of pellets are being produced per year. It is proposed to distribute electric power at the mine site at 34.5 kV. This is an industry standard voltage for projects using comparable power levels. Met-Chem is aware that equipment and devices are readily available at competitive prices for this voltage.

It is proposed the power be received from the Brisay generating station located approximately 240 km from the Otelnuk site. To transmit upwards of 635 MW over such a long distance, a 315 kV AC transmission line will be required.

ii) Pipeline Water Pumping Stations

Power at pumping stations along the concentrate pipeline to Sept-Îles will be supplied by diesel generator stations installed at each location.

iii) Rail, Stockyard and Port Facilities

Power demand is estimated to be less than 15 MW at the Sept-Îles port facilities including the rail station, rotary dumpers, stockyard, and shipping area. For the purpose of this study, however, the 2006 figure of 60 MW was assumed. These installations will be supplied with electricity from Hydro Quebec established grid.

b) Transmission Lines

According to the 2006 study for Adriana, Met-Chem met with Hydro-Québec in March 2006 to discuss the electrical requirements of the Lac Otelnuk and Sept-Îles. At that time, Hydro-Québec provided information as to the power sources to be considered for Lac Otelnuk and Sept-Îles and those are discussed in subsequent paragraphs. Unit consumption costs to be used in the project study were also recommended as follows by Hydro-Québec:

- For the first 50 MW of demand: use $0.0438/kWh;
- For the demand exceeding 50 MW: use $0.0830/kWh.

Since 2006, Adriana has been in negotiations with Hydro-Québec, and has provided an updated figure of $0.036/kWh. This unit price was used in this PEA.

i) Otelnuk Power Supply

Hydro-Québec recommended, in 2006, a 315 kV power line in consideration to the distance and the demand load of up to 160 MW at the mine site. According to Hydro-Québec, the power station of Brisay located at 240 km can supply the mine site and is the best alternative at a cost of $300 million (in 2006). The same figure was assumed for the transmission line in this PEA.

ii) Port Facilities at Sept-Îles

The communication with Hydro-Québec in 2006 also confirmed the main power substation Arnaud could feed the port facilities which included the pellet plant, stockyard, berth and others facilities considering the demand load of 60 MW.

c) Distribution at the Otelnuk Site

i) Main Electrical Room

The main electrical room will be located near main loads with the following equipment:

- Switchgear 34.5 kV;
- Switchgear 13.8 kV;
- Switchgear 4.16 kV;
- Switchgear 600 volts.

ii) Overhead

34.5 kV lines will be installed between the main substation and the following locations:

- Reclaim water pumphouse at tailings pond;
- Fresh water pumphouse at Lac Bricot;
- Open pit;
- Camp site area.

iii) Emergency

Emergency diesel generators will be located near the main electrical room and will feed the main busbar at 4,160 volts to give the emergency power as much to the critical loads in the concentrator as the critical loads on the site.

iv) Water System

A tap will be fixed on an overhead line to feed the collecting pond area.

v) Communication System

The plant will be connected to the public utility service by satellite which will allow communication lines for the plant and the camp site. The main entrance will be located in the administration building of the concentrator and other one in the camp site.

d) Distribution to Sept-Îles Facilities

A 161 kV – 34.5 kV main sub-station with a capacity evaluated at 60 MW will be built near the pellet plant.

i) Distribution at Port Site

From the port substation, power will be distributed at 34.5 kV to the following areas:

- Stackers, reclaimers and conveyors in the product stockyard, to the conveyor from the stockyard to the jetty, and to the conveyors and shiploaders on the jetty and wharf;
- Rail station and yard;
- Rotary rail car dumpers;
- Berth to feed the shiploaders; and
- Administration building.

ii) Remote Plant Gate

A 4,160 volts line will be installed between the main substation and the remote gate.

iii) Fire Alarm System

The fire alarm system includes a main protection panel located in the office building and auxiliary panels in all buildings.

iv) Communication System

The Port will be connected to the public utility service available on the area. The main entrance will be located in the administration building of the Port.

17.6.6 Administration

a) Otelnuk Administration

The Company's administration office will be located in a dedicated building near the pellet plant. Mine and processing operations, maintenance and services staff offices will be located within the Otelnuk Processing Complex.

b) Sept-Îles Administration

Port Facility administration offices will be housed in a separate building.

c) Sept-Îles

No camps are required during the construction, and all personnel will live in Sept-Îles.

17.7 Rail Transportation of Pellets

17.7.1 Railway Operations Analysis

a) Introduction

As part of the preliminary assessment, CANAC was requested to provide a general layout of the railway corridor from the proposed project site to the Sept Îles/Port Cartier area at a scoping level. A stated requirement was that the proposed corridor be laid out entirely within the boundaries of the Province of Quebec. CANAC's other main tasks were to provide a "basis of design" (BOD) for the set-up and operation of the railway delivery system, provide an estimate of capital expenses for the construction of the proposed railway corridor including rolling stock and infrastructure and operating expenses for the railway delivery system. The basis of design was to address design parameters relating to the determination of rolling stock fleet requirements, train make-up, mainline infrastructure, loading and unloading loop track layouts, equipment maintenance facility, train control requirements, inspection and servicing requirements.

b) Traffic Level

The railway system is designed to deliver 50 million tonnes per annum (MTPA) of iron pellets from the mine site to the port.

In addition, there may be a need to transport supplies and equipment for the mine as well as mine workers in case a decision is made to build a small town at Otelnuk Lake. Due to the expected long span of the mine, if a town is built, there may also be a need for some passenger train service. The supply and passenger train traffic may total a few trains per week and is assumed as covered in this preliminary assessment.

c) Design Criteria

The preliminary concept railway design and train operation is based on the following key considerations:

- Use of only appropriate field-proven, leading-edge technologies suitable for robust operating environment;
- Maximizing productivity and efficiency by employing international, heavy-haul freight best practices and equipment;

- Minimizing capital and operating costs, while ensuring the rail delivery system is safe, responsive, and reliable;
- Provision for sufficient redundancy or peaking capacity in the railway delivery system to ensure a smooth and reliable system to deliver the targeted tonnages to the port.

17.7.2 Proposed Rail Plant

a) Main Line

Using the contour maps provided by Met-Chem, a preliminary alignment for the railway line was laid out, by CANAC, entirely within the boundaries of the Province of Quebec. In choosing the alignment an attempt was made to minimize the need to cross any body of water and to avoid large degree of curvature and changes in grade. In keeping with the scope of work and the time and effort available to do this exercise, an in depth analysis or optimization was not done in choosing the alignment (for example to minimize cut and fill or the number of bridges required). The main purpose of the exercise at this stage was to investigate the feasibility of laying out the line to have reasonable degree of curvature, and for the line to have as few as possible bridges and other structures such as public crossings and to determine the approximate length of the route. A far more detailed analysis is needed and should be carried out at the appropriate stage in choosing the rail alignment that optimizes the layout and meets some of the key design parameters and in particular the ruling grade in the loaded direction.

Two rail alignment options were developed. The two alignments differ from each other on the south end of the route and are based on two alternate locations of the port. The two port location options are Sept-Îles and Port Cartier. There are advantages associated with each port location. Sept-Îles is a deep water port and the bay offers natural protection with no need to build a "breakwater" facility; however, there is a good possibility that all the good spots on the bay are already taken. With the port location at Port Cartier the route would likely be shorter by 15 to 25 km; however, Port Cartier is not a deep water port and is in the open water; hence there would be need for dredging and need to build breakwater facility. The breakwater facility is expensive to build, costing as much as hundreds of millions of dollars, according to the port consultant Anna Klimek of BH&T Engineering.

The capital and operating costs have been developed with the port location at Sept-Îles.

The main features of the laid out route with Sept-Îles as the port, shown in Figure 17.13 and Figure 17.14, are as follows:

- Route length – 815 kilometres between the mine loading loop and the port unloading loop;

- Total number of curve sections on the line – 630, 400 sections with 5 degree of curvature and 230 sections with less than 5 degrees of curvature;
- Public crossings – 2, a provincial and a municipal road;
- A diamond crossing or overpass with Quebec Cartier Mining (QCM) railway line; and
- Number of bridges of indeterminate length - 22 (detailed maps and assessment is needed to refine the results).

The following are the key design parameters of the railway track infrastructure:

- Gauge: 1,435 mm "Standard Gauge";
- Load Capacity: 32.5 tonnes static axle load;
- Operating Speeds: 50 KMPH maximum on Main track (tentative);
- 30 KMPH maximum for entering passing loops;
- 15 KMPH maximum within yard limits, loading and unloading loops;
- Gradients: 0.4% maximum in loaded direction;
- 1.5% maximum in empty direction;
- Curves: 350 m minimum radius for mainline, 250 m;
- Minimum radius for terminal loop tracks;
- Turnouts: Powered on mainline and manually actuated in yard.

b) Passing Sidings

Based on the projected traffic levels, 30 passing sidings are required, located approximately 27 kilometers apart. The final count and location for each siding can only be determined once the final track alignment has been established. The location of sidings must consider such factors as the gradient, location of public crossings, bridges, etc. Once candidate locations are identified, the precise locations will be based on a grid time analysis, which will attempt to equalize the train running time between loops, based on train performance modeling results. Refer to Figure 17.5, for the conceptual layout of the mainline and locations of the sidings.

The typical passing siding will be 2.8 kilometers in length clear of turnouts. The clear length provides a full train length plus an additional 9% allowance to accommodate braking distance and slack action.

Provision is made for 250 meters, stub-ended set-off tracks at the end of the sidings on either side of the wayside detection systems to allow defective wagons to be removed from the train en route. These cars may undergo on-site repairs or be picked up periodically by work trains to transport them to the maintenance shop at the port. These set-off tracks will also be utilized by track maintenance crews as needed to temporarily store maintenance of way equipment.

Figure 17.13 – Preliminary rail alignment in northern segment to the mine site. (CANAC)

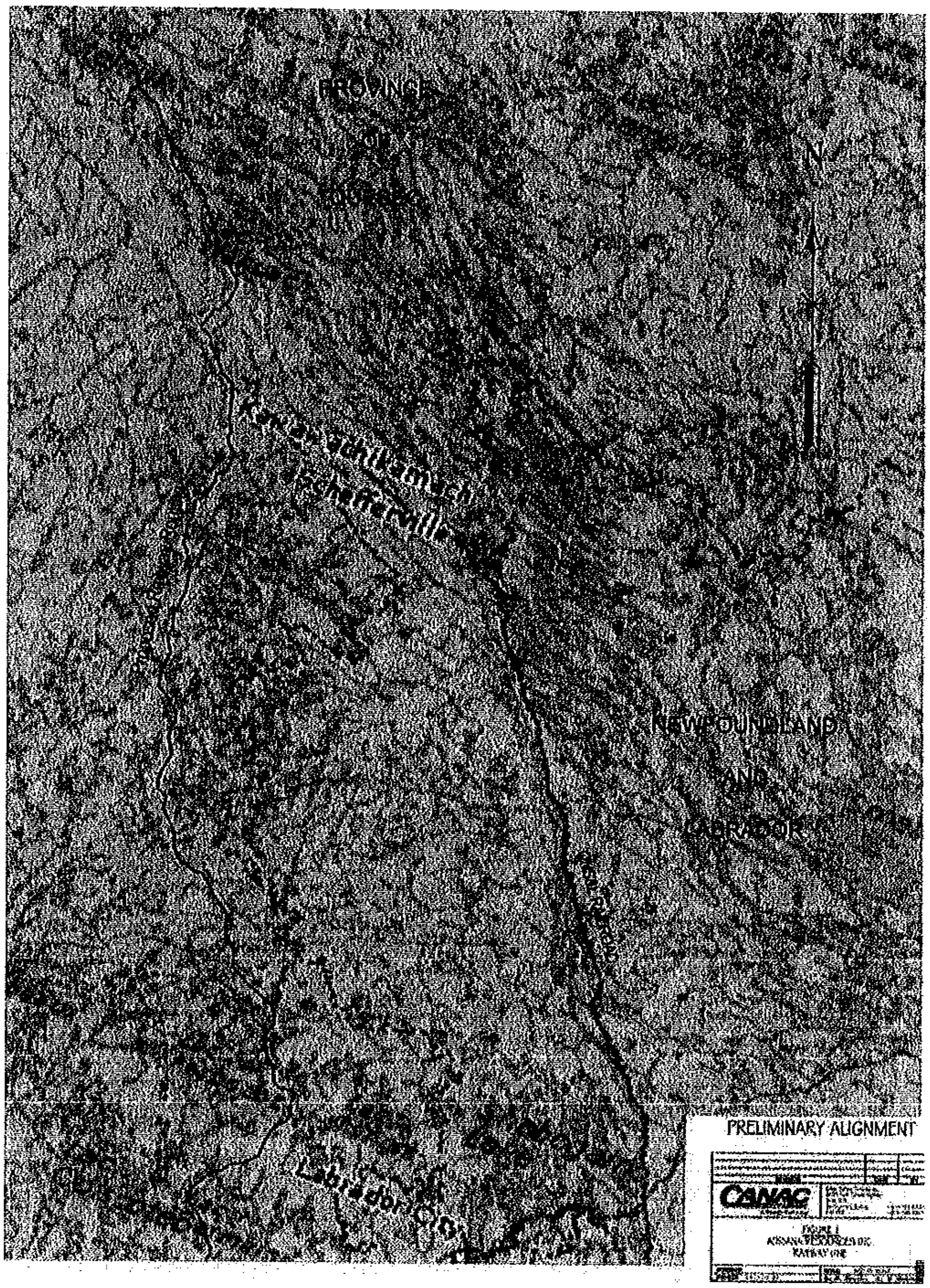
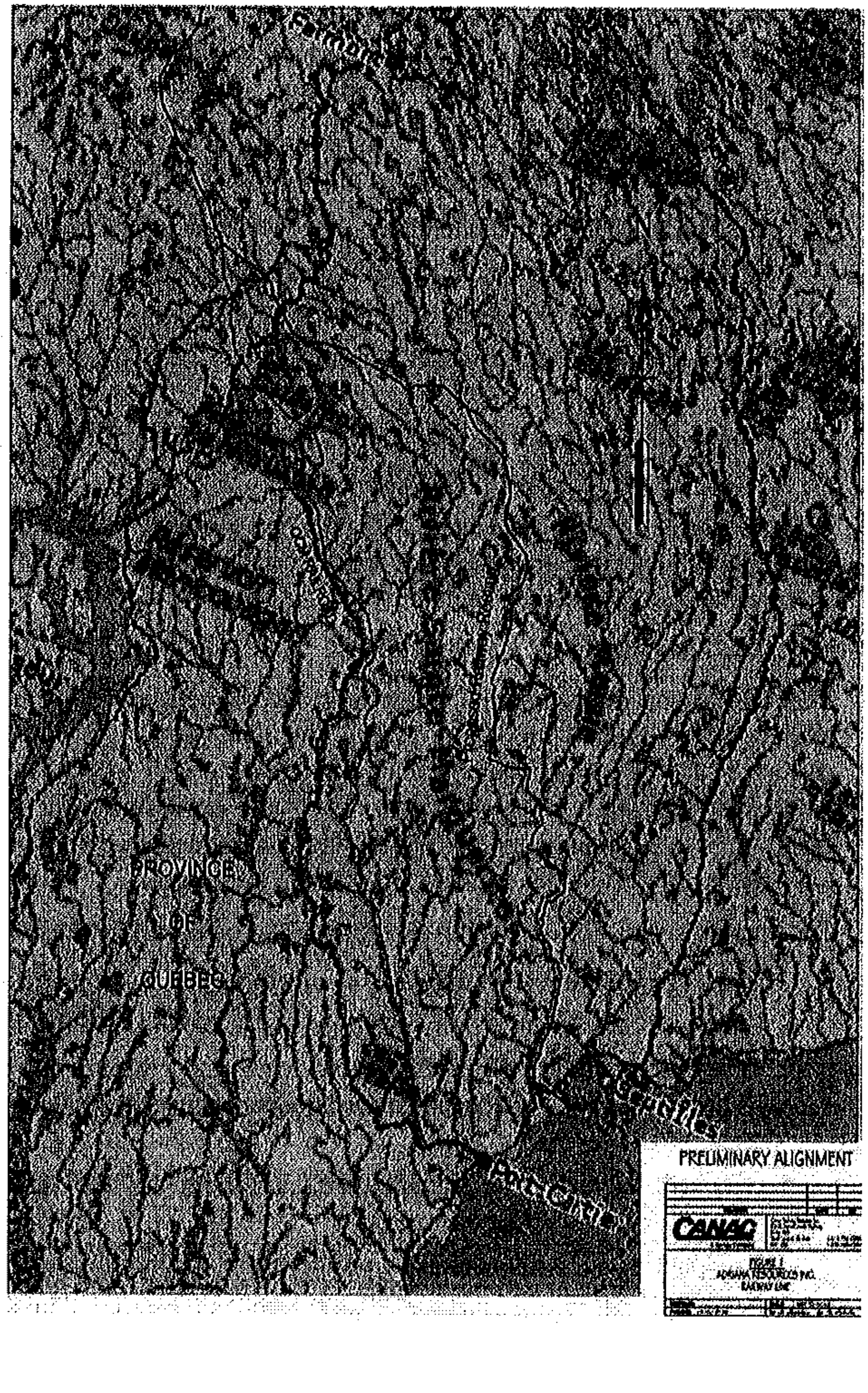


Figure 17.14 – Preliminary rail alignment in southern segment to the port sites. (CANAC)



c) Wayside Inspection Devices

Automatic rolling stock defect detectors will be deployed at 6 to 10 key locations along the right of way. These devices are required to identify defective rolling stock running gear and to remove the cars from service to limit damage to railway assets and property and avoid potential derailments. Figure 17.15 indicates the key locations of these installations, which are typically installed in clusters.

The typical detector cluster shall consist of the following devices:

- Hot Box Detector which identifies defective bearings and journals;
- Hot Wheel Detector which identifies partially applied brake shoes;
- Dragging Equipment Detector which identifies loose hoses or running gear;
- Wheel Impact Detector which identifies wheel tread flat spots and spalling; and
- Automatic Equipment Identification Scanner which identifies the suspect wagon by reading the equipment tag.

Only the cluster located at the entrance to the port terminal will be equipped with a wheel impact detector, since defective loaded cars will be emptied before the wheel sets are changed out at the servicing track.

d) Mine Site Loading Loop

The rail physical plant required at the mine and the conceptual layout of the mine loading facility is shown in Figure 17.16. The mine site train loading terminal will consist of a double loading loop track arrangement each loop equipped with an independently operated loadout chute. Each will have sufficient clear length to accommodate a complete empty train on the in-run track segment, and a complete loaded train on the out-run segment, clear of the loop turnout.

The operating steps for the handling of individual trains will progress as follows:

- Empty Trains are received directly to one of the in-run loop tracks;
- Defective cars identified by the inbound detectors will be set-off in the designated bad order set-off track;
- If the in-run tracks are occupied, the inbound train will be held in the staging track;
- Cars will be loaded on a continuous basis with the train speed controlled remotely by the loadout operator;
- The loaded train will undertake a pre-departure inspection; and

When authority is given to occupy the mainline, the loaded train will depart.

Figure 17.15 – Conceptual layout of the mainline. (CANAC)

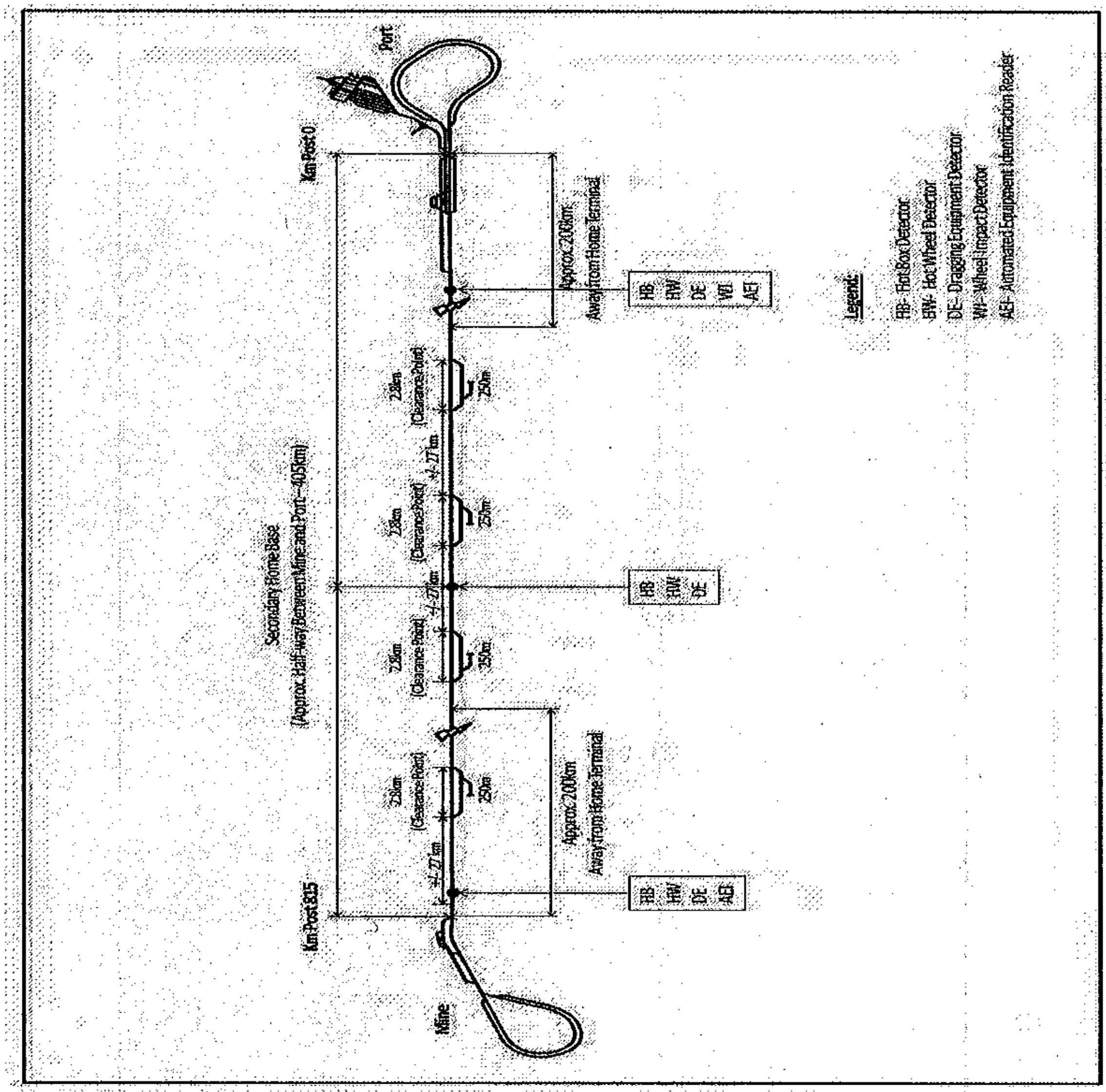
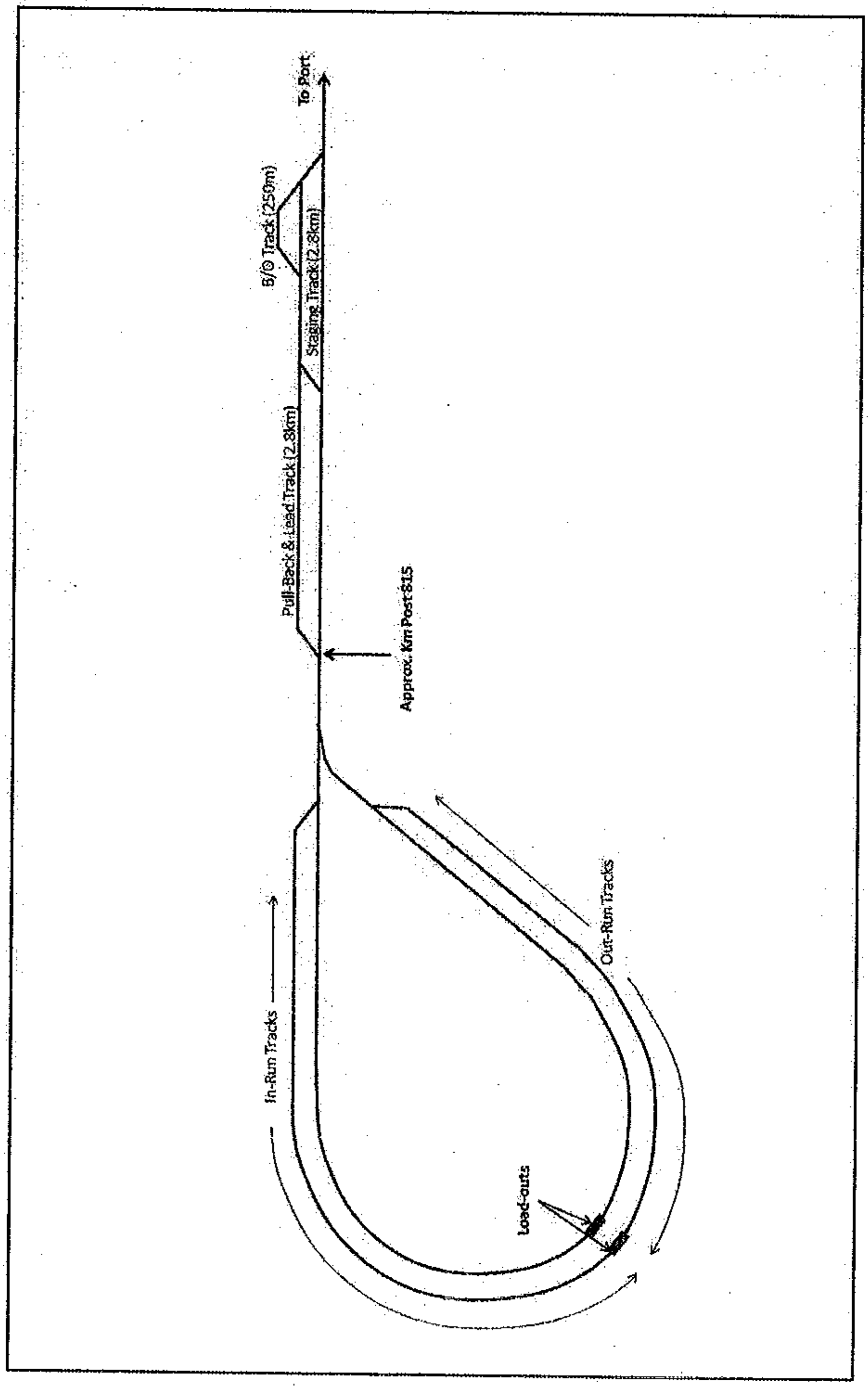


Figure 17.16 – Conceptual layout of the mine loading facility. (CANAC)



e) Port Unloading Loop & Rolling Stock Maintenance Shop

The rail physical plant required at the port and conceptual layout of the port loading and shop facilities is shown in Figure 17.17. The port train unloading terminal will consist of a double unloading loop track arrangement; each loop equipped with an independently operated rotary dumper. Each will also have sufficient clear length to accommodate a complete loaded train on the in-run track segment and a complete empty train on the out-run segment, clear of the loop turnout.

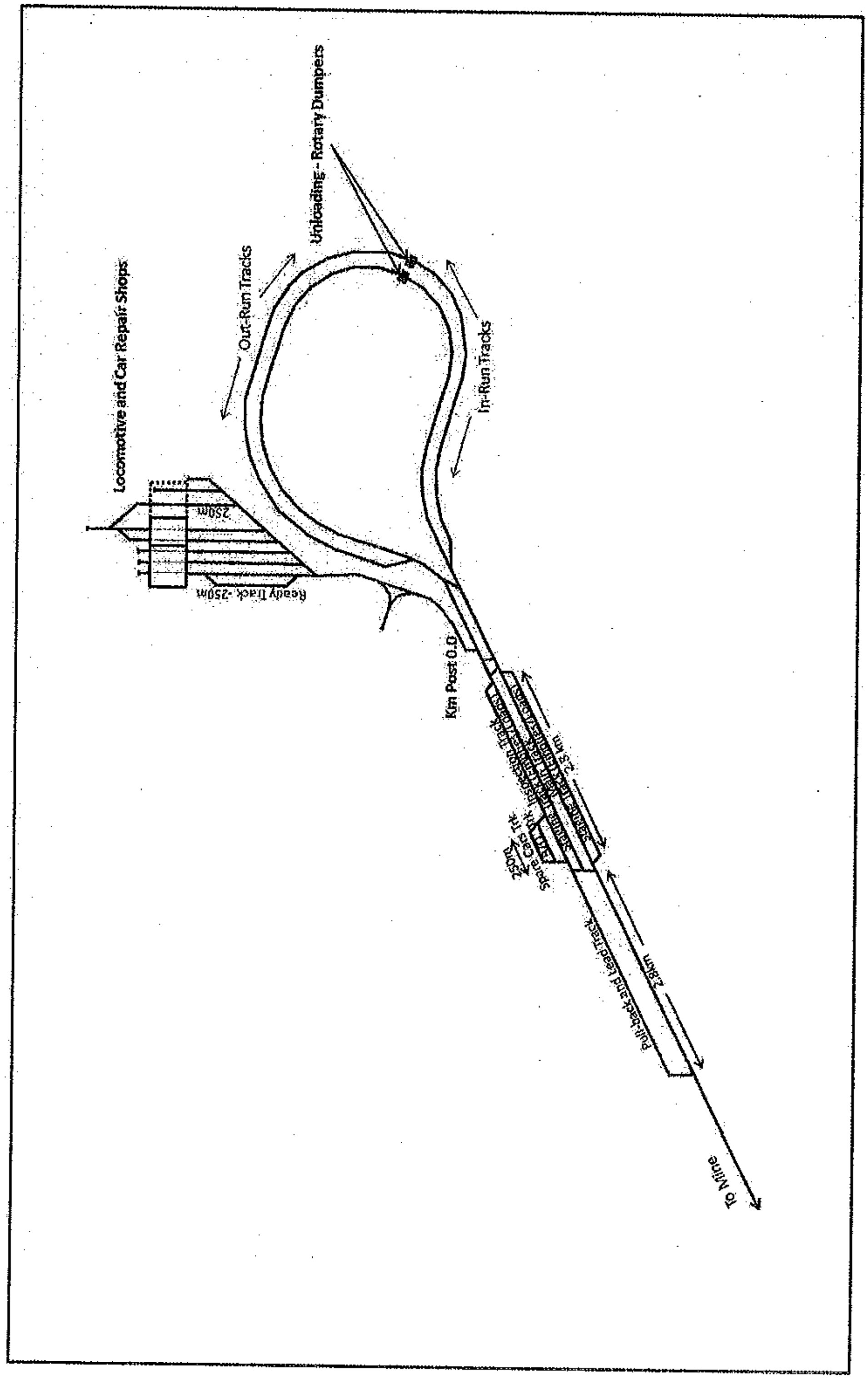
The operating steps for the handling of individual trains will progress as follows:

- Loaded trains are received directly to one of the in-run loop tracks;
- Defective cars identified by the inbound detectors will be set-off in the designated bad order set-off track after unloading; replacement good order cars will be added as required;
- If the in-run tracks are occupied, the inbound train will be held in a staging track;
- Cars will be unloaded on a continuous basis with the train speed controlled remotely by the loadout operator;
- The empty train set will undergo servicing and scheduled inspection on the designated inspection track. Locomotives will be re-fueled, sanded, cleaned and re-supplied or replaced with fully serviced set of locomotives. Defective cars will be set-off and replaced by spares;
- The empty train will undertake a pre-departure inspection; and
- When authority is given to occupy the mainline, the empty train will depart.

f) Shop Facilities:

The rolling stock maintenance shops would be located adjacent to the unloading loop at the port. The facilities would consist of a locomotive repair shop and a car repair shop. Each shop would have separate sections for light and heavy repairs.

Figure 17.17 – Conceptual layout of the port unloading facility. (CANAC)



17.7.3 Train Operations, Cycle Time and Fleet Size

a) Framework for Operations Analysis

The operations analysis and the determination of capital and operating costs have been carried out at a high level and would need to be refined by doing a more detailed analysis.

b) Operating Parameters

The analysis assumed the following operating parameters:

Traffic: 50,000,000 tonnes of iron pellets per annum;

Operating Days: 330 days per year;

Operating Hours: 24 hours per day; 7 days per week;

Payload: 103 tonnes per car, based on a 27 tonne tare, rotary dump car;

Loading Rate: 4500 tonnes per hour (nominal);

Unloading Rate: 4500 tonnes per hour (nominal);

Ruling Gradient: 0.4% in loaded direction; 1.5% in empty direction;

Locomotive Type: High adhesion (+/- 35%), 4300/4400 HP; AC, 6-axle.

c) Train Sizing

The train size was determined based on adhesion and available tractive effort on the loaded direction designed maximum ruling grade of 0.4% and provision for suitable power to trailing tonnage to achieve the required running performance.

The optimal train size was determined to be 3 locomotives and 240 cars. To reduce the in-train forces, it would be desirable to have distributed power on the train. With distributed power, the train consist would be made up of 2 locomotives at the head-end with 164 cars followed by the remote third locomotive and then the remaining 76 cars. This consist has been proven to be the most efficient set-up.

The train will use a Sense and Brake Unit (SBU) at the end of the train. This device provides continuous monitoring via telemetry to the train operator of the brake pipe pressure and velocity data at the rear of the train. The SBU is also equipped with a high visibility warning flasher.

The 3 locomotives, 240 cars train is expected to be 2.6 kilometers long and as stated earlier would need passing sidings or staging tracks of 2.8 kilometers in length.

d) Cycle Time and Fleet Requirements

The operations analysis and the determination of capital and operating costs have been carried out at a high level, and would need to be refined by doing a more detailed analysis.

The train cycle time is made up of three components; the loading time at the mine, the train running time on the mainline and the unloading time at the port.

i) Mine Loading Time

The loading time is defined as the time element from the time the empty train arrives at the mine site to the time the train departs with the loads from the mine. This time component can be further subdivided into three sub-components:

- Waiting time to begin loading;
- Set up to begin loading and the actual loading time; and
- Waiting time following the loading for crew change, brake test, permission from the dispatcher to occupy the mainline.

ii) Mainline Operation

This is the transit time of the laden train in the southbound direction from the mine to the port, and in the reverse move, the transit time of the empty train in the northbound direction from the port to the mine. It includes the time for:

- Train meets;
- Crew change; and
- Set–off of bad order cars or handling of pull-aparts or other service interruptions.

iii) Port Unloading Time:

The unloading time is defined as the time element from the time the train arrives at the port to the time the train departs with the empties from the port. This time component can be further subdivided into four sub-components:

- Waiting/queuing time to begin unloading;
- Set up to begin unloading and unloading itself;
- Train inspection following the unloading, switching out of bad order cars and fill of the train with replacement cars; and
- Waiting time following the train inspection and car replacement for crew change, brake test, permission from the dispatcher to occupy the mainline.

The time in each sub component was estimated based on QNS&L/Wabush Mines actual operating experience, and time performance guidelines in Consolidated Thompson (CLM) and New Millennium operating plans. Table 17.14 below summarizes the average train cycle time based on 3 locomotives and 240 cars trains. The transit time estimate would be refined using Train Performance Calculator (simulation model) once the alignment and route characteristics such as grade and curvature are well defined.

The fleet size was derived from the train cycle time and adjusted to handle peaking that occurs from time to time in normal train operation and results in bunching of trains due to mine, port or line outages. The fleet size is based on provision for 20% peaking factor to ensure adequate recovery capacity to make up for periodic lost loading slots due to normal operating variability.

Table 17.14 – Cycle Time and Fleet Requirements. (CANAC)

Estimated Cycle Time & Fleet Size Requirements (Cycle time is measured between departures for a specific empty train set from the unloading loop)	240 Car Train with 3-Locos (16 train meets) (hours)
Sidings approximately 27 kilometers apart - 30 sidings	
Empty Move - Mainline Time	
Empty transit time (route length- 815 kms) without meet delay	20
Train meet delay on empty move assuming 45 mins delay/train meet -12 meets	9
Crew change - 3 crew changes enroute	2
Mine Time	
Avg Queuing Time - Arrival to Prepare for Loading	4
Spotting Time	1
[redacted]	6
Transit Time from Loop to Staging Yard @ 8KMPH	1
Crew change and wait time for permission to approach and occupy the mainline	2
Loaded Move - Mainline Time	
Load transit time (route length - 815 Kms) without meet delay	25
Train meet delay on loaded move assuming 1 hour delay/train meet - 4 meets	4
Crew change - 3 crew changes enroute	2
Port Time	
Avg Queuing Time - Arrival to Prepare for Unloading	4
Spotting Time	1
[redacted]	6
Transit Time from Loop to Staging Yard @8KMPH	1
Brake test and wait time for crew/permission to approach and occupy the mainline	2
Train Inspection Time *1	
Train inspection time	4
Switching of bad order cars/refilling of train with repaired cars	2
Cycle time	96
Average Daily Train Volume	6.1
Train Volume to Handle 20% Peaking	7.3
Number of Train Sets Required Based on Daily Average Trains	24
Number of train sets required to Handle 20% Peaking	29
Cars Required (includes 4% contingency)	7240
Locomotives Required (includes 10% contingency)	96

*1 Round trip is 1630 Kms, train is inspected after every round trip

e) Train Servicing and Fuelling

At the end of each round trip the empty train sets will undergo servicing and scheduled inspection on the designated inspection track in the port terminal. Locomotives will be re-fueled, sanded, cleaned and re-supplied or replaced with fully serviced set of locomotives.

Cars will be inspected to identify running gear and body defects. Worn brake shoes and hoses will be changed out and light repairs performed. Cars with defective wheel sets or requiring more extensive repairs will be identified/set-off and replaced by spare wagons.

f) Train Control and Dispatching

Centralized Traffic Control (CTC) with wayside signals and powered switches would be the method of dispatching and train control on the line. The access and dispatch control of trains on the mainline will be controlled by a dispatch center located at the port facility. CTC is designed to ensure conflicting movements are not permitted and that all authorities and radio communications are automatically logged. Radio communication would be used to maintain contact with trains and maintenance/track work gangs.

Train movements within yard limits at the mine and port terminals will operate at restricted speed (maximum 15 km per hour) maintaining a minimum stopping distance of half the range of vision.

g) Operating Crews

Trains will operate with 2-person crews comprised of one operator + one brakeman. Crew members should be cross-trained to handle either assignment.

On the +/- 815 km route/run three crew changes would be needed in order to ensure that on any crew district the crews do not exceed their permitted hours of duty. Relieving crews is challenging in any environment, and would be particularly onerous given the absence of good access roads on the line and harsh weather conditions for most of the year. A suitable location would need to be found approximately midway between the port and the mine as a secondary home base for some of the crews. Two away from home locations would need to be established at approximately a quarter of the way from each end i.e. the port and the mine. On each train, the crew change would occur at the two away from home locations and the secondary home base located midway. A total of four set of crews would be required for the train operation in each direction. Given that the transit time in each direction would be in the order of 28 to 36 hours, with properly placed crew change locations each crew may be called upon to work for approximately an 8 hour shift.

17.7.4 Capital and Operating Costs – Infrastructure and Rolling Stock

a) Capital Cost

The capital costs have been estimated for equipment i.e., locomotives and cars and for the rail infrastructure that is needed to handle 50 million tonnes of traffic. The rolling stock and infrastructure requirement and their cost estimate are summarized in Table 17.15 below. It should be noted that this capital cost estimate is strictly for the rail component and it does not include cost of the loading/unloading systems, silos, storage facilities or material handling systems such as stackers/re-claimers, etc.

Table 17.15 – Locomotive, Car and Infrastructure Requirement and Costs. (CANAC)

Item	Description	Unit Cost in ($thousands)	Units Required	Cost in ($millions)
Locos	6-axle AC Units	3,500	96	336
Cars	Steel - rotary dump	100	7240	724
Infrastructure	Port - Loop Tracks	950	12	11
	Port - Staging Tracks	950	12	11
	Mainline - 815 Kilometers	950	815	774
	Sidings - 30 @1.75 mile/siding	950	84	80
	Set-off Tracks for Defective Equipment/Storage	950	2	2
	Mine - Loop Tracks	950	12	11
	Mine - Staging Tracks	950	6	6
	Bridges and Overpass Structures *1	3,000	25	75
Road Bed Prep Cost	Road Bed Prep Cost Including in Engineering Cut and Fill, Stabilization for Poor Soil Conditions	400,000	1	400
Detection Devices	Covered in Signals and Comm Costs			
MOW Equipment	Wreck Cranes, Hi-Rail, Tampers, etc.	25,000	1	25
Signals & Comm	CTC and Radio Communication Equipment (including 300+ telephone network at Port and Mine)	125,000	1	125
Maintance Shop Facilities	Locomotive and Car Repair Shops (Bldg, tools, including access and staging tracks)	30,000	1	30
Total Capital Costs				2,610

1* Assumption is most of the bridges would be of single span of under 50 meters length

The cost of a locomotive, 6-axle AC unit is expected to be in the order of \$3.5 million per unit. An ore car is estimated to be in the range of \$100,000 per car.

The cost of track construction with 136 lb premium rail, hardwood ties, 45-50 cm tie spacing, with anchors/tie plates and 60 cm ballast is estimated at \$ 950,000 per km excluding the cost of preparing the road bed. The cost of cut and fill would vary. Depending upon the final alignment and soil conditions it could run into hundreds of millions of dollars. The track bed preparation cost is estimated at

$400,000,000. This dollar figure is used simply to have a starting point and come up with the overall rail infrastructure costs.

The cost of grade separations at the two public road crossings (provincial and municipal roads) and rail crossing with QCM, and the 22 bridges for a total of 25 structures is estimated at $3 million per structure.

b) Operating Costs

Operating costs are made up of transportation, engineering and rolling stock maintenance costs. The operating costs as is the case for the capital costs estimate do not include any cost for the loading and the unloading operation. The developed annual operating costs are the costs that would be applicable over the long term of the project. Some of the operating costs such as for the track and rolling stock maintenance would obviously be quite low in the initial years of operation. Cost estimate for the three components have been derived based on the guidelines discussed below.

<u>Equipment</u>: Industry standard indicators for locomotive and car maintenance adjusted for the local working conditions are estimated at $0.05 per car Km and $1.25 per locomotive Km.

<u>Infrastructure</u>: Based on the high tonnage, poor road infrastructure/access roads, harsh weather conditions, a large number of curves on the line, the track and signal/communication maintenance cost is estimated to be $22,000 per km for mainline and $9,500 per km for loop, staging and sidings tracks.

<u>Operations</u>: The fuel consumption for this heavy haul bulk train operation with 50% empty car moves adjusted for grade/curvature on the line and factoring for fuel usage in switching and yard operation, is estimated at 360 tonne km per litre. Diesel fuel cost is assumed to be $0.80 per litre.

The train crew costs are based on a two man crew and four crew shifts for each direction of train operation. It is assumed that the crew cost is $150,000 per year including benefits.

General administration for positions such as directors and other support staff for train operations, engineering and rolling stock maintenance are estimated to be 5% of the respective department costs.

The operating costs are summarized in Table 17.16 below.

In summary, the total capital cost, for the equipment and rail infrastructure, is estimated at Cdn$2,610 million. The operating cost is estimated at Cdn$245 million per year.

Table 17.16 – Rail Operating Cost Breakdown. (CANAC)

Operating Cost		Units	ARI Rail Operating Costs	
Track & Bridge Maintenance				
	Mainline - miles	815	$22,000 per Km	17,930,000
	Loops, staging and siding tracks - miles	128	$10,000 per Km	1,280,000
Equipment Maintenance				
	Car - miles	790,550,000	$0.05 per Km	39,527,500
	Locomotives - Mainline Service - miles	9,882,000	$1.25 per Km	12,352,500
Operations				
	Fuel usage based on - TonneMiles	62,114,410,000	360 Tonne Kms/litre @$0.8/litre	138,032,000
	Loading and unloading operators (2 staff positions on 24/7 basis) - employees	10	10 staff @ $100,000 per year	1,000,000
	Mainline train crews to operate on 24/7 basis an avg of 6.1 trains/day, 2 crew members/train, 8 set of crews for roundtrip, crews work 220 days per year, 330 opr days/year	150	150 crew members @$150,000 per crew member	22,500,000
	Dispatcher and supervisor	10	10 staff @ $100,000 per year	1,000,000
Sub-total				233,622,000
Admin - General Supervision Including Directors for transportation, engineering and mechanical services			5% of total oper and mtce	11,681,000
Total - Operating and Maintenance Costs				**$ 245,303,000**

17.8 Port and Shiploading Facilities

17.8.1 Marine Facility Selection Parameters

The objective of this section of the PEA Study is to define a site for a marine terminal and onshore infrastructure capable of supporting ocean shipment of 50 Mt/y of iron ore pellets.

The key parameters in selecting the marine facility are as follow:

- Privately owned marine terminal solely dedicated to Otelnuk Lake mine operation;
- The marine terminal to suit a new railway line to be constructed entirely within the Province of Quebec;
- Marine terminal suitable for iron ore ships designated for an Asian market; and
- Marine terminal suitable for the import of consumables for pellet production.

17.8.2 Marine Facility General Requirements

A bulk shipping terminal is a vital link in the overall transportation system. It provides a storage buffer between a mine operation, railway transportation and port operation; therefore, it has significant impact on railway and ocean shipping operating costs.

The Otelnuk Project marine facility key requirements are defined as follow:

- Minimize railway and ocean shipping operating costs;
- Provide safe cargo handling operations at 95 % port availability level; and
- Provide safe navigation of the ships into and out of the port.

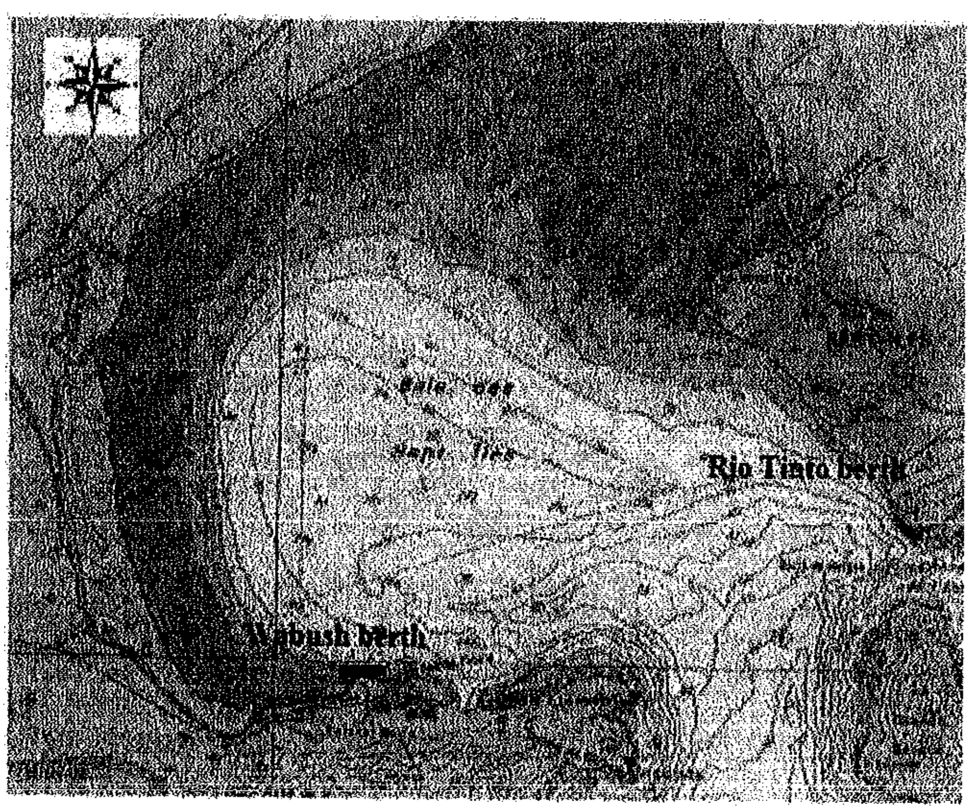
Sea conditions like waves, wind & currents are major factors affecting ship motions during ship approach and at berth. Ships motions are required to be within permissible range for ship loading operations. The industry practice is that marine facility should be available for operation as a minimum 85 % availability level.

17.8.3 Existing Iron ore Marine Facility

Given the history of iron ore mining in the Labrador Trough, there already exists a number of facilities for shipping iron ore in the Gulf of St. Lawrence. These existing iron ore marine terminals are located in the Sept-Îles Bay and Port Cartier.

Rio Tinto and Wabush private marine terminals are located in the Sept-Îles Bay. The configuration of Rio Tinto and Wabush iron ore berths are schematically indicated on Figure 17.18.

Figure 17.18 – The Sept-Îles Bay marine terminals (BH&T Engineering)



In Port Cartier, the iron ore terminal, owned by ArcelorMittal, is a harbour type facility. The ship navigational channel is dredged and loading berths are sheltered from sea conditions by man-made structures. The Port Cartier Harbour is showed in Figure 17.19

Figure 17.19 – Port Cartier Harbour (BH&T Engineering)

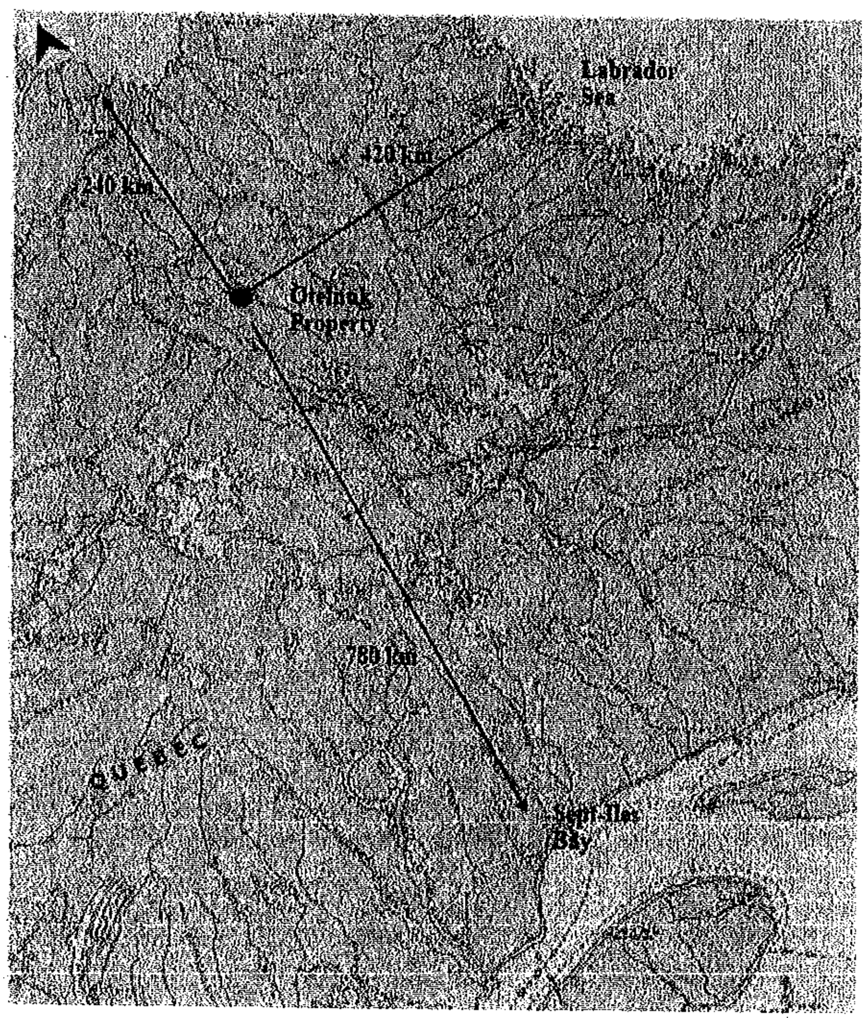
17.8.4 Otelnuk Lake Potential Marine Facility Locations

The Otelnuk Property, as indicated on Figure 17.20, is located about 240 km south from the Ungava Bay and about 420 km west from the Labrador Sea.

The tidal range in Ungava Bay can reach 16 metres. High tidal ranges in the Ungava Bay are the result of an unusual combination of resonance (or seiche) and the shape of the bay. The Ungava Bay is "V" shaped causing water, entering at the wide mouth at the open ocean end, to funnel as it moves into the head of the bay. In so doing, the water can only pile up thereby forming a large tide. The water in the Ungava Bay also has a natural rocking motion called a seiche which compounds the tidal activity. To further complicate matters, in addition to a high tidal range, the Ungava Bay winter ice conditions would necessitate iron ore shipment in ice class vessels. It is this combination of high tidal range and sea ice conditions that makes the construction of marine facilities in Ungava Bay quite impractical.

The Labrador Sea ice conditions will also require ice class vessels for iron ore ocean shipment. The shipping cost of iron ore in ice class vessels is significantly higher than in blue water type ships. Having a marine facility in Labrador Sea would increase shipping costs substantially; therefore, it is concluded that the port located in Gulf of St. Lawrence is the optimal option in terms of the project development costs and operational reliability.

Figure 17.20 – Mine Location in reference to open sea (BH&T Engineering)



17.8.5 Gulf of St. Lawrence

Three potential locations are evaluated for onshore and marine facility in St. Lawrence as marked on Figure 17.21 and listed here:

- The Sept-Îles Bay;
- North of the Port Cartier;

- The Homards Bay.

Evaluation of the three sites is based on a series of parameters important to the development and operation of ship loading terminal. The sites were evaluated according to the following criteria:

- Required water depth;
- Navigation issues;
- Sheltering of the berth;
- Trestle length or distance of the berth from shore;
- Constructability issues;
- Geotechnical considerations;
- Road access;
- Rail access;
- Existing services; and
- Proximity to existing communities.

a) Sept-Îles Bay

In the context of this study, the Sept-Îles Bay has been identified as the most suitable site for the Otelnuk Lake Project marine facility. This is largely due to having sheltered water for a ship loading operation without any need for breakwaters or other wave-attenuating infrastructure.

The onshore facility and iron pellet loading berth in the Sept-Îles Bay has been identified as per Figure 17.22. It is assumed that the land for the onshore facility can be purchased or leased from the Quebec Government or private owners. The onshore facility with the iron pellet loading berth will be connected via a causeway and a trestle to a water depth of 18 meter. The required water depth for VLOC vessels is about 22.5 meter; therefore some dredging at the iron pellet loading berth is needed. The amount of dredging at the berth and the length of the trestle will need to be further optimizing in the subsequent project phases. It is noted that the berth is located in 18 meter water depth, and the soil conditions are most likely a combination of sand and clay.

Figure 17.21 – Potential Port Locations (BH&T Engineering)

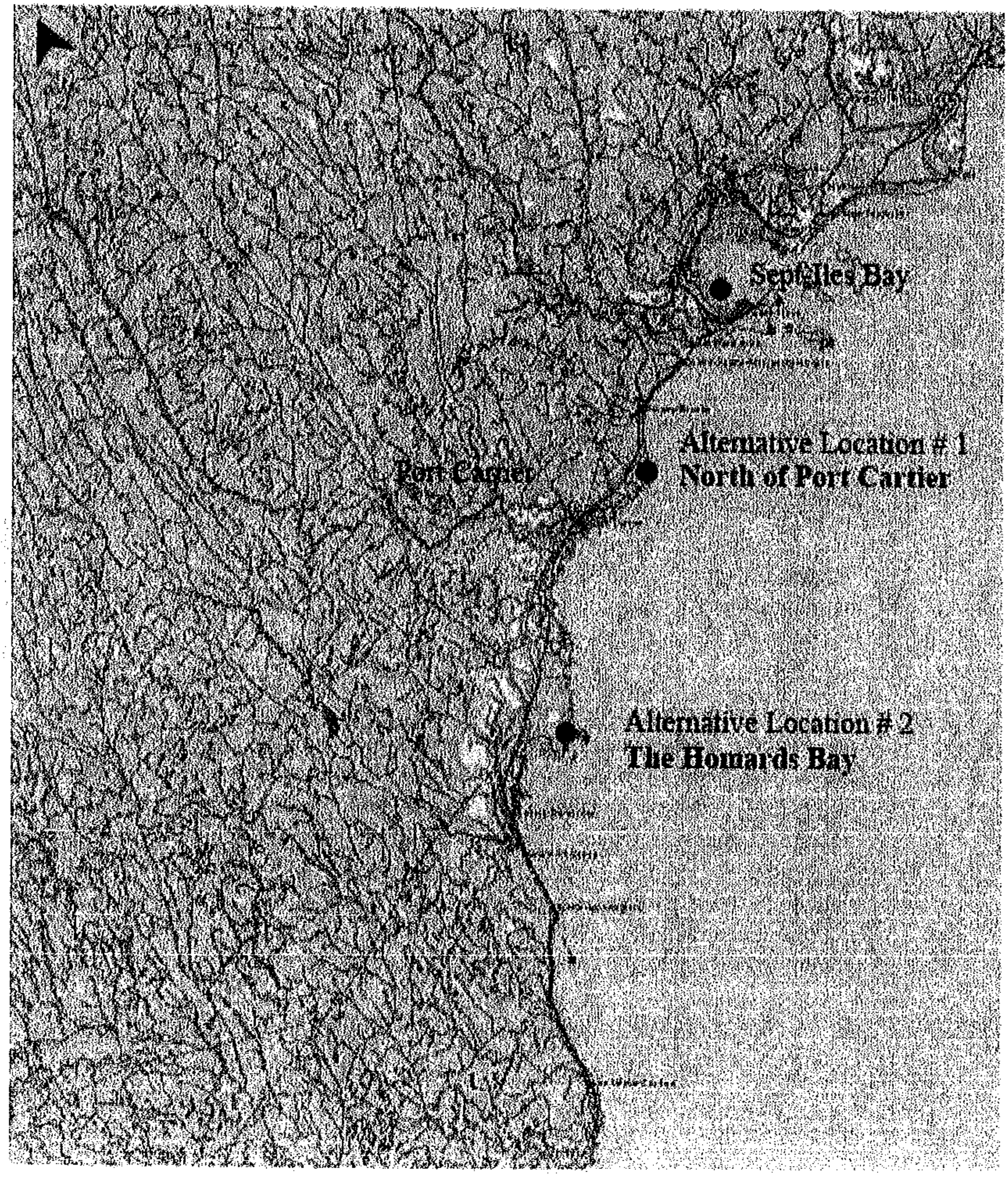
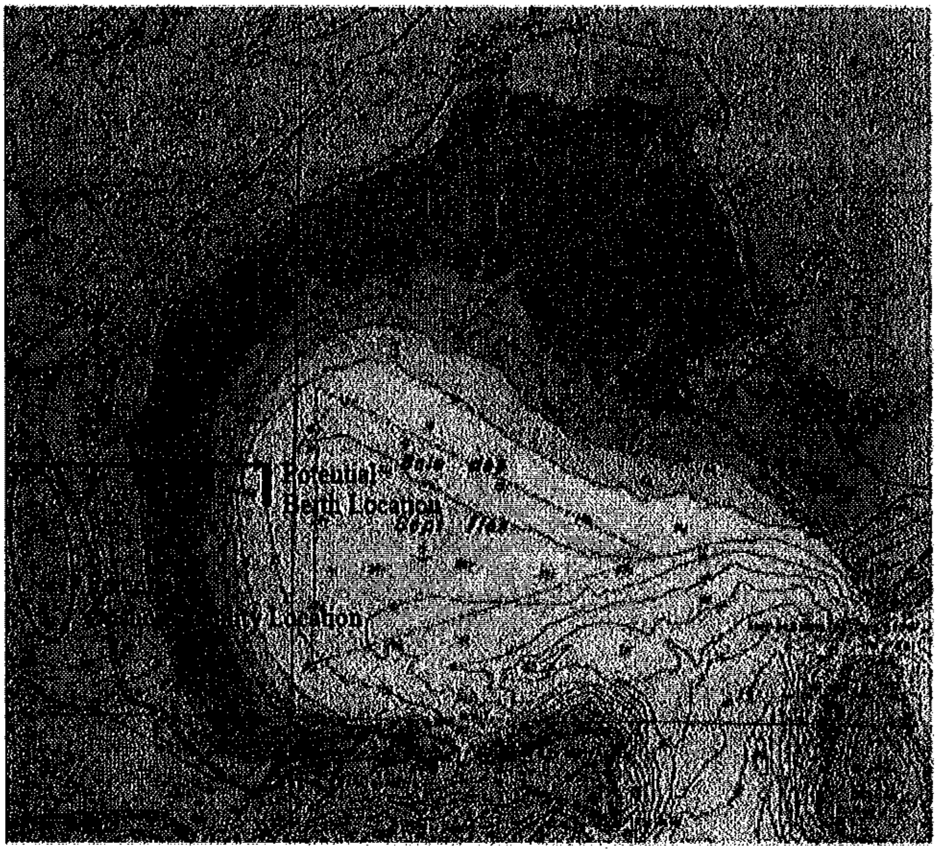


Figure 17.22 – Marine Facility in Sept-Îles Bay (BH&T Engineering)



In terms of the land availability for onshore facilities and viability of obtaining construction permits, the current study timeframe does not allowed to conduct these investigations.

The Sept-Îles Bay area is well established in terms of supporting infrastructures: community, highway, electrical power line.

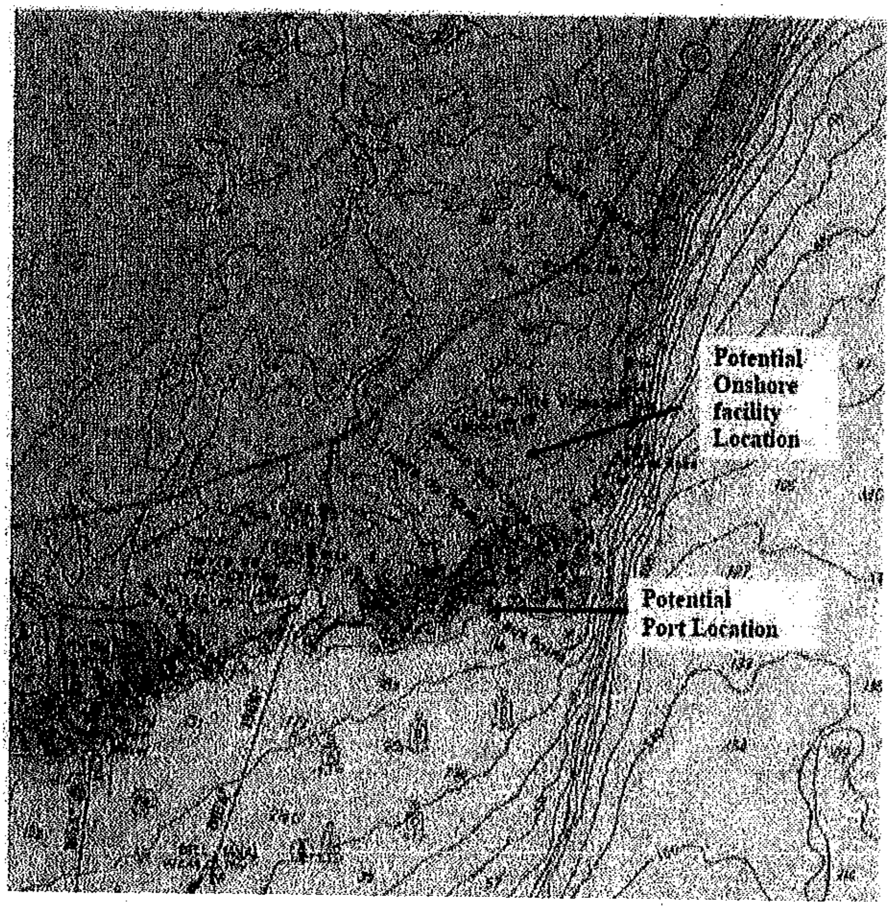
b) Alternative site – North of the Port Cartier

It appears that a harbour type marine facility, similar to Port Cartier would be required to provide a safe ship operation. An analysis of sea conditions are required to confirm this assumption. The study time frame does not allow for any investigation of land availability for onshore & marine facility or any environmental restrictions.

This alternative site for Otelnuk port (Figure 17.23) is supported by existing infrastructures: highway, town, electrical power line. It offers good railway connection with the planned mine, the shortest railway route.

The construction cost of marine facility in this location might be higher than in the Sept-Îles Bay due to need for a breakwater or a harbour type port, but the lower railway cost from the mine to the port might balance the difference. More detail analysis is required to validate these costs assumptions.

Figure 17.23 – Potential location north of Port Cartier (BH&T Engineering)

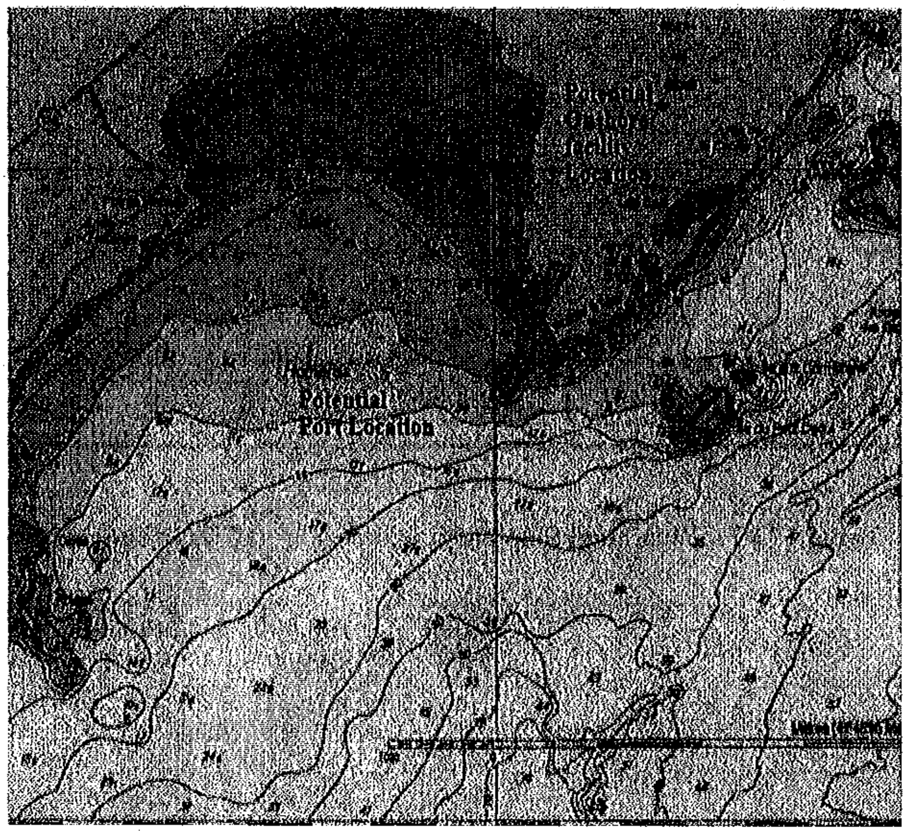


c) The Homards Bay

This site offers deep water relatively close to the shore. It appears the Homards Bay (Figure 17.24) might provide some natural protection to a marine facility from sea waves. An analysis of the sea conditions are required to confirm this assumptions. High level investigation of the land zoning and any environmental restrictions are recommended prior to detail analysis of sea conditions.

The cost of the railway from mine to the port is expected to be higher in comparison to the site north of Port Cartier; cost of construction of marine & offshore facility might be lower than in Sept-Îles Bay.

Figure 17.24 – Potential location of Homards Bay (BH&T Engineering)



This site offers deep water relatively close to the shore. It appears the Homards Bay might provide some natural protection to a marine facility from sea waves. An analysis of the sea conditions are required to confirm this assumptions. High level investigation of the land zoning and any environmental restrictions are recommended prior to detail analysis of sea conditions.

The cost of the railway from mine to the port is expected to be higher in comparison to the site north of Port Cartier; cost of construction of marine & offshore facility might be lower than in Sept-Îles Bay.

17.8.6 Shiploading Wharf Requirements

The shiploading system (Figure 17.25) is one of the key components in the iron ore export chain and also constitutes a significant proportion of the capital investment.

If the majority of iron ore products are designated for shipment to China, than the marine terminal should be capable of accommodating 400,000 DWT vessels in order to be competitive and attain high ore prices. The marine terminal will also need to permit loading smaller vessels for ore shipment to North American and European customers, where receiving ports cannot accommodate large ships. Therefore the marine terminal should be suitable for the range of vessels between 70,000 DWT and 400,000 DWT.

Figure 17.25 – Shiploading wharf configuration (BH&T Engineering)

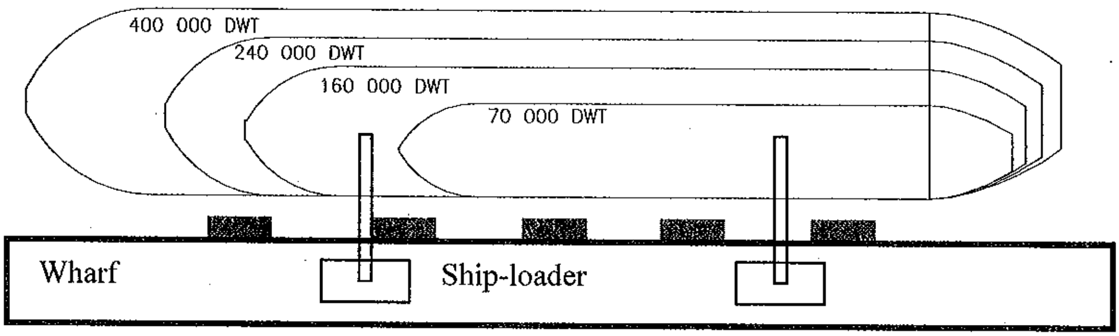


Table 17.17 – Wharf and Shiploader Dimensions (BH&T Engineering)

Ship DWT	70,000 DWT	160,000 DWT	240,000 DWT	400,000 DWT
Ship draft	14 m	18 m	19.5 m	22 m
Ship beam	32 m	45 m	56 m	66 m
Ship LOA	225 m	295 m	325 m	360 m
Required Wharf Length	325 m	395 m	425 m	460 m
Required Shiploader Outreach	36 m	45 m	50 m	60 m

17.8.7 Iron Ore Berth Capacity Model

Size of the vessels calling the port will have impact on the annual achievable shipping tonnage. Ship in port time is measured from the ship approach to berth to the ship departure. The average ship in port time listed in the Table 17.18 for various ships is based on the iron ore industry practice. Main factors on the ship in port time is rate of stockyard reclaiming system feeding shiploader and the shiploader capability to travel along the ship to load different ship cargo holds. The listed ship in port time is for the reclaimer 16,000 t/h capacity and shiploader capability to access any ship cargo hold without the need to move the ship.

The following tables provide indication what is the achievable shipping level for various ships DWT.

Table 17.18 – Iron Ore Berth Capacity (BH&T Engineering)

Annual production	50 Mt/y	50 Mt/y	50 Mt/y
Average ship DWT	160,000 ton	240,000 ton	360,000 ton
Number of ships calling the port	312 ships	208 ships	139 ships
Average ship in port time	32 hours	40 hours	52 hours
Berth Occupancy	10,000 hours	8,333 hours	7,222 hours
Berth Availability at 95 %	8,322 hours	8,322 hours	8,322 hours
Required number of ship loading berths	2	1	1

Based on the current trend in iron ore shipping and understanding that majority of iron pellets will be shipped to China, it is proposed to construct one iron ore berth capable of handling up to 400,000 DWT ships. This recommendation is based on the assumption that average ships calling the port will be between 240,000 and 400,000 DWT. The iron ore berth will be equipped with a rail mounted slewing and luffing ship-loader.

In addition to an iron ore berth, there will be dedicated berth for products shipped for pellets production. The berth for import products will be capable of handling ships up to 70,000 DWT. It will be equipped with a grab type ship un-loader.

17.8.8 Stockyard Requirements

The stockyard provides the Iron Ore Export Terminal with storage buffer for ship loading operation. The stockyard storage buffer capacity is based on cargo assembly operating model. This model relies on the demand "pull" of the vessel for products to initiate transport and assembly of the cargo at the port.

The stockyard storage capacity at the port is governed mainly by the following:

- Annual throughput;
- Numbers of grades;
- Blending requirements – operation of the yard with product blending significantly increase the stockyard storage capacity requirements;
- Stockyard equipment capacity and flexibility; and
- Stockyard management and shipment scheduling – Product arrival pattern in terms of grade, quantity and frequency.

A conceptual layout of the stockyard and port facility is shown in Figure 17.26. The long stockyard, where the stacking and reclaiming operations are decoupled is efficient for multiple products handling where direct ship-loading is the preferred operation. Because of the operational flexibility to service multiple products, use of travelling and slewing boom mounted bucket wheel reclaimers is common practice for longitudinal open stockpiles.

Stacking and reclaiming operations should be independent of each other, so that a product from a car dumper can be stacked to any pile at any time and it can be reclaimed from any pile at any time. By implementing this system, the train and shiploading operations have no impact on each other operation. The independent stacking and reclaiming operation is important if the stockyard is to have multiple product grades.

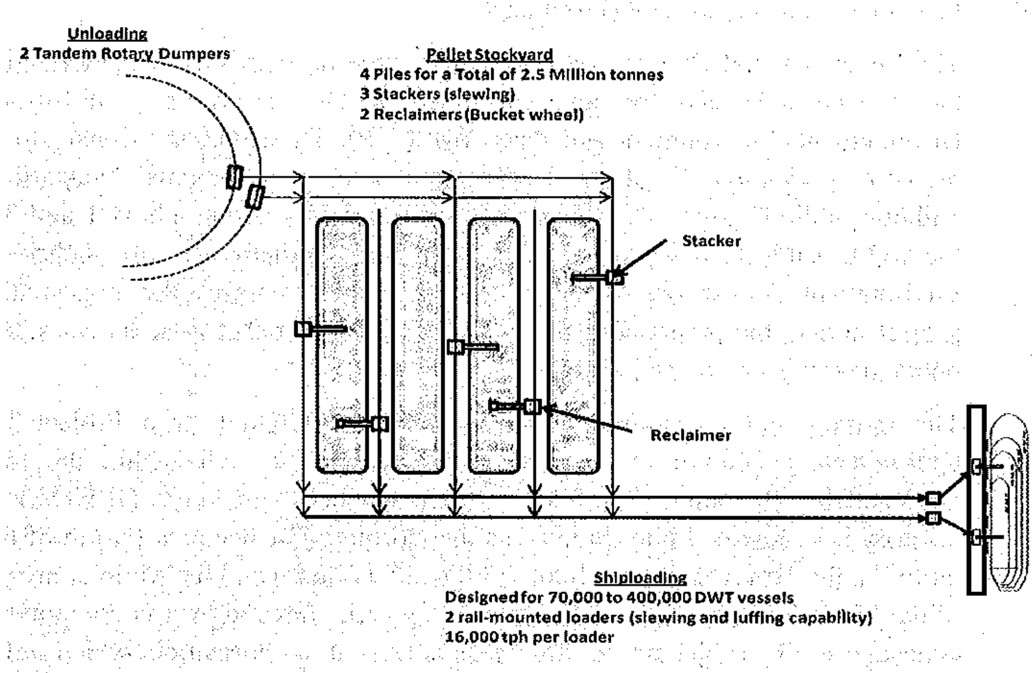
The stockyard conveying system will permit direct shiploading or stockpiling operations with no interruption to train unloading or to shiploading operations. This functionality is provided by using stackers capable of readily bypassing the stacking operation and redirecting the product back onto the yard conveyors to feed shiploaders. Stackers will have the ability to switch from direct shiploading mode to stacking mode without interruption to train unloading operation.

A direct shiploading conveying system and stackers with bypass ability offer a high level of versatility in terms of shiploading and car dumper operation. In the event of interruptions to the receiving stream from the dumper, e.g. due to train or dumper breakdown, product can be reclaimed from the stockyard so the shiploading operation is not interrupted. In the case when shiploading is interrupted, stackers direct the product to the stockpiles.

The main benefits of direct shiploading are considered to be as follows:

- Cost reduction per tonne of ore shipped, through reduction in double handling. Elimination of the stockpiling and reclaiming operations reduces costs at the port for the quantity of ore which bypasses the stockyard.
- Increase in product quality through a reduction in product degradation as a result of reduced ore handling.
- Improved environmental performance through a reduction in dust generated from the portion of throughput that is loaded directly to ship. Reduction of product stacked/stored at the port reduces opportunity for windblown dust generation from piles, and direct hit eliminates dust generated during stacking and reclaiming operations

Figure 17.26 – Stockyard and port conceptual layout
(Adapted from BH&T Engineering)



For 50 Mt/y production and cargo assembly at the port operating model, the recommended storage at the port is 2.5 Mt, which is equal to 5 % of the annual production. This value is adopted for the scoping study and it should be review in the subsequent project phases as more information in regards to number of product grades and shipping patterns become available.

17.9 Environmental Considerations

17.9.1 Introduction

The Otelnuk Iron Project includes the following components:

- A mine site, camp and related infrastructures located approximately 240 km North-East of Brisay and 8 km South-West of Lac Otelnuk in the Province of Québec (Québec);
- A crusher, concentrator, pellet plant and tailings disposal area located near the mine site in Québec;
- An access road from Brisay to the mine site;
- A fresh water intake from Lac Bricot;
- A pellet transportation system from the mine site to Sept-Îles: transportation by railway using a new line with a proposed routing entirely located in Québec;
- A 315 kV transmission line, 240 km long, from Brisay in Québec; and

- A stockyard, dock, and year-round ship-loading at Sept-Îles (Québec).

17.9.2 Environmental Authorizations Requirements

a) Environmental Assessment (Provincial)

The Environmental Quality Act (EQA) has three mechanisms of authorization for the projects subjected for approval from the Québec Ministry of Sustainable Development, Environment and Parks (MSDEP). The simplest mechanism which refers to paragraph 22 of the EQA requires an environmental evaluation, but without public hearing. The longer process framed by paragraph 31.1 and 31.9 of the EQA, subjects the projects located in the Southern part of Québec to the Environment Assessment Review Process, which requires the presentation of project notice, the preparation of an Environmental Impact Assessment study and public hearings on the project.

The mining and concentrating activities of the Otelnuk Iron Project located approximately 240 km North-East of Brisay, Québec fall within the territory governed by the James Bay and Northern Québec Agreement (JBNQA). This territory is subdivided into three areas the Northern Québec area (North of the 55° latitude), the James Bay area (South of the 55° latitude) and the Moinier area South of the 55° latitude, but East of the James Bay area. Several project components are expected to be subjected to this mechanism of authorization which refers to paragraphs 168 to 204 of the EQA and involves the active participation of the Cree, Inuit and Naskapi communities. As stipulated in Appendix A of the EQA mining projects, roads exceeding 25 km, electrical transmission lines exceeding 75 kV, sewage systems and railroads are subject to the Environmental and Social Impacts Evaluation and Exam Process for the area north of the 55° latitude. Project components listed in Appendix A of the EQA (possibly roads and sewage systems) will be subjected to the Environmental Evaluation Process in force in the Southern Québec area.

The Environmental and Social Impacts Evaluation and Exam Process for project north of the 55° latitude begins with the submission of a project notice and the preparation of an Environmental and Social Impact Assessment report based on the Kativik Environmental Quality Commission (CQEK) guidelines. This commission is responsible for the evaluation and exam of the Environmental Study, the preparation of public hearings, and to recommend the approbation or rejection of the project. The CQEK is composed of members named by the Kativik Regional Government and named by the Quebec Government.

The southern part of the railroad is expected to require a Certificate of Authorization under Paragraph 22 of the EQA. The port facilities are expected to be subjected to the Environment Assessment Review Process for the Southern part of Québec.

b) Environmental Assessment (Federal)

Federal laws and regulations that could have significant direct impact on the proposed project include the Canadian Environmental Protection Act (CEPA), the Canadian Environmental Assessment Act (CEAA) and the Fisheries Act. The Fisheries Act applies to any body of water that may contain fish. It prohibits any work or undertaking that results in harmful alteration, disruption or destruction of fish habitat. It prohibits the deposition of deleterious substances into water body that are fish habitats. The Department of Fisheries and Oceans applies the "no net loss" guiding principle, so that unavoidable fish habitat losses as a result of development projects are balanced by newly created and/or restored fish habitat.

The Metal Mining Effluent Regulation (MMER), under the Fisheries Act, provides maximum acceptable concentration for mine effluent and dictates requirements in terms of Environmental Effects Monitoring Studies (EEMS).

Regarding the CEAA and Environmental Impact Assessment's requirements, the project components that are expected to trigger the CEAA process include water crossing, water intake from a lake or a river, wastewater discharge to a water body and any work that could affect an endangered species, a migratory bird or their habitat.

This project is expected to require a comprehensive environmental study since some of the project components include the construction of a marine terminal designed to handle vessels up to 250,000 DWT (and over 400,000 DWT).

c) Harmonization

The Canada-Québec Agreement on Environmental Assessment Cooperation has been signed on august 2010. The agreement promotes a better coordination of the two environmental assessment processes (Federal and Provincial) in order to reduce overall delays. Through this agreement, information is allowed to be exchanged between the two levels of government and a joint review panel may be used to conduct hearings if necessary.

However, in 2006 a ruling from the Superior Court of Québec stipulates that the CEAA does not apply in Northern Québec where the 1975 JBNQA takes precedence. It is, therefore expected that some of the project components (mine site, railway and access road) will not be submitted to the CEAA process.

d) Other Environmental Permits

Other environmental permits expected to be required include:

- Paragraph 32 and 32.1 of the EQA: authorization or permits for waterworks, water supply intake, sewage treatment facilities, etc.;

- Paragraph 48 of the EQA: authorization or permits for air pollution control devices;
- Paragraph 232.2 of the Québec Mining Act: rehabilitation and restoration plan for the mining activities;
- Petroleum product storage authorization;
- Authorization from the Agricultural Land Protection Commission in Québec;
- Authorization under the Forest Act;
- Construction permits;
- Water intake/discharge permits.

e) First Nations

As mentioned earlier the CQEK is in charge of the evaluation and exam of projects located within the territory governed by the JBNQA North of 55° latitude. Upon reception of the project notice, the CQEK prepares guidelines for the preparation of the Environmental Impact Assessment (EIA), reviews the EIA, determines if public hearings within the First Nations communities affected by the project are required and approves or rejects the project.

Some details regarding First Nations closest to the project are given in Table 17.19.

Table 17.19 – List of First Nations and Location (2007)

Territory	Nation	Population	Location
Kawawachikamach	Naskapi	673	15 km North-East of Schefferville
Matimekosh-Lac-John	Innu	846	Matimekosh is located 510 km North of Sept-Îles and Lac-John is 3.5 km from Matimekosh and Schefferville
Uashat and Maliotenam	Innu	3,654	Uashat is located West of Sept-Îles and Maliotenam is 16 km East of Sept-Îles

It should be noted that Impact Benefit Agreements (IBA) and royalty sharing agreements between First Nations and mining companies have increased in the recent years in Canada. These IBA generally covers financial incentives to improve employment, training or community infrastructure and services for First Nations. IBAs have been reached for several mining projects including Voisey's Bay (Newfoundland and Labrador), Raglan (Québec), Dona Lake (Ontario) and Musselwhite (Ontario).

f) Challenges Regarding Approval Processes

The following is a list of topics that should be taken into consideration during the environment approval process:

- The Project Description/Notice should be completed as soon as the project components are well defined and should be submitted to both the Federal and Provincial/First Nations approval processes;
- The Southern part of the project would need to be submitted to both Federal and Provincial approval process. An agreement exists between the Federal approval process and the Provincial approval process outside JBNQA to use the same documentation for both regulating agencies, but a recent ruling has indicated that the CEAA will not apply to the JBNQA territory;
- The Project Stakeholders should be identified early in the project, and their issues/potential impacts/concerns should be monitored closely. Government, municipalities, environmental associations, health and social services should be included in the list of project stakeholders;
- Environmental testing should be considered and addressed during any testwork related to the process: consideration should be made for the environmental characterization of the solid and liquid fraction of the tailings, the waste rock, and any other wastes/residues produced by the processing/mining activities. Testing should include chemical stability, heavy metal leaching, acid rock drainage, preliminary toxicity testing of effluent, etc.; and
- The selection of the tailings pond location will need to include environmental considerations. Several alternatives will need to be presented in the Environmental and Social Impact Assessment. Provisions will need to be made in the design of the tailings pond for sufficient volume to allow adequate retention time and contained design flood.

17.9.3 Preliminary Environmental Study

An environmental focussed scoping study has been conducted by Golder Associates Ltd (Golder) in April 2009 (preliminary report: 08-1222-3008) for the Lake Otelnuk – Iron mine project. For this purpose, Golder conducted a site visit and developed a preliminary desktop review of physical, biological and social environments. Surface water and sediments were studied and sampled when possible.

It appears that the background level of some parameters in the surface water (Ba, Cu, Se, Mn, Zn) and sediments (Cr) marginally exceed the applicable criteria (provincial and federal). No exceedance was found for the groundwater. Hydrology and hydrogeology has been briefly evaluated. A preliminary desktop review of the biological environment is briefly presented, and concluded with a lack of readily available data for this remote area; however, a preliminary request to the Northern Quebec Regional department of the

MSDEP for documented occurrences of plant species with particular status indicate that no endangered or threatened species were found. Golder mentioned that an environmental assessment more developed will be required for this project. Some of Golder's recommendations regarding the following steps include:

- Installation of meteorological station;
- Aerial photo interpretation;
- Hydrological characterization;
- Geotechnical investigations;
- Baseline studies and field surveys; and
- Identification and consultation with project stakeholders.

17.9.4 Preliminary Potential Impacts

a) Description of Local Environment

The Lac Otelnuk property is located 240 km North-East of Brisay, in the Northern Québec area. The property is accessible only by air while Brisay is accessible by road.

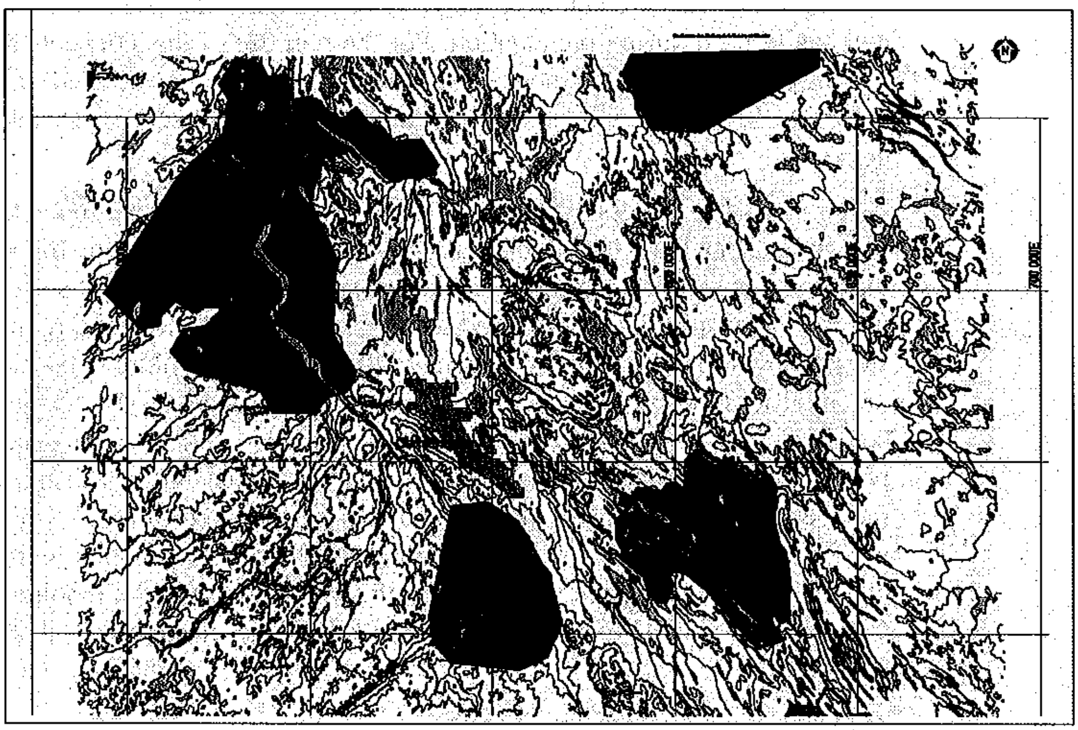
The average yearly mean temperature for the area is -5.3°C. The average temperature in July reaches 12.4°C while for January it averages -24.1°C.

According to precipitation data gathered for the Schefferville weather station, the average annual precipitation is 822.9 mm. Rain precipitation is more intense in July with an average of 106 mm of water. Snow precipitation is registered throughout the year but is more important between October and May where the average monthly snow precipitation is generally greater than 42 mm (expressed in mm of water).

The area is poorly drained with extensive swampy areas and is characterized by a forest cover of black spruce and balsam fir with a ground cover of lichen, low-growing willow and Arctic birch shrubbery.

The railroad routing is taking into account the location of sectors identified for future protected areas or classified as exceptional forests. Three zones identified for future protected areas nearest to the Lac Otelnuk project are Canyon Eaton, Collines Ondulées and Lac Cambrien as shown in Figure 17.27.

Figure 17.27 – Future Protected Areas near Lac Otelnuk



b) Preliminary Potential Impacts

The following is a preliminary description of potential impacts related to specific components of the project: mine/concentrator site, pellet plant, pellet transportation, stockpiling and shipping. Other potential impacts such as sanitary wastewater treatment, solid waste disposal and used oil disposal, are addressed and provisions were made in the capital cost estimate for a solid waste incinerator, sanitary wastewater treatment based on biological contactor technology and filtration system for used oil.

i) Mine/Concentrator Site

Potential impacts related to the construction and operation of an open pit mine include site preparation and uncontrolled clearance, quality of surface water (maintenance activities, potential of Acid Rock Drainage (ARD), tailings management, etc.), the quality of the ambient air (crushing, truck haulage, etc) and loss of ecosystem.

A review of existing drillhole logs indicated that pyrite has been observed in drillhole 190-1, 73-430-6 and 73-350-4 and it is recommended to conduct a Metal Leaching (ML) and ARD assessment program in order to rule out any possibility of ML and ARD. The intent is to determine the ML/ARD potential for waste rock, low/high grade ore stockpiles and tailings and to determine the Neutralization Potential of other type of waste material that could be eventually used during reclamation. For the purpose of this conceptual study the project is considered non ARD generating, but as mentioned earlier, a complete ML/ARD will need to be undertaken to satisfy the stakeholders concerns.

A preliminary assessment of tailings management requirements was investigated in the 2006 Scoping Study and one potential site for tailings disposal was identified at the time: Concession Option. The final selection of the tailings disposal site will need to take into account the space required to store tailings for a period of 34 years with possibility of future expansion, the potential loss of fish habitat as well as flora and fauna ecosystems, financial considerations, distance from the concentrator, etc. Since several lakes and ponds are present within the area, it is expected that tailings disposal will require to fill existing lakes or ponds and compensation for loss of fish habitat will need to be addressed. The Concession Option, shown in Figure 17.4, corresponds to a footprint with an area of 5,000 ha, but will be required to fill Concession Lake. The hydrogeology and hydrology of the area will need to be studied.

Typical mitigation measures include:

- Preservation of existing vegetation whenever possible;
- Ensure controlled discharge of any mine effluent to the environment through one final effluent and in compliance with acceptable standards.

Regarding the waste dump, the current option proposed is to fill the pit with the waste rock as soon as enough space will be made available in the pit. A formal waste disposal will be required at the beginning of the operations. It will be located approximately 300 metres south of the pit.

ii) Pelletizing

Potential impacts related to the pellet plant include the concentrate slurry filtration and the pelletizing process. The concentrate slurry filtration will generate a filtrate that will return to the concentrator as process water while any excess would be directed to the tailings pump box and eventually the tailings pond.

The pelletizing process includes all mitigation measures related to air quality control such as dust collectors and electro-static precipitator in order to ensure compliance to air quality regulations. Dust as well as floor wash-down will be collected in sumps and returned to the process.

iii) Pellet Transportation

Potential impacts related to the pellet transportation include loss of flora and fauna ecosystems, increased pressure on hunting and fishing resources, etc. Transport of pellet from the mine site to Sept-Îles will be by railroad.

iv) Stockpiling and Shipping

Potential impact related to the stockpiling and shipping of pellets will include air quality during stockpiling and conveying activities, dredging and disposal of dredging material, disturbance of marine ecosystems, etc.

17.9.5 Closure Plan

Preliminary closure plan costs have been estimated based on the rehabilitation of the tailings disposal area and the waste rock disposal area. Planned rehabilitation and closure costs are including re-sloping, re-vegetation and water treatment.

Provisions should be made in the Economic analysis of the Project for the disbursement of the estimated cost of rehabilitation as per the "Guidelines for preparing a mining site rehabilitation plan and general mining site rehabilitation requirements" published by the Québec Ministry of Natural Resources in collaboration with the Ministry of Environment.

In addition, a modification of the Québec Mining Act is proposed and should be adopted in the near future. These modifications included some new directives for the disbursement of the estimated cost of rehabilitation. Indeed, the proposed paragraphs 232.4.1 and 232.4.3 of the Québec Mining Act mention to provide an amount equal to 100% of the anticipated costs for works undertaken in terms of rehabilitation and restoration. This amount must be paid in five annual payments starting 90 days after rehabilitation and restoration plan has been approved.

17.10 Capital Cost Estimate

The following paragraphs outline the methodology followed by Met-Chem for the estimation of the capital costs of the Adriana Mining project. The estimate is based on Met-Chem's standard methods applicable for a scoping study to achieve the accuracy level of ± 35%.

17.10.1 Scope of Estimate

a) General

The capital cost estimate covers the scope of work, the indirect costs and the contingency required to develop the mine, construct the processing facilities, and establish all the site, transport and off-site infrastructure and services necessary to support the mining operation.

The facilities covered in this estimate are described in sections 17.1 through 17.9 of this Report.

b) Scope of Work

The scope of work includes the activities required at the mine site to develop the pit and purchase the mining equipment. Also included in the scope of work is the construction of the processing and pelletizing facilities, the railroad transport facilities and the port facilities.

Major groups of processing equipment, and ancillary equipment, include, but not limited to:

- Primary and secondary crushing;
- Transfer conveyors;
- Milling and concentrating plants;
- Thickeners;
- Pelletizing plants;
- Stockpiles;
- Storage bins and tanks;
- Tailings disposal; and
- Water reclaims pipelines.

Electrical supply is also within the scope of work. This scope includes the transmission power lines (Hydro-Quebec), main substations, electrical equipment installed in electrical rooms and emergency power plants required at the mine site and the port site.

The following infrastructures are covered. Included, but not limited to, are the main access road, the airstrip and terminal, the tailings management facilities and rehabilitation. Other infrastructures and services also include:

- Mine dry and garage;
- Warehouses;
- Offices;
- Laboratory;
- Medical facilities;
- Surface mobile equipment fleet;
- Fuel;
- Port facilities;
- Waste management facilities, and
- Railroad transportation facilities.

The scope of work also includes the pellet load out facilities at the mine site, and unloading facilities at the port. In this context, the railroad facilities include:

- Rail loop and sidings at the mine site;
- Mainline and sidings;
- Rail loop and sidings at the port site;
- Rolling stock; and
- Ancillary equipment and facilities required for the transport of the pellets.

Equipment and facilities at the port for the pellet stockpiling, reclaiming and handling, and ship loading is included in the scope of work. Also included as part of the port site:

- Causeway;
- Pellet loading and material receiving wharfs;
- Ship unloading facilities;
- All infrastructure, services and ancillary buildings; and
- Tug boats to service the ships.

c) Indirect costs

Indirect costs include Engineering, Procurement and Construction Management (EPCM), Project Development Costs, and Owner's Costs.

The major items covered in Project Development include:

- Permitting;
- Land acquisition;
- Exploration;
- Environmental Studies, Community Relation;
- Test Works;
- Feasibility Studies; and
- External Audits.

The major items covered in Owner's Costs include:

- Spares;
- First Fills;
- Exploration;
- Construction Indirects (Power, Security, Health & Safety...)
- Room and Board, Fly-In & Fly-Out;
- Commissioning; and
- Insurance.

d) Contingency

The Contingency is discussed and the estimated amount provided below.

17.10.2Estimate Summary

The capital cost for an annual production of 50 Mtpy of pellets, based on the scope described in section 17.10.1, is estimated at $12,909 M of which $11,206 M is direct cost, $506 M is indirect cost and $1,196 M is contingency. Currently in Revision C, the cost estimate is summarized in Table 17.20.

Table 17.20 – Summary of Capital Cost Estimate

Cost Item	Item Description		Sub-Total CAD $M
	DIRECT COST		
100	OFFSITE ACCESS AND TRANSPORT INFRASTRUCTURES		$101.6
200	MINE INFRASTRUCTURE & EQUIPMENT		$289.6
300	SITE INFRASTRUCTURE & EQUIPMENT		$198.4
400-1	CRUSHER - 1		$228.9
400-2	CRUSHER - 2		$224.3
400-3	CRUSHER - 3		$224.3
500-1	CONCENTRATOR - 1		$591.4
500-2	CONCENTRATOR - 2		$579.6
500-3	CONCENTRATOR - 3		$579.6
600	MINE SITE WATER SYSTEMS, Potable, Sanitary, Process, Fire		$25.1
700	TAILINGS		$39.8
800B	TRANSPORT SYSTEM - RAILROAD		$2,653.0
900-1	PELLET PLANT - 1		$1,520.2
900-2	PELLET PLANT - 2		$1,444.2
900-3	PELLET PLANT - 3		$1,368.2
1000	PORT INSTALLATION		$609.8
1100	ELECTRICAL POWER SUPPLY		$528.3
	TOTAL		$11,206.4
	INDIRECT COSTS		
	EPCM		$146.4
	Project development costs		$25.0
	Permitting, Land, Exploration		Included
	Environmental studies, Test Works, Community Relations,		Included
	Pre-Feasibility / Feasibility studies / External Audit		Included
	Owner's costs		$335.8
	Equipment Spares		$56.3
	First fill		$3.4
	Construction Indirects		$61.9
	Room & Board / Fly-In & Fly-Out		$138.0
	Commissionning		$20.2
	Insurance		$56.0
	TOTAL INDIRECT COSTS		$506.2
	CONTINGENCY		$1,196.8
	TOTAL COST		$12,909.4

17.10.3Basis of Estimate, General

a) Previous Study

A few items in this estimate were derived from the previous study developed by Met-Chem in 2006 for this project done at production capacity of 10 Mtpd. Scaling and updating was performed to adapt these costs.

b) Currency Base Date and Exchange Rate

The base date for the cost estimate is the first quarter of 2011. The estimate is expressed in CAD dollars. No allowances for escalation or currency fluctuation are included. The exchange rates used were CAD $1.05 / $1.00 USD when quotations or estimation were expressed in USD dollars, and CAD $1.40 / €1.00 when quotations or estimation were expressed in Euro.

c) Unit Rates

Installation of equipment was estimated as a factor on supplied cost. The factor was established at 25% for the process equipment and 5% for erection of mining equipment.

An allowance of 2% of process equipment value is included for installation material, lifting equipment and sub-contracting.

d) Freight, Duties, Taxes, and Financial Costs

The freight cost was estimated as a factor on supplied cost. The factor was established at 15% for the process equipment and 5% for the mining equipment.

All duties, taxes, financing interest, and working capital are excluded from this estimate.

e) Design Allowances and Contingencies

In an estimate, provisions are made to reflect the level of definition of the project. As such, design allowances and contingencies are two (2) different but essential elements of costs, ensuring that the estimate covers the needs and requirements of the project scope.

The following definitions are taken from AACE Recommended Practice No. 10S-90 (revised in 2010):

- Allowances: "Resources included in the estimates to cover the costs of known, but undefined requirements for an individual activity or work item".
- In this estimate, some allowances were applied to less well defined requirements.
- Contingency: "An amount added to an estimate to allow for items, conditions or events for which the state, occurrence, or effect is uncertain and that

experience shows will likely result in additional costs". It is value added to an estimate to allow for unforeseen problems. This may be derived either through statistical analysis of past projects costs, or by applying experience gained on similar projects. Contingency is not intended for changes in scope. It should also be noted that contingency is an expense, and as such, is expected to be spent.

- The contingency amount is provided in the section below.

17.10.4Basis of Estimate, Detailed

a) General Civil and Buildings Works, Infrastructure

Quantities for civil work were estimated from plan site, buildings layout and some sketches for specific requirements.

Unit rates from recent similar projects or allowances adapted for local conditions were used to estimate the costs of buildings and facilities.

b) Process

The process equipment list was derived from general flow sheets. Budget prices were obtained from qualified suppliers for major equipment representing approximately 80% of all equipment cost, while database or allowances from recent similar projects were used for other equipment estimation.

Factorization based on recent similar projects was used for the auxiliary equipment such as the chutes, hoppers, small bins and small cranes, the services such as industrial ventilation, compressed air and fire protection, the process piping, electricity and instrumentation.

c) Mining

The mining equipment list was derived from the mine plan. Budget prices were obtained from qualified suppliers for major equipment while database or allowances from recent similar projects were used for other equipment estimation.

Quantities for the mine development, tailings deposit and roads were derived from the mine plan and general layout. Preliminary assessment of the needs was established for services and ancillary facilities.

Unit rates from recent similar projects or allowances adapted for local conditions were used to estimate the costs.

d) Railway System

Preliminary layouts were established for the railway networks at the mine site, at the port and the main track between the two locations. Preliminary assessment of the needs was established from the transport schedule for the rolling stock and sidings.

High level budget pricing was provided by CANAC, a qualified consultant, for the railway system scope of work. Estimated costs from CANAC include provision for indirect costs and contingency.

e) Pellet Plants

Preliminary assessment of the needs was established for the pellet plant facilities based on the nominal capacity.

High level budget pricing was provided by Danieli, a qualified supplier, for the pellet plants scope of work. Estimated costs from Danieli are based on a turnkey delivery.

f) Port Installation

Preliminary assessment of the needs was established for the port facilities based on the nominal capacity.

High level budget pricing was provided by Anna Klimek of BH&T Engineering, a qualified consultant for the port installation scope of work. Estimated costs from BH&T did not include indirect costs or contingency.

g) Electrical Power Supply

Preliminary assessment of the needs was established for the power supply to the mine site and the port facilities based on the power demands.

High level budget pricing was done based on Hydro-Quebec preliminary estimate from 2006, the Met-Chem database, and unit rates and allowances from recent similar projects.

17.10.5Indirect Costs and Contingency Summary

The Indirect costs were estimated by factorization on the direct costs of the project or allowances based on recent similar projects. The major items considered are the EPCM, the Owner's Costs and the Contingency. The indirect costs are summarized in Table 17.20.

Based on the type of project, the nature of the work and the scale of the scope required, the indirect costs total was estimated at $506 M, consisting of $145 M for EPCM, $25 M for Project Development Owner's costs and $336 M for construction Owner's Costs.

The Contingency is estimated at $1,197 M, representing about 10% of direct and indirect costs.

17.10.6Exclusions

The following items are not included in the cost estimate:

- Any escalation like cost increases due to the indexing of wage rates, the price of materials or the cost of equipment;

- Cost increases resulting from fluctuations in currency exchange rates;
- Working capital;
- Project financing and interest during construction;
- Taxes and duties.

17.11 Operating Cost Estimate

The operating cost estimate (OPEX) for the project is presented in the following paragraphs. It is based on the operation of mining and processing facilities, located near Lac Otelnuk, Quebec, producing 50 million tonnes per year of iron pellets. These pellets will be transported by rail south to Sept-Îles where they can be loaded aboard ocean-going, iron vessels at an Adriana-owned Port Facility located at Sept-Îles. Details pertaining to the specific mining, processing, pelletizing, transport, and port handling are documented in previous sections 17.1 through 17.4, 17.7 and 17.8.

17.11.1 Summary of Estimated Operating Costs

A summary of the estimated OPEX for the project based on year 6 of production is provided in Table 17.21. The sixth year of production was chosen as this represents the first year of full production at 50 Mtpy based on the mine production schedule.

Table 17.21 – Summary of Operating Costs (Year 6)

Description	Base Case (50 Mtpy of Pellets)		
	($000,000)/year	**$/tonne of ROM**	**$/tonne of pellets**
Mine	375.6	1.93	7.51
Concentrator	280.1		5.61
Tailings	4.9		0.10
Otelnuk Administration	90.5		1.81
Pellet Plant	522.7		10.45
Railway	245.3		4.90
Shiploading	60.0		1.20
Total	**1,579.1**		**31.58**

17.11.2 Basis of Estimate

The operating cost estimate generally covers the following four major components:

- Manpower;
- Energy, including electricity, diesel fuel, heavy fuel oil, propane, etc;
- Consumables such as wear parts and grinding media;

- Maintenance; and
- Repair, including replacement parts.

The basis for assessment of the major cost components is as follows:

- Manpower costs are generally based on existing labour agreements on the North Shore for unionized employees, and corresponding mining industry standard remuneration was used for staff and management;
- Electrical energy unit cost used, as discussed in section 17.6.5b), $0.036/kWh for both Otelnuk and the Sept-Îles; fuel costs used were $0.85/litre No. 2 diesel fuel and $0.55/litre for No. 6 Bunker C fuel oil;
- Maintenance and repair costs were estimated from manufacturer's data, Met-Chem's database or factored from similar projects.

17.11.3Mine

The average mine operating cost over the life of the mine is 1.89 $/tonne of ROM. This equates 7.10 $/tonne of pellets. Table 17.22 shows the breakdown of the mine operating cost.

Table 17.22 – Mine Operating Costs

Description	Total Cost ($000,000)	$/tonne of ROM	$/tonne of Pellets	%
Equipment	5,981	1.00	3.75	53
Manpower	1,932	0.32	1.21	17
Explosives	3,250	0.54	2.04	29
Other	146	0.02	0.09	1
Total Cost	**11,309**	**1.89**	**7.10**	**100**

a) Equipment

The operating costs for the mining equipment is 3.79 $/t of pellet. This cost includes the consumption of fuel, electricity, lubricants and parts for repairs. The labour associated with operating the equipment as well as well maintenance is accounted for in the manpower component. Estimates for consumption rates and repairs were obtained for each piece of equipment from the following sources:

- Quotations from equipment suppliers;
- Met-Chem's in-house operating cost database; and
- Comparison to similar projects located in the region.

Table 17.23 summarizes the hourly operating cost for each piece of equipment.

Table 17.23 – Mine Equipment Hourly Operating Costs

Description	Total ($/hr)
Major Equipment	
Truck - 363 tonne	489.32
Shovel - 109 tonne bucket	463.50
Drill - 15" diameter	72.25
Support Equipment	
Track Dozer - 850 hp	166.31
Graders - 24 ft blade	126.51
Wheel Dozer - 904 hp	116.61
Wheel Loader - 53 yd^3 bucket	227.50
Backhoe Excavator - 404 hp	58.71
Water Truck	239.00
Sand Truck	239.00
Cable Reeler - 687 hp	116.61
Utility Truck - 90 tonne	131.41
Secondary Drill - 8" diameter	67.60
Pipelayer - 580 hp	69.00
Utility Track Dozer - 580 hp	106.00
Tow Truck - 1348 hp	195.00
Service Equipment	
Fuel / Lube Truck	14.41
Blaster Truck	13.42
Explosives Truck	14.41
Mechanic Truck	13.42
Tire Handler	20.02
Boom Truck - 14.5t	16.98
Pick-up Truck - 3/4 ton	8.42
Low Boy - 150t	16.98
Transport Bus - 20 per.	14.41

b) Manpower

The manpower component of the mine operating cost is 1.21 $/t of pellets. This number is calculated using the manpower requirements presented in Table 17.9 as well as the annual salaries presented in Table 17.24 below. The annual salaries are based on similar operations in the region. The total annual salaries are comprised of the employee's nominal salary plus fringe benefits valued at 30%. The Site Manager is responsible for the pellet plant, concentrator and mine.

Table 17.24 – Manpower and Salary Operating Costs

Description	Total Annual Salaries
Manager	$227,500
Superintendent	$195,000
Engineer/ Planner	$117,000
Foreman	$117,000
Operator	$97,500
Mechanic	$97,500
Labourer	$78,000
Clerk	$62,400
Total	**$991,900**

c) Explosives

The explosives component of the mine operating cost is 2.04 \$/t of pellets. This cost is derived using a nominal 1.00 $\$/m^3$ of material blasted calculated using data from Met-Chem's internal database, and is reflective of other similar projects in the region.

d) Other

The component of mine operating cost labelled "Other" amounts to 0.09 \$/t of pellets. This category includes dewatering, road maintenance and other activities. A nominal 2 million dollars per year was used to cover pit dewatering and a nominal 2 million dollars per year was used to cover road maintenance.

17.11.4Concentrator

Table 17.25 provides a summary of the operating costs related to the process plant operation including crusher and concentrator. The $5.61/t of pellets is a lower than the accepted average: however, it might be normal for this size of operation. Details of the process plant operating costs are presented in Appendix E.

Table 17.25 – Process Plant Operating Costs for 50 Mtpy of Concentrate

Description	Total Cost ($000,000)/year	Unit Cost	
		$/tonne of ROM	$/tonne of Pellets
Manpower	40.50	0.22	0.81
Energy	77.37	0.42	1.55
Consumables	131.91	0.72	2.64
Maintenance Supplies	30.29	0.17	0.61
Total Cost	**280.07**	**1.53**	**5.61**

a) Manpower

For the three options developed, the amount of people required to cover the operation requirements for the process plant was established. A summary of the planned manpower is provided in the Table 17.26. The proposed workforce can handle all the operation and maintenance of the process area from the crusher operation up to the tailings disposal as well as the laboratory operation.

Table 17.26 – Process Plant Manpower Summary

Category	Employees		Labour Cost with 30% Fringe ($000/yr)
	Onsite	Total	
Manpower	26	52	6,594
Operating Labour	99	198	15,795
Maintenance Labour	101	202	17,995
Total	**226**	**452**	**$40,384**

b) Energy

The energy requirement per area has been estimated from the list of process equipment required for the conceptual design. It includes both electrical and fuel consumption. Details of the cost of the estimated energy consumption are presented in Appendix E.

c) Consumables

The global cost for consumables includes the crusher liners, the liners and balls for the mills, the screens cloths and flocculants. Their cost is estimated based on consumption from similar operating projects, database figures and experience. The laboratory supplies are also included in the consumables. Details are available in Appendix E.

Table 17.23 – Mine Equipment Hourly Operating Costs

Description	Total ($/hr)
Major Equipment	
Truck - 363 tonne	489.32
Shovel - 109 tonne bucket	463.50
Drill - 15" diameter	72.25
Support Equipment	
Track Dozer - 850 hp	166.31
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Wheel Loader - 53 yd^3 bucket	227.50
Backhoe Excavator - 404 hp	58.71
Water Truck	239.00
Sand Truck	239.00
Cable Reeler - 687 hp	116.61
Utility Truck - 90 tonne	131.41
Secondary Drill - 8" diameter	67.60
Pipelayer - 580 hp	69.00
Utility Track Dozer - 580 hp	106.00
Tow Truck - 1348 hp	195.00
Service Equipment	
Fuel / Lube Truck	14.41
Blaster Truck	13.42
Explosives Truck	14.41
Mechanic Truck	13.42
Tire Handler	20.02
Boom Truck - 14.5t	16.98
Pick-up Truck - 3/4 ton	8.42
Low Boy - 150t	16.98
Transport Bus - 20 per.	14.41

b) Manpower

The manpower component of the mine operating cost is 1.21 $/t of pellets. This number is calculated using the manpower requirements presented in Table 17.9 as well as the annual salaries presented in Table 17.24 below. The annual salaries are

d) Maintenance Supplies

The replacement parts cost for regular maintenance of the equipment is estimated at 3% of total equipment capital cost.

17.11.5Tailings Disposal

The operating cost for tailings in this study was divided into two categories: tailings management; and pumping tailings to the pond. While the cost of pumping tailings to the tailings pond are covered in the concentrator operating costs, the cost of labour for tailings management is covered in the mining section.

Reclaim water energy costs and make up water energy costs have also been included in the concentrator energy costs.

17.11.6Pellet Plant

The annual pellet plant operating cost for production of 50 Mtpy of acid pellets is estimated at $531.5 million. Distribution of unit operating costs is presented in Table 17.27. These costs are based on operating a single module with a 17 Mtpy capacity, as described in section 17.4 of this Report, then the unit costs applied to the 50 Mtpy target.

Table 17.27 – Pellet Plant Operating Costs (Acid Pellet)

Production Level	Unit	Usage	Unit Cost	$/tonne of Pellets
Bentonite	kg	10	$0.125	$1.25
Limestone	kg	3	$0.045	$0.14
Fuel Oil	L	6.7	$0.550	$3.67
Electricity -Total	kWh	37	$0.0360	$1.33
Filter bags	pcs	0.001	$40	$0.04
Rollers	pcs	0.000	$3,200	$0.05
Refractories	kg	0.02	$3.204	$0.05
Grinding Media	kg	0.04	$1.50	$0.04
Spares	$			$1.17
Grate bars	Pcs	0.0004	$35	$0.01
Other consumables	$			$1.41
Manpower				$1.47
Total Cost				**$10.63**

It should be noted the unit labour cost will vary during the phased development of the Project as each module is constructed and brought to capacity. It is estimated that the unit labour cost will be $1.29 per tonne of pellets from year six (6) onward. This, in turn, drops the total unit cost to an estimated $10.45 per tonne of pellets.

a) Manpower

Manpower for the pellet plant is summarized in Table 17.28 and details are provided in Appendix F.

Table 17.28 – Pellet Plant Manpower Summary

Description	Base Module 17 Mtpy	At Capacity 50 Mtpy
General Administration Services	50	50
Pellet Plant Operation	84	252
Maintenance	126	378
Total	260	680

The yearly cost of labour is estimated at $65 million operating at the full capacity of 50 Mtpy by year 6.

b) Energy

Energy costs include fuel oil for the induration furnace and electrical energy for the pellet plant equipment. Consumption and unit rates are provided in Table 17.27.

c) Consumables

Consumables include bentonite, filter bags, refractories, grate bars and others as listed in Table 17.27.

d) Maintenance

The maintenance and repair cost were estimated from Met-Chem's database or factored from similar projects. The maintenance is covered in spares.

17.11.7General and Administration

General and administration (G & A) costs will include the corporate Head Office as well as all other G & A costs associated with operating the business.

The corporate Head Office is expected to be in a dedicated building located at the Otelnuk site within a short distance from the Otelnuk Processing Complex. This is where the corporate and senior management of the company will be located. All the general administrative and support functions to the operations will be located in that office.

Administrative and support function will include:

- General management;
- Financial;
- Accounting;
- Payroll;

- Purchasing;
- Legal and Public Relations;
- Sales;
- Human Resources;
- Health and Safety; etc.

The administration costs include all costs not already covered in the operating units such the mine and the concentrator, and cover those costs related to the administration and upkeep of the site. More specifically the Administration costs include salaries, housing and transportation costs for the administrative group for function such as human resources, health and safety, accounting and payroll. Site Services refers to personnel such as road maintenance, building upkeep, general maintenance personnel, airport crew etc. They also include salaries, housing and transportation costs.

Housing and transportation for the operations manpower (mine, concentrator, and pellet plant) were not included in the respective areas; rather they are totalled here as Operations Admin. The calculation for housing is based on $80 per on-site person for 365 days. At peak in year 6, the operations on-site manpower is 873 people; therefore, costing just over $25M. Travel is based on six (6) trips per year at $2,000 per trip. Again in year 6, the total operations manpower is 1745 working out to just approximately $21M for travel. The total Operations Admin, therefore, is just over $46M annually from year 6 onwards.

Head Office costs also includes communications, and all other costs such as material and supplies for safety, offices, camp upkeep, insurances for all company installations, general expenditures such as local taxes, association fees etc.

Royalties or any other form of payments that may arise from potential agreements with First Nations are not included in this cost estimate, but should be accounted for in future studies. These costs are represented in Table 17.29.

Table 17.29 –G & A Costs

Description	50 Mtpy ($000,000)
Operations Administration	46.4
Head Office Administration	5.71
Site Services	19.23
Communications	0.79
Other	5.25
Executive	7.82
Total	**85.20**

17.11.8Railway

The railway operating cost estimate was provided by CANAC, and is discussed in section 17.7.4b) of this Report. CANAC estimated the cost at $245 million annually. Based on transporting 50 million tonnes of pellets annually, this works out to a rail unit cost of $4.90 per tonne of pellets.

17.11.9Port Facilities

An estimate of the port facilities operating costs was provided by BH&T Engineering based on the description in section 17.8 of this Report. The port and shiploading costs include manpower, energy, general maintenance, and miscellaneous items. Port and property taxes as well as demurrage costs were not included. These costs are summarized in Table 17.30.

As shown in the table, the estimated costs for the port operations total $60 million annually. This works out to a unit cost of $1.20 per tonne of pellets produced when in full production.

Table 17.30 – Port Operation Costs

Description	**Estimated Costs ($000,000)**
Manpower	18,960
Port Communication and Office	2,500
Facility Maintenance, Parts, Consumables and Outside Services (2 % of CAPEX)	9,000
Electrical Energy	21,000
Diesel Fuel, lube and hydraulic oils replacement	1,000
Port Taxes	Not Included
Property Taxes	Not Included
Demurrage or Dispatch (Shipping cost)	Not Included
Miscellaneous Costs (allowance of $0.15/t x 50 Mt/y)	7,500
Estimated Total	$ 59,960,000
Estimated Unit Cost ($/tonne of pellets produced)	$ 1.20

17.11.10 Site Restoration

The Lac Otelnuk site rehabilitation will fall under the jurisdiction of the Province of Québec relevant regulations. The published "Guidelines for preparing a mining site rehabilitation plan and general mining site rehabilitation requirements" provide the required information under which Met-Chem prepared a preliminary cost estimate for this rehabilitation and closure plan.

This preliminary cost estimate amounts to $36.6 million and is based on the re-sloping and re-vegetation of 80% of the tailings pond area (taking into consideration that approximately 20 % of the area could remain under water), and the re-vegetation of the top and berms of waste rock stockpiles and the topsoil/overburden area. Those elements normally represent the largest proportion of the rehabilitation costs.

A modification of the Québec Mining Act is proposed and should be adopted soon. These modifications included some new directives for the disbursement of the estimated cost of rehabilitation. Indeed, the proposed paragraphs 232.4.1 and 232.4.3 of the Québec Mining Act mention to provide an amount equal to 100% of the anticipated costs for works undertaken in terms of rehabilitation and restoration. This amount must be paid in five annual payments starting 90 days after rehabilitation and restoration plan has been approved. In order to be prepared in advance, the disbursement of the estimated cost of the rehabilitation has been calculated in taking into account these future changes.

According to the Guidelines quoted above, and to the modifications proposed for the Québec Mining Act, 100% of the estimated cost of rehabilitation must be set aside during the life of the mine. In the present case, a first amount of $9.2 million will have to be disbursed after 90 days starting when rehabilitation and restoration plan has been approved. The other three payments of $7.3 million will have to be disbursed each anniversary date. A final amount of $5.5 million will have to be paid at the fifth anniversary date. A provision for those disbursements is included in the economic analysis of the project.

17.12 Project Implementation Schedule

The project schedule provided in Figure 17.28 has been prepared assuming that all activities are carried out without interruption and that financing is made available as required. The schedule starts at the end of the fourth quarter of 2010, with the scoping study activities that are documented within this Report, and extends to the fourth quarter 2018 upon start of the full production at the 50 million tonne per year target.

17.12.1Summary

The Scoping Study should be completed before the end of the first quarter of 2011 at which time the execution of the exploration Phase 1 is expected to begin. Unlike the study performed in 2006, there is no phase 1 and 2 exploration. This is because Adriana has continued with exploration; therefore, the exploration is expected to be completed in the single phase shown.

Assuming that the Exploration Phase 1 is completed near the end of 2011, and the Pre-Feasibility Study is completed in tandem with the exploration, it should be possible to begin the Feasibility Study by mid-first quarter of 2012. If this occurs, it is expected the Feasibility Study could be completed in early second quarter of 2013.

Also running in a fast-track mode, the Environmental Studies and Assessment Process would be expected to begin in the third quarter of 2011. Assuming the studies and assessment are indicating favourable results, the application for construction permits could be initiated before the end of the Assessment; however, there would be risk associated with doing so. By taking the that risk, and assuming the Assessment is completed by mid-2013, permits for construction could be completed soon after in early third quarter of 2013.

Another risk is to assume all goes well and begin Engineering and Procurement at the same time the application for permits is initiated. The construction must await all permits to be granted; therefore, construction of the access road from Brisay, and construction in Sept-Îles, could begin in early part of the third quarter of 2013. An earlier start for rail construction is expected.

As the plant will be constructed in a modular fashion, the engineering, procurement and construction for the second module is scheduled to begin by the third quarter of 2015. Engineering and procurement activities for this second module would be wrapping up in mid-to-late 2016 just as the concentrator, pellet plant and port facilities undergo commissioning. Work on the third module would then begin prior to completion of the second module.

The Project will take just over 8 years to complete.

17.12.2Exploration

The exploration scheduling is based on the programs proposed in the WGM Report of May 6, 2009. It is expected the exploration will take 11 months so, if drilling commences by late quarter 2011, exploration should be completed within the first quarter of 2012.

17.12.3Engineering Studies

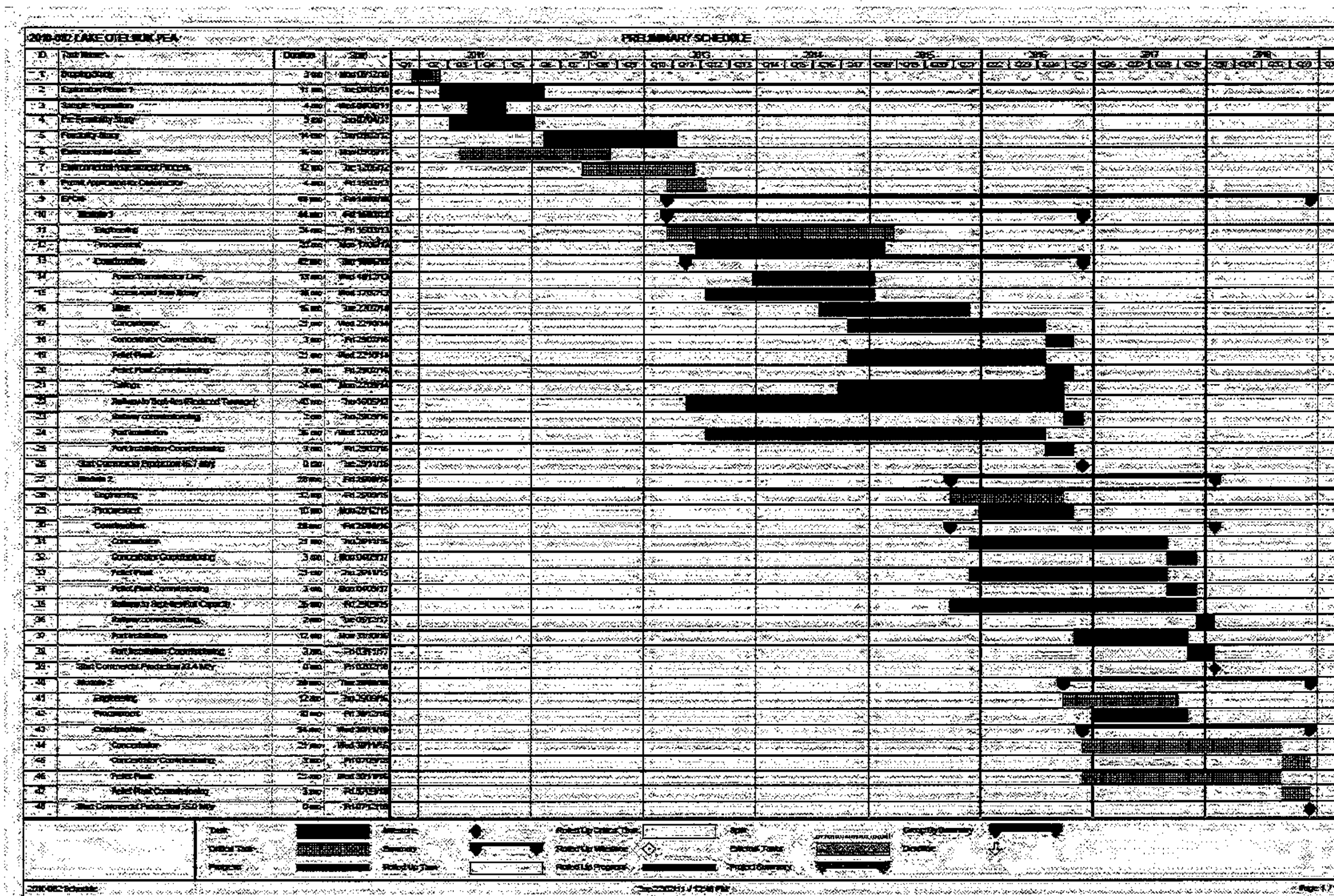
a) Scoping Study

This PEA is considered the Scoping Study. As such, it will be completed within the first quarter of 2011.

b) Pre-Feasibility and Feasibility Studies

The pre-feasibility study could start around a month or so after the beginning of the exploration phase. It could be completed in 9 months on a fast-track basis with the feasibility study following immediately afterwards lasting 16 months. The overall feasibility process would end in the second quarter of 2013.

Figure 17.28 – Project Schedule



17.12.4Environmental Aspects and Permitting

a) Environmental Studies

Environmental studies cover environmental baseline studies and Environmental Impact Assessment (EIA); they would last about 24 months. Since Adriana has already initiated studies with Golder Associates, the timing was reduced to 16 months. The project notice to Federal and Provincial Government Authorities will need to be submitted early in the Pre-Feasibility Study. An overlap of about 7 months with the Feasibility Study is required because some information needed to complete the Feasibility study will only be available after the completion of environmental studies.

b) Environmental Assessment Process

The environmental assessment process consists of the review of the EIA by the Government authorities as well as the public hearing process. It typically follows immediately after the environmental studies; however, it is expected to be able to initiate the process earlier, and is expected to be completed about 3 months after the feasibility study. It would last 12 months, ending by mid 2013.

17.12.5Permits for Construction

Several permits are required for construction. The application process begins prior to completion of the environmental assessment process, and lasts about 4 months, ending in the last quarter of 2013.

17.12.6Engineering, Procurement and Construction

a) Engineering

Although the construction cannot begin before all required permits are granted, it has been assumed that engineering will begin at the same time as the application for construction permits is initiated. Engineering for the first module which includes the bulk of work for the access road, rail and port, would take 24 months.

The engineering for modules 2 and 3 will be staggered. Module 2 engineering would begin in third quarter of 2015 and last 12 months soon after which module three would begin and last another 12 months. The total engineering time for the Project is 48 months.

b) Procurement

Procurement starts 3 months after the engineering when some packages are ready for the bidding process. The first contracts are awarded shortly after. The procurement would is expected to take a total of last 40 month with 20 of those months spent during module 1. Modules 2 and 3 require 10 months of procurement each.

c) Construction

Construction of the access road from Brisay will begin in the third quarter of 2013 once permits are granted. The power transmission line to Lac Otelnuk from Brisay could then begin in late 2013 before completion of the access road.

The duration of construction of the access road to the Lac Otelnuk site has been estimated at 18 months; however, mine development could begin prior to completion of the access road, and lasts about 16 months. Mine development material will be required for tailings dam construction and site preparation which is scheduled to begin soon after the start of mine development. The tailings work will take 24 months.

The concentrator construction starts 3 months after the mine development and lasts 21 months. Turn-key construction of the pellet plant will occur in parallel also lasting 21 months.

Railway and port construction begin as early as possible in mid-2013. Sufficient rail will be constructed to meet the capacity requirement for the first module by completion of module 1 in mid-2016. The port will be completed at this time as well.

Construction of all modules will be completed by third quarter of 2018.

17.12.7Production

The targets for commercial production to begin for each module are

- Module 1 – 4th Quarter 2016;
- Module 2 – 1st Quarter 2018; and
- Module 3 – 4th Quarter 2018.

17.13 Economic Analysis

The economic analysis for the Lac Otelnuk Iron Ore Project was based on the mine plan developed by Met-Chem for a production rate of 50 Mtpy of pellet, as well as the capital expenditures and operating costs estimates derived from the same mine plan.

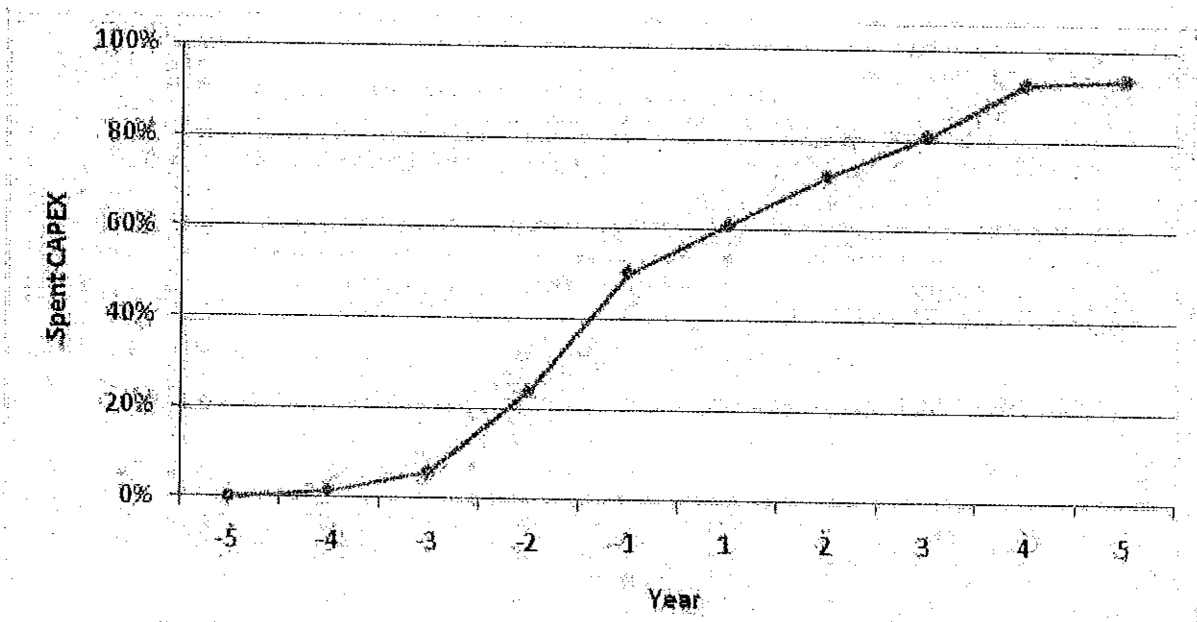
The economic analysis of the asset indicates a solid economic performance under the conditions analyzed. The parameter that most affects the NPV is the commodity price, as opposed to capital expenditures and operating costs.

17.13.1Basis of Economic Parameters

a) Capital Expenditures

A preliminary detailed capital expenditures calculation was performed for each area of the project. The expenditures were split in yearly amounts based on the expected construction schedule. Figure 17.29 shows the cumulative capital expenditures per year for the pre-production period, as well as for the first five years of production. It can be observed from the figure that 93% of the total capital expenditures are spent in the fourth year of production. Most of the remaining expenditures can be considered sustaining capital.

Figure 17.29 – Cumulative CAPEX Percentage



Further details regarding capital costs are presented and discussed in section 17.10 of this Report.

b) Operating Costs

Operating costs for mining were estimated according to equipment requirements established in the mine plan. The total operating time per equipment type was calculated and the hourly cost was also calculated based on standard calculation procedures. The costs for the concentrator, pellet plant, and railway were also estimated based on the required production. These costs start with high values and then steadily decrease to reach stability when the full production rate is achieved in year 6. General and administration costs were also estimated.

Table 17.31 shows the itemized unit operating costs.

Table 17.31 – Unit Operating Costs Summary

Item	Units	Year					
		1	2	3	4	5	6-34
Mining	CAD$/t ROM	2.87	1.91	2.05	2.16	1.76	1.93
Concentrator	CAD$/t pellet	6.68	6.50	5.86	6.01	5.70	5.61
Tailings	CAD$/t pellet	0.47	0.23	0.16	0.15	0.10	0.10
Pellet Plant	CAD$/t pellet	12.16	11.85	10.83	11.09	10.59	10.45
Railway	CAD$/t pellet	7.16	5.79	5.34	5.12	4.98	4.90
Port	CAD$/t pellet	1.20	1.20	1.20	1.20	1.20	1.20
G&A	CAD$/t pellet	3.18	2.56	2.02	2.09	1.79	1.71

Further details regarding operating costs are presented and discussed in section 17.10 of this Report.

c) Pellet Price

It is difficult to predict future prices of iron ore products given the past number of years. Pellet prices tend to vary based on the open market conditions. Another factor is the delivery terms and how they are changing.

Typically iron pellets are sold Free on Board (FOB) at the ore producer's terminal, and the purchaser pays for shipping from that point forward. Prices quoted FOB are, therefore, specific to this shipping methodology. Other modes include Cost, Insurance and Freight (CIF) and Cost and Freight (CFR) that place the cost of shipping on the producer. It is further assumed that, at minimum, pellets sold CIF or CFR must carry a premium price to at least offset the cost of shipping.

Due to the lack of market studies, a conservative approach was used to determine the long term pellet price to be used in the economic model. A flat price of US$100 per metric ton of pellet was assumed for the life of mine. Sensitivity to pellet pricing is included in the analysis, and presented in 17.13.4 below.

17.13.2Cash Flow Projections

Yearly life of mine cash flow was calculated taking into account the mine production, plant recoveries, as well as the estimated OPEX and CAPEX. The net present value (NPV) for a discount rate of 8% was also calculated.

Table 17.32 shows a summary of the most relevant economic parameters calculated in the technical economic model. The LoM cash flow is CAD$102,905 M, which corresponds to an NPV of CAD$15,157 M.

Table 17.32 – Cash Flow Projection

Concept	LoM Amount (CAD$M)
Gross Revenue	167,227
Operating Cost	49,720
Gross Margin	117,507
Capital Expenditures	14,421
Cash Flow	103,085
NPV@8%	15,189

17.13.3 Summary of Analysis

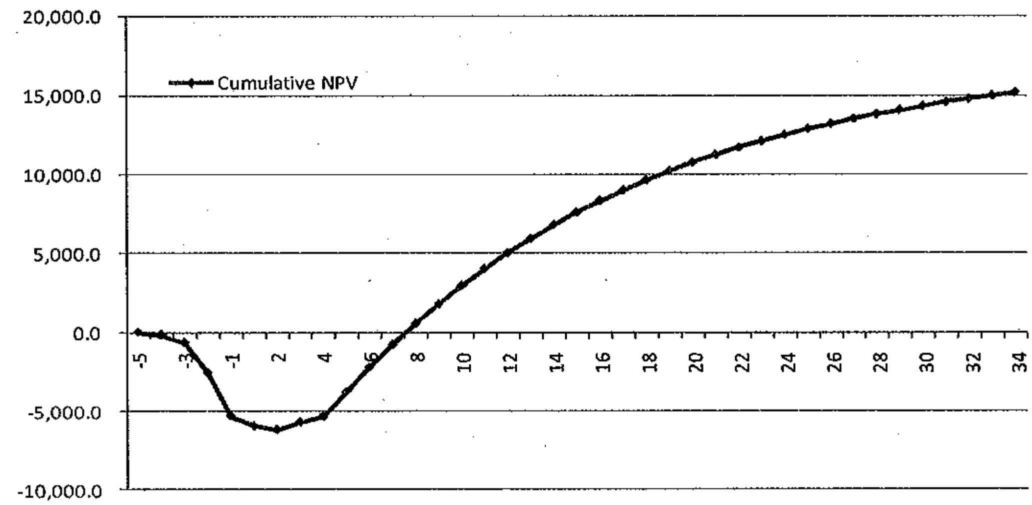
Results of the economic analysis, performed as part of this PEA, are summarized in Table 17.33. A detailed presentation of the base case is provided in Appendix G. The analysis indicates the Project has a potential net present value (NPV) of CAD $15 B at an internal rate of return (IRR) of 20% with a payback period of seven (7) years.

The cash flows determined in the economic analysis shows that the project performs very well in terms of NPV. This is presented in Figure 17.30 over the life of the Project starting in year -5 through to year 34.

Table 17.33 – Economic Analysis Summary

Description	Units	Base Case
Production rate	Mtpy	50.0
Discount Rate	%	8%
NPV	CAD$M	15,189
IRR	%	20.0%
Payback Period	Years	7

Figure 17.30 – Cumulative NPV over the Life of the Project



17.13.4Sensitivity Analysis

A sensitivity analysis of the NPV and the IRR was performed for variations in CAPEX, OPEX, selling price, and discount rate. The changes on these parameters were established in 5% steps for a total variation of ±15%. Table 17.34 shows the sensitivity analysis results for NPV, and Table 17.35 shows the results for IRR. The results are also shown in Figure 17.31 and Figure 17.32.

It can be observed in the sensitivity analysis that the parameter that most affect the project economics is the selling price, followed by the discount rate. The project is less sensitive to changes in CAPEX and OPEX.

The selling price that drives the NPV to zero is US$56.10 per ton of pellet.

Table 17.34 – NPV (Pre-Tax) Sensitivity Data

Sensitivity	Capital Expenditures		Operating Costs		Selling Price		Discount Rate	
Factor	NPV	Variation	NPV	Variation	NPV	Variation	NPV	Variation
-15%	16,514	8.7%	16,776	10.4%	9,999	-34.3%	19,982	31.6%
-10%	16,072	5.8%	16,247	7.0%	11,729	-22.8%	18,235	20.1%
-5%	15,630	2.9%	15,718	3.5%	13,359	-11.4%	16,642	9.6%
0%	15,189	0.0%	15,189	0.0%	15,189	0.0%	15,189	0.0%
5%	14,747	-2.9%	14,660	-3.5%	16,919	11.4%	13,861	-8.7%
10%	14,306	-5.8%	14,131	-7.0%	18,649	22.8%	12,647	-16.7%
15%	13,864	-8.7%	13,602	-10.4%	20,379	34.2%	11,535	-24.1%

Table 17.35 – IRR (Pre-Tax) Sensitivity Data

Sensitivity	Capital Expenditures		Operating Costs		Selling Price		Discount Rate	
Factor	IRR	Variation	IRR	Variation	IRR	Variation	IRR	Variation
-15%	22.6%	13.3%	21.1%	5.5%	16.4%	-18.1%	20.0%	0.0%
-10%	21.7%	8.5%	20.7%	3.7%	17.6%	-11.9%	20.0%	0.0%
-5%	20.8%	4.1%	20.4%	1.9%	18.8%	-5.8%	20.0%	0.0%
0%	20.0%	0.0%	20.0%	0.0%	20.0%	0.0%	20.0%	0.0%
5%	19.2%	-3.8%	19.6%	-1.9%	21.1%	5.7%	20.0%	0.0%
10%	18.5%	-7.2%	19.2%	-3.7%	22.2%	11.2%	20.0%	0.0%
15%	17.9%	-10.5%	18.9%	-5.6%	23.3%	16.6%	20.0%	0.0%

Figure 17.31 – Sensitivity Analysis on NPV (8% Discount rate; Pre-Tax)

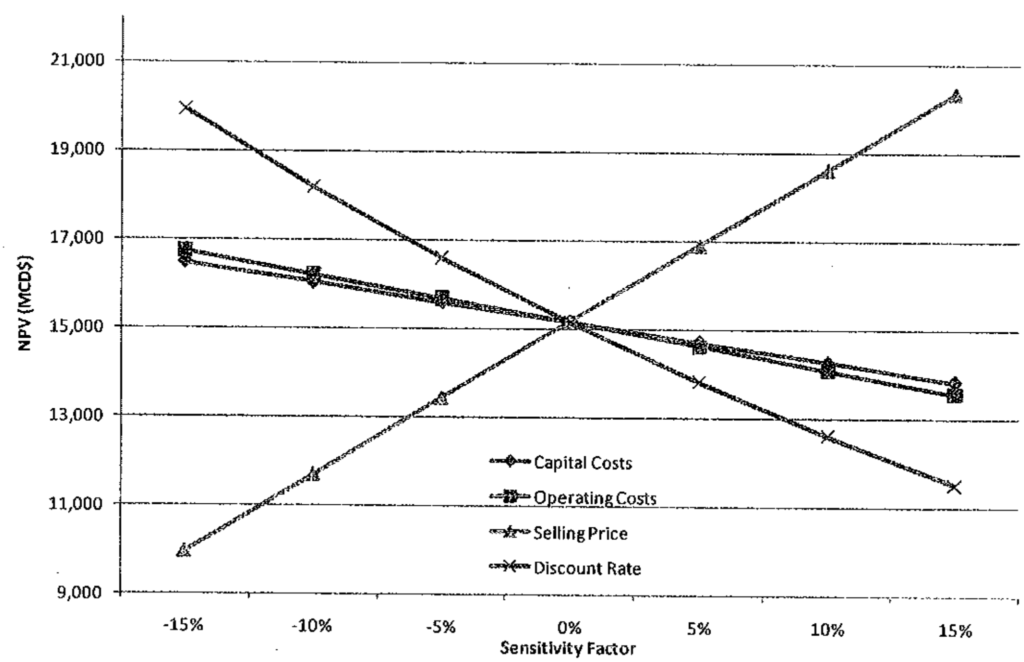
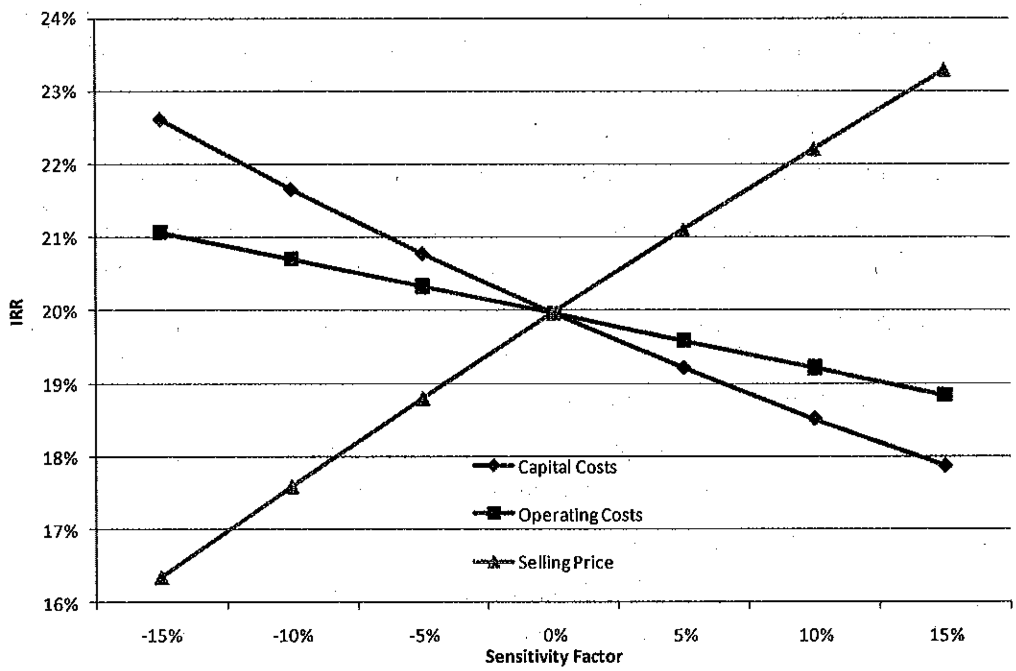


Figure 17.32 – -Sensitivity Analysis on IRR (8% Discount rate; Pre-Tax)



18.0 INTERPRETATION AND CONCLUSIONS

The project that is the subject of the present study involves an iron ore integrated project comprising a mine, concentrator, and pellet plant at Lac Otelnuk in northern Québec connected by rail to ship loading facilities located in Sept-Îles some 700 km to the south.

The study provides technical parameters and an economic assessment of the related capital and operating costs of implementing and operating this project.

Capital costs involved in producing 50 Mtpy of pellets are estimated to be on the order of CAD$13 billion. Related total unit operating costs for pellets are $32/tonne.

A preliminary project implementation schedule indicates that approximately 8 years will be required to bring the project to full production assuming all activities are carried without significant unforeseen delays.

The following paragraphs highlight some of the characteristics of the project as well as some concerns, risks and recommendations.

18.1 Summary of WGM Interpretation and Conclusion

Based on our review of the available information for the Lac Otelnuk Property and the results of our Mineral Resource estimate, WGM concludes the following:

- The Lac Otelnuk iron deposit is an iron formation of the Lake Superior-type and consists of banded magnetite and hematite within quartz (chert)-rich rock, with variable amounts of silicate and carbonate;
- The geometry of the deposit is very simple, with the exception of the far northern portion, and the iron formation is generally northwest-southeast striking, with an average easterly dip of 5°;
- Within the oxide iron formation units, the most distinguishable compositional feature is the rather abrupt changes from dominantly magnetite to dominantly hematite, and a corresponding change of the silica from chert over to jasper;
- The changes are defined as different units or members. Units are named 2, 3 and 4 and sub-units are designated with a letter (a, b or c). Unit 5 forms the basal unit (Ruth Formation) which directly underlies the Sokoman Formation;
- WGM modeled the upper five geological sub-units (2a, 2b, 2c, 3a and 3b) of the Lac Otelnuk iron formation for the Mineral Resource estimate and used a 3-dimensional block model with Inverse Distance grade interpolation;
- Plans and cross sections through the current block model display excellent continuity of geology and grade along strike and down dip of the mineralization based on drillhole intersections;
- WGM believes Adriana's general sampling and QA/QC procedures are to industry standards and the results for Certified Control Materials inserted by SGS-Lakefield

indicate the assay results are accurate. WGM found no indications of any sample "mix-ups" in the field or at the lab;

- The results for WGM's independent sampling and the assaying and testwork at the Secondary laboratory (MRC) also indicates SGS-Lakefield assaying and DT tests are precise. WGM is of the opinion that any differences in DT test results between the labs are largely due to differing grinding methods;
- The type of iron formations present at Lac Otelnuk have been the principal sources of iron throughout the world. Lithofacies that are not highly metamorphosed or altered by weathering are referred to as taconite and the Lac Otelnuk deposits are examples of taconite-type. Mineralization in the iron formation consists mainly of magnetite (Fe_3O_4) and hematite (Fe_2O_3);
- Because this type of iron formation is known to be relatively continuous for kilometers of strike length, WGM is of the opinion that the Lac Otelnuk Property shows excellent potential for additional Mineral Resources being defined, either as extensions of known mineralization, or as further delineation of this mineralization with the deepening of some holes that did not penetrate the entire stratigraphy; and,
- Indicated Mineral Resources are defined as blocks being within 350 m of a drillhole intercept. Inferred Mineral Resources are interpolated out to a nominal 1,000 m on the fringe and at depth. Table 18.1 and Table 18.2 summarize the Mineral Resources.

Table 18.1 – Lac Otelnuk Iron Project Estimated Resource (Cut-off of 18% DTWR)

Resource Category	Tonnes (billions)	%TFe (Head)	DTWR %	SiO_2 % (DTC)	TFe % (DTC)
Indicated	4.29	29.08	27.26	3.53	68.00
Inferred	1.97	29.24	26.55	3.51	68.12

Table 18.2 – Categorized Mineral Resources by Sub-unit
Lac Otelnuk Iron Project (Cut-off of 18% DTWR)

	Tonnage (t)	TFe%	DTWR%	SiO_2% (DTC)	TFe% (DTC)
Indicated					
Sub-unit 2a	400,951,317	33.26	34.88	3.56	68.20
Sub-unit 2b	1,356,468,139	31.20	27.89	3.41	68.51
Sub-unit 2c	1,144,803,690	27.71	24.36	3.16	68.75
Sub-unit 3a	266,219,889	26.40	23.24	3.85	67.73
Sub-unit 3b	1,122,988,110	27.06	27.69	3.97	66.61
Total Indicated	**4,291,431,147**	**29.08**	**27.26**	**3.53**	**68.00**
Inferred					
Sub-unit 2a	93,846,334	31.88	32.40	3.46	68.05
Sub-unit 2b	665,681,442	32.59	28.31	3.26	68.60
Sub-unit 2c	464,077,895	27.41	24.06	3.27	68.61
Sub-unit 3a	144,243,915	26.63	22.74	3.64	68.41
Sub-unit 3b	601,530,569	27.15	26.53	3.93	67.14
Total Inferred	**1,969,380,158**	**29.24**	**26.55**	**3.51**	**68.12**

Note: Numbers may not add up due to rounding

18.2 Processing of the Otelnuk Iron Mineralization

Current average grade (+19% MagFe) and weight recovery (27%) used in the present study were derived from drill core data and will need to be supported by confirmation testwork. In addition, dedicated testwork should eventually be carried out to confirm the present design parameters preferably on a pilot plant scale.

Testwork on the pelletizing of the Otelnuk concentrate is also required at the pre-feasibility/feasibility level of study. For example, pot grate tests will permit evaluation of the production rate, product quality and gain/loss on ignition.

Two potential sites were proposed in the 2006 Study for tailings disposal. For the purposes of this PEA, the Concession option was chosen. Final site selection will need to include environmental considerations and potential impacts of proposed sites. Experts in tailings disposal design and construction will be required to evaluate the options.

18.3 Pellet Plant Location

This study included a cursory study of locating the pellet plant at either the mine or port site. A variety of key elements were identified; however, there remain pros and cons for both sites. Given the potential added capital and operating costs associated with transporting concentrate by rail to the port, and the need to develop a rather significant workforce for the Otelnuk site, it would appear there is an advantage for establishing a complete processing complex at the mine site. This would include the mining, crushing, concentrating, and pelletizing operations.

As noted in section 17.5.3, it the pellet plant location was assumed at the mine site for this PEA study. The location must be finalized during the pre-feasibility/feasibility levels as more information is gathered, and Adriana progresses with negotiations.

18.4 Railway Pellet Transport

This option involves the construction by Adriana of approximately 815 km of railway line between Lac Otelnuk and Sept-Îles at a cost of approximately $2.61 Billion.

The previous study in 2006 considered construction of rail to Schefferville then onward to Sept-Îles using the Tshiuetin Railway and QNS&L line. Several issues arose including the Ross Bay Junction segment needing major repairs and upgrade to be rehabilitated for iron pellet transport. According to the 2006 study, preliminary contact with an IOC's representative indicated a significant transportation unit cost is anticipated as the route selected would make use of existing railway segments between Schefferville and Ross Bay Junction (owned by Tshiuetin Railway) and thereafter to Sept-Îles on the QNS&L line (owned by IOC). Those higher costs were estimated at around $11 per tonne of pellets whereas the estimated unit cost in this current study is less than half that amount at $5 per tonne of pellets.

According to Adriana, discussions with both the Quebec government and the Inuit have been supportive of a railway into northern Quebec especially in the Nunavik region inhabited by the Inuit. Further discussions with both parties are expected as the project moves forward to determine synergies to all parties associated with constructing such a railway.

18.5 Port and Shiploading

Although a generalized location was considered in Sept-Îles for this study, further study will be required, and negotiations with the Sept-Îles Port Authority, to assess the concept. Other sites located south of Sept-Îles could also be considered for additional study.

There are no technical concerns at this time regarding the port installations; however, as this PEA did not include a study of shipping logistics the concept is truly preliminary. Such a study should be performed to determine the vessel requirements and future availability of such vessels. This will impact the stockpiling as well as the berthing requirements at the port.

18.6 Environmental Considerations

Environmental approvals typically involve appreciable time before they are obtained. Consequently, environmental studies should be initiated as early as possible in the project schedule.

Discussions, consultations and, if applicable, negotiations with First Nations representatives should be pursued during all phases of the project. It is the understanding of Met-Chem that Adriana has already had meetings with representatives of the Lac Otelnuk area First Nations.

18.7 Project Implementation Schedule

Because the Project is to follow a modular approach, the estimated schedule indicates the production from the first module is expected in six years with full capacity readiness by the eight year. Much of this scheduling depends on the fast-tracking of the exploration and pre-feasibility/feasibility studies with the environmental studies and assessment. As such, this implies risk to the project schedule.

Further risk is assumed by starting the engineering and procurement activities prior to completing the environmental assessment process; however, that risk is mainly monetary, and would be necessary to maintain the schedule. A number of construction activities, including the access road from Brisay and the railway, are also fast-tracked in order to accomplish this schedule. Construction of the railway, in fact, is scheduled to begin prior to completion of the permitting process with the expectation that permitting for portions of the rail will be obtained as early as possible.

Access from the west (Caniapiscau area) was mentioned as an option in a previous study. However, cursory examination of the distances and terrain involved indicates a longer distance and construction of at least one important bridge structure as opposed to none for the road access from Schefferville. The Caniapiscau option, if proven practical and economic, might be considered in the early stages of the project to fly in required equipment, material and supplies.

The 2006 study suggested building a 175 km all-weather gravel road to Schefferville. In this scenario, all supplies for the project would be delivered to Sept-Îles using trans-modal container for fast trans-boarding on rail cars destined for Schefferville. The road would be used to truck supplies from the Schefferville train station to the mining site during construction. This might still be considered to minimize risk to the project schedule.

A more detailed look at site access will need to be carried out to confirm the preferred access road and to identify means to reduce the construction time such as winter road to allow final road construction from both ends.

18.8 Electrical Power Supply

Considering the magnitude of the project at Lac Otelnuk, power supply options should be further explored as discussed with Hydro-Québec in 2006 to confirm the option retained for the present study or identify a more attractive alternative.

19.0 RECOMMENDATIONS

Geology

WGM in their 2009 Report offered a series of recommendations for the Lac Otelnuk Project:

- Insert natural Blanks into the field sample stream; Menihek split core would suffice and be "blind" to the lab;
- Formulate the policy for SGS-Lakefield to take steps for retesting and assaying preparation duplicates that returned poor correlation with respect to the original sample;
- Use second half core for field duplicates rather than quarter split core;
- Submitted entire sample identification to the lab rather than an abbreviated identification;
- Have the database containing all project assay, testwork and QA/QC constructed and updated by the field geologists as soon as possible, rather than at end of the program; plotting on cross sections, ongoing interpretation and validating assay quality / results to be done as drilling proceeds;
- Search for, and DGPS survey, North Zone historic drillhole collars;
- Compile, digitize and field check surface geological mapping and trenching data from historic programs to produce an updated geological base map;
- Update the geological interpretation using all drillhole, mapping data and the new topographic data from the aerial survey;
- Deepen the holes that did not penetrate the whole thickness of the mineralized stratigraphy in order to upgrade the classification of the Mineral Resources in the lower sub-units; WGM only modeled the upper five geological sub-units of the Lac Otelnuk iron formation for the Mineral Resource estimate;
- Upgrade the Indicated Mineral Resources by a small grid of closer spaced drillholes (maybe 300 m x 250 m) to confirm the Mineral Resources, and if there are no surprises in the geological continuity or grades, that knowledge / experience could be applied over the strike length of the currently drilled off deposit to upgrade a large portion of the Mineral Resources in the South Zone;
- Test the potential for additional Mineral Resources, primarily as extensions of known mineralization along strike, and apply the knowledge gained in drilling the South Zone to the North Zone; a wider spaced drilling pattern could be used to achieve this;
- Follow up with Adriana's preliminary program for the third phase of work for the project consisting of the five main components: Diamond Drilling (30 BQ holes totaling 3,000 m) to extent the current Mineral Resource northward into the North Zone to better define the centre of gravity of the deposit for mine; SGS-Lakefield to

review bench scale and pilot plant test results performed on bulk samples collected from the Upper Iron Formation in the 1980s.

Mining

- Additional drilling should be scheduled in order to reclassify all or part of the Inferred Resource Category to the Indicated Resource Category;
- Perform geotechnical studies on slope stability with the intent of increasing overall pit slopes.

Process

- Proceed with a metallurgical testwork program to further advance metallurgical processing development;
- Additional testwork should be performed to confirm the present design parameters preferably on a pilot plant scale;
- Pelletizing testwork, such as, pot grate tests, are required at the pre-feasibility/feasibility stage;
- Experts in tailings disposal design and construction will be required to assess and finalize the selection and design of disposal tailings.

Infrastructure

- Continue with negotiations and approach for iron pellet railway transportation;
- Continue with port and shiploading concepts and perform a shipping logistic study;
- Address and refine electrical supply options with Hydro-Quebec.

Environment

- Continue Environmental Baseline Monitoring; Preliminary Engineering; and
- Continue to participate with First Nation agencies through the Letter of Intent executed with Makivik and previous meeting held with the Québec Government;
- Initiate the pre-feasibility and environmental studies in conjunction with exploration and testwork as early as possible to evaluate the Project on a more solid basis, and to make fast-tracking decisions at the earliest possible time.

20.0 REFERENCES

Watts, Griffis and McOuat, Technical Report and Mineral Resource Estimate for the Lac Otelnuk Iron Property Labrador Trough – North-eastern Quebec for Adriana Resources Inc., May 7, 2009.

Met-Chem Canada Inc., Lac Otelnuk Iron Property Preliminary Capital and Operating Costs Estimate for Adriana Resources Inc., Met-Chem's Reference No.: 26004-2, June 2006.

Gestion Otelnuk Inc., Report on the 2008 Diamond Drilling for Adriana Resources Inc., January 31, 2010.

WISCO Kaisheng Engineering Design & research Co., Ltd., Testing and Research Report of Ore Sampling and Ore Dressing of Adriana Resources Inc., May 2010.

Golder Associates, Environmental Focussed Scoping Study – Lac Otelnuk Iron Mine Project Quebec, April 17, 2009.

Lakefield Research of Canada Limited, A Pilot Plant Investigation of the Recovery of Magnetic Iron from a Sample of Otelnuk Lake Ore Submitted by MPH Consulting Limited, Progress Report 1, April 1, 1981.

21.0 DATE AND SIGNATURE PAGE

The undersigned prepared this Technical Report, titled "NI 43-101 Technical Report on the Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore Project", with an effective date of April 8th, 2011, for Adriana Resources Inc. The format and content of the report are intended to conform to Form 43-101F1 of National Instrument 43-101 of the Canadian Securities Administration.

"Original signed and sealed"

André Boilard, Eng.

"Original signed and sealed"

Michael W. Kociumbas, B.Sc., P. Geo.

"Original signed and sealed"

Yves Buro, Eng.

"Original signed and sealed"

Richard W. Risto, M.Sc., P. Geo.

"Original signed and sealed"

Jeffrey Cassoff, Eng.

"Original signed and sealed"

Charles Cauchon, Eng.

"Original signed and sealed"

Mary-Jean Buchanan, Eng. M. Env.

22.0 ADDITIONAL REQUIREMENTS FOR TECHNICAL REPORTS ON DEVELOPMENT PROPERTIES AND PRODUCTION PROPERTIES

The aspects, which will have to be developed to bring the property to a further development stage, have been covered in the previous Sections of the Report.

23.0 ILLUSTRATIONS

The illustrations have been integrated in the text or included in Sections 3, 15 and 17.

Appendix A – Certificates of Authors

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CERTIFICATE OF AUTHOR

I, André Boilard, Eng., do hereby certify that:

1) I am a Senior Project Manager with Met-Chem Canada Inc. (Met-Chem) with an office situated at Suite 300, 555 René-Lévesque Blvd. West, Montréal, Canada;

2) I am a graduate of Université Laval of Quebec City with B.Eng. in Mechanical Engineering in 1977;

3) I am a member in good standing of the "Ordre des Ingénieurs du Québec" (31060);

4) I have worked as a Mechanical Engineer / Project Manager continuously since my graduation from university;

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

6) I have supervised and participated in the preparation of the report entitled "**NI 43-101 Technical Report on the Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore Project, Québec-Canada**" dated April 8, 2011;

7) I have not visited the site;

8) I had no prior involvement with Adriana Resources Inc. and its Otelnuk Lake Iron Ore Project and property that is the subject of the Technical Report;

9) As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

10) I am independent of the issuer as defined in section 1.4 of NI 43-101;

11) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

This 8th day of April 2011.

Original signed and sealed

(Signed) "André Boilard"

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Senior Project Manager
Met-Chem Canada Inc.

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I, Yves A. BURO, Eng. do hereby certify that:

1) I am a Senior Geologist presently with Met-Chem Canada Inc. with an office situated at Suite 300, 555 René-Lévesque Blvd West, Montreal, Canada;

2) I am a graduate of University of Geneva, Switzerland with the equivalent of a B.Sc. and a M.Sc. in Geology obtained in 1976;

3) I am a member in good standing of the *Ordre des ingénieurs du Québec* (Reg. 42279);

4) I have worked as a geologist continuously since graduation from University in 1976. I have gained experience on iron deposits similar to the Otelnuk, as exploration geologist, in Canada, the USA, India, Africa, South America;

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

6) I have participated in the preparation of the report entitled **"Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore – 43-101 Technical Report"** dated April 08, 2011, under Met-Chem consultation company as geologist. I have participated, and I am responsible for the sections three (3) to fourteen (14), inclusive, of the report;

7) I have not visited the site;

8) I have not had prior involvement with Adriana Resources Inc. and its Otelnuk Lake Iron Ore Project and property that is the subject of the Technical Report;

9) I state that, as the date of the certificate, to the best of my qualified knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading;

10) I have no personal knowledge, as of the date of this certificate, of any material fact or material change which is not reflected in this Technical Report;

11) I am independent of the issuer as defined in section 1.4 of NI 43-101;

12) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

This April 08, 2011.

Original signed and sealed

(Signed) "Yves Buro"

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I, Jeffrey Cassoff, Eng, do hereby certify that:

1) I am a Senior Mining Engineer presently with Met-Chem Canada Inc. with an office situated at Suite 300, 555 René-Lévesque Blvd West, Montréal, Canada;

2) I am a graduate of McGill University in Montréal with a Bachelor's in Mining Engineering obtained in 1999;

3) I am a member in good standing of the Ordre des Ingénieurs du Québec (Reg. 5002252);

4) I have worked as a mining engineer continuously since graduation from university in 1999;

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

6) I have participated in the preparation of the report entitled " **NI 43-101 Technical Report on the Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore Project, Québec-Canada**" dated April 08, 2011, under Met-Chem consultation company as Senior Mining Engineer. I have participated, and I am responsible for sections 17.1, 17.10 and 17.11;

7) I have not visited the site;

8) I have not had prior involvement with Adriana Resources Inc. and its Otelnuk Lake Iron Ore Project and property that is the subject of the Technical Report;

9) I state that, as the date of the certificate, to the best of my qualified knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading;

10) I have no personal knowledge, as of the date of this certificate, of any material fact or material change which is not reflected in this Technical Report;

11) I am independent of the issuer as defined in section 1.4 of NI 43-101;

12) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

This April 08, 2011.

Original signed and sealed

(Signed) "Jeffrey Cassoff"

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I, Charles H Cauchon, Eng, do hereby certify that:

1) I am a Senior Process Engineer presently with Met-Chem Canada Inc with an office situated at 555 boul. Rene-Levesque Ouest, Montreal, Quebec, Canada;

2) I am a graduate of the Universite de Montreal with BSc in Mining Engineering obtained in 1960;

3) I am a member in good standing of the "Ordre des Ingénieurs du Québec" (Reg. 11811);

4) I have practiced my profession for the mining industry continuously since my graduation from university;

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience in iron ore beneficiation plants, plant design, construction and engineering, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

6) I have participated in the preparation of the report entitled " **NI 43-101 Technical Report on the Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore Project, Québec-Canada** " dated April 8th, 2011, under Met-Chem consultation company as Senior Process Engineer. I have participated, and I am responsible for sections 17.2, 17.4 and part of 17.11;

7) I have not visited the site;

8) I have had prior involvement with Adriana Resources Inc. and its Otelnuk Lake Iron Ore Project and property that is the subject of the Technical Report at the time of a previous scoping study conducted in 2006;

9) I state that, as the date of the certificate, to the best of my qualified knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading;

10) I have no personal knowledge, as of the date of this certificate, of any material fact or material change which is not reflected in this Technical Report;

11) I am independent of the issuer as defined in section 1.4 of NI 43-101;

12) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

This 8th of April 2011.

Original signed and sealed

(Signed) "Charles H Cauchon"

____

Charles H Cauchon, Eng.
Senior Process Engineer

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I, Mary Jean Buchanan, Eng., M.Env. do hereby certify that:

1) I am a Senior Environmental Engineer and Project Manager with Met-Chem Canada Inc. (Met-Chem) with an office situated at Suite 300, 555 René-Lévesque Blvd. West, Montréal, Canada;

2) I am a graduate of Université du Québec à Chicoutimi with B.Eng. in Geological Engineering in 1983 and of the Université de Sherbrooke with a M.Env. (Master degree in Environment) in 1997;

3) I am a member in good standing of the "Ordre des Ingénieurs du Québec" (38671);

4) I have practiced my profession for the mining industry continuously since my graduation from university;

5) I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience that includes 24 years in consulting practice related to resource estimates, mine engineering and environmental assessment, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101;

6) I have participated in the preparation of the report entitled **"NI 43-101 Technical Report on the Preliminary Economic Assessment for 50 MTPY Otelnuk Lake Iron Ore Project, Québec-Canada"** dated April 8, 2011 and am responsible for Sections 17.9, 18.6, 17.11.10 and part of Executive Summary;

7) I have not visited the site;

8) I have had prior involvement with Adriana Resources Inc. and its Otelnuk Lake Iron Ore Project and property that is the subject of the Technical Report at the time of a previous scoping study conducted in 2006;

9) As of the date of this certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

10) I am independent of the issuer as defined in section 1.4 of NI 43-101;

11) I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form;

This 8^{th} day of April 2011.

Original signed and sealed

(Signed) "Mary Jean Buchanan"

Mary Jean Buchanan, Eng., M.Env.
Senior Environmental Engineer
Met-Chem Canada Inc.

CERTIFICATE

To Accompany the Report Entitled
"NI 43-101 TECHNICAL REPORT ON THE PRELIMINARY ECONOMIC ASSESSMENT FOR 50 MTPY, OTELNUK LAKE IRON ORE PROJECT, QUEBEC – CANADA" for Adriana Resources Inc., April 8, 2011

I, Michael W. Kociumbas, do hereby certify that:

1. I reside at 420 Searles Court, Mississauga, Ontario, Canada, L5R 2C6.

2. I am a graduate from the University of Waterloo, Waterloo, Ontario with an Honours B.Sc. Degree in Applied Earth Sciences, Geology Option (1985), and I have practised my profession continuously since that time.

3. I am a member of the Association of Professional Geoscientists of Ontario (Membership Number 0417).

4. I am a Senior Geologist and Vice-President with Watts, Griffis and McOuat Limited, a firm of consulting geologists and engineers, which has been authorized to practice professional engineering by Professional Engineers Ontario since 1969, and professional geoscience by the Association of Professional Geoscientists of Ontario.

5. I am an independent Qualified Person for the purposes of NI 43-101 and have extensive experience with iron deposits, a variety of other deposit types, Mineral Resource estimation techniques and the preparation of technical reports.

6. I am responsible for Section 16 and jointly responsible with the co-authors for the Executive Summary, Sections 1, 3, 15.1 to 15.3, 18 and 19 of the report.

7. I have not visited the Lac Otelnuk Property.

8. I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this report.

9. Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Adriana Resources Inc., or any associated or affiliated entities.

10. Neither I, nor any affiliated entity of mine own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Adriana Resources Inc., or any associated or affiliated companies.

11. Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three years from Adriana Resources Inc., or any associated or affiliated companies.

12. I have read NI 43-101 and Form 43-101F1 and have prepared the technical report in compliance with NI 43-101 and Form 43-101F1; and have prepared the report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

signed by
" *Michael W. Kociumbas* "

Michael W. Kociumbas, B.Sc., P.Geo.
April 8, 2011

CERTIFICATE

**To Accompany the Report Entitled
"NI 43-101 TECHNICAL REPORT ON THE PRELIMINARY ECONOMIC ASSESSMENT FOR 50 MTPY, OTELNUK LAKE IRON ORE PROJECT, QUEBEC – CANADA" for Adriana Resources Inc., April 8, 2011**

I, Richard W. Risto, do hereby certify that:

1. I reside at 22 Northridge Ave, Toronto, Ontario, Canada, M4J 4P2.

2. I am a graduate from the Brock University, St. Catherines, Ontario with an Honours B.Sc. Degree in Geology (1977), Queens University, Kingston, Ontario with a M.Sc. Degree in Mineral Exploration (1983), and I have practised my profession for over 26 years.

3. I am a member of the Association of Professional Geoscientists of Ontario (Membership Number 276).

4. I am a Senior Associate Geologist with Watts, Griffis and McOuat Limited, a firm of consulting engineers and geologists, which has been authorized to practice professional engineering by Professional Engineers Ontario since 1969, and professional geoscience by the Association of Professional Geoscientists of Ontario.

5. I am an independent Qualified Person for the purposes of NI 43-101 and have extensive experience with gold deposits and the preparation of technical reports.

6. I visited the Otelnuk Property in August 2007 and September 2008.

7. I have no personal knowledge as of the date of this certificate of any material fact or change, which is not reflected in this report.

8. I am jointly responsible with the co-authors for the Executive Summary, Sections 1, 3 to to 14 and 18 and 19 of the report.

9. Neither I, nor any affiliated entity of mine, is at present, under an agreement, arrangement or understanding or expects to become, an insider, associate, affiliated entity or employee of Adriana Resources Inc., or any associated or affiliated entities.

10. Neither I, nor any affiliated entity of mine own, directly or indirectly, nor expect to receive, any interest in the properties or securities of Adriana Resources Inc., or any associated or affiliated companies.

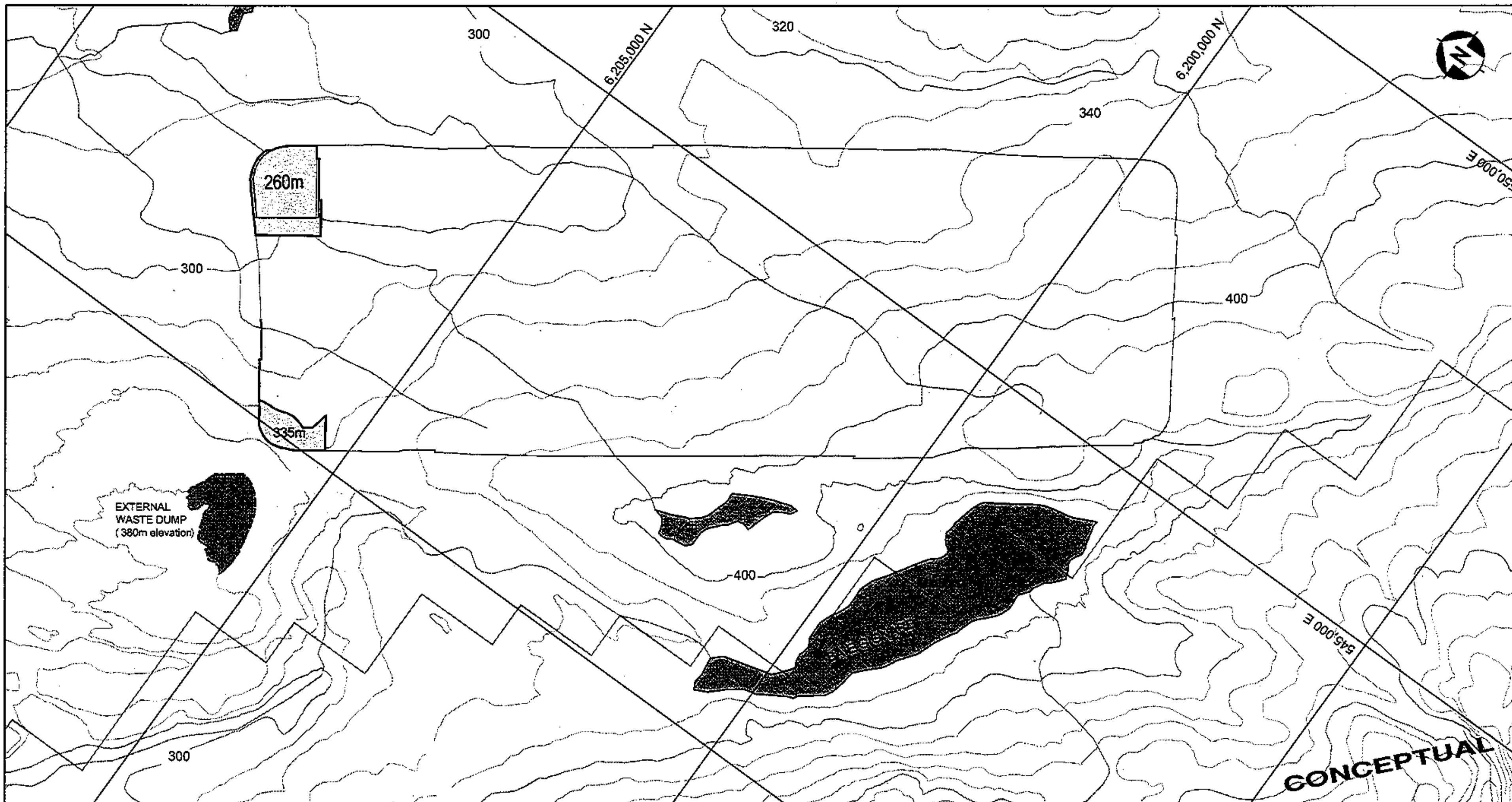
11. Neither I, nor any affiliated entity of mine, have earned the majority of our income during the preceding three years from Adriana Resources Inc., or any associated or affiliated companies.

12. I have read NI 43-101 and Form 43-101F1 and have prepared the technical report in compliance with NI 43-101 and Form 43-101F1; and have prepared the report in conformity with generally accepted Canadian mining industry practice, and as of the date of the certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

signed by
" *Richard W. Risto* "

Richard W. Risto, B.Sc., M.Sc., P.Geo.
April 8, 2011

Appendix B – End of Period Maps (Mine / Pit)



LEGEND

ULTIMATE PIT LIMIT	TOPO CONTOURS (20m)	PIT AREA	WASTE DUMP	TAILINGS
RIVERS	TOPO CONTOURS (100m)	PIT OUTLINE	DUMP FOOTPRINT	CONVEYOR LAYOUT
LAKES	ADRIANA CLAIMS	PIT CONTOURS (15m)	DUMP CONTOURS (15m)	SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

DRAWING NO	TITLE	NO.	DATE	TITLE	BY	APP
		A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REFERENCE DRAWINGS		REVISIONS				

DESIGNED J CASSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CASSOFF	DATE 11/14/02	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

MET-CHEM

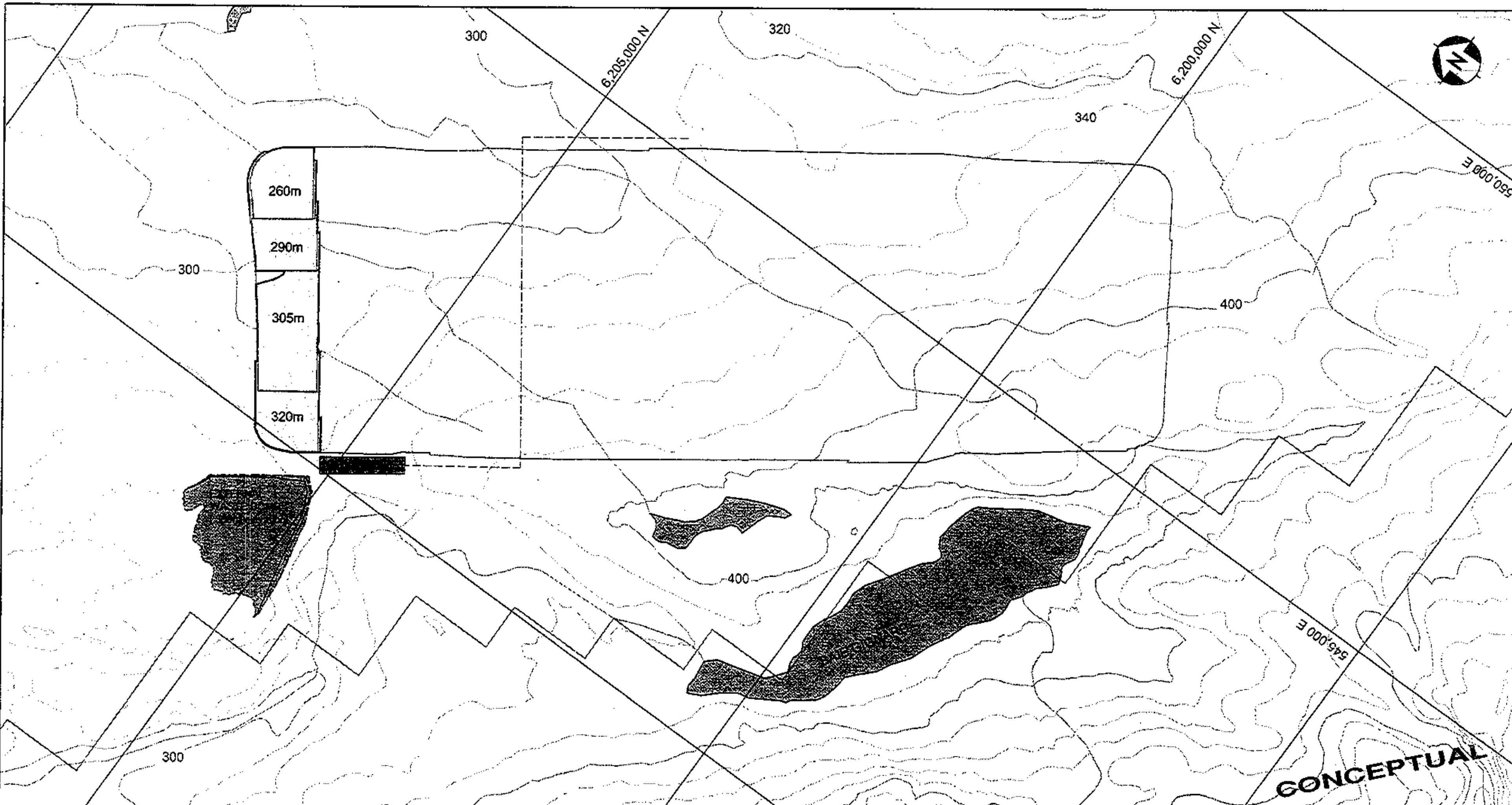
Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY MINE

END OF PRE-PRODUCTION

DRAWING NO. A1-2010-082-0505-MN REV. A

File: P:\2010-082\Autocad\Mine-Geology\Pit Design_cur.dwg - Feb 14, 2011 - 8:26am



LEGEND

ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

DRAWING NO	TITLE
REFERENCE DRAWINGS	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REVISIONS				

DESIGNED J CASSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CASSOFF	DATE 11/14/02	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

MET-CHEM

Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY MINE

END OF YEAR 1

DRAWING NO. A1-2010-082-0506-MN REV. A

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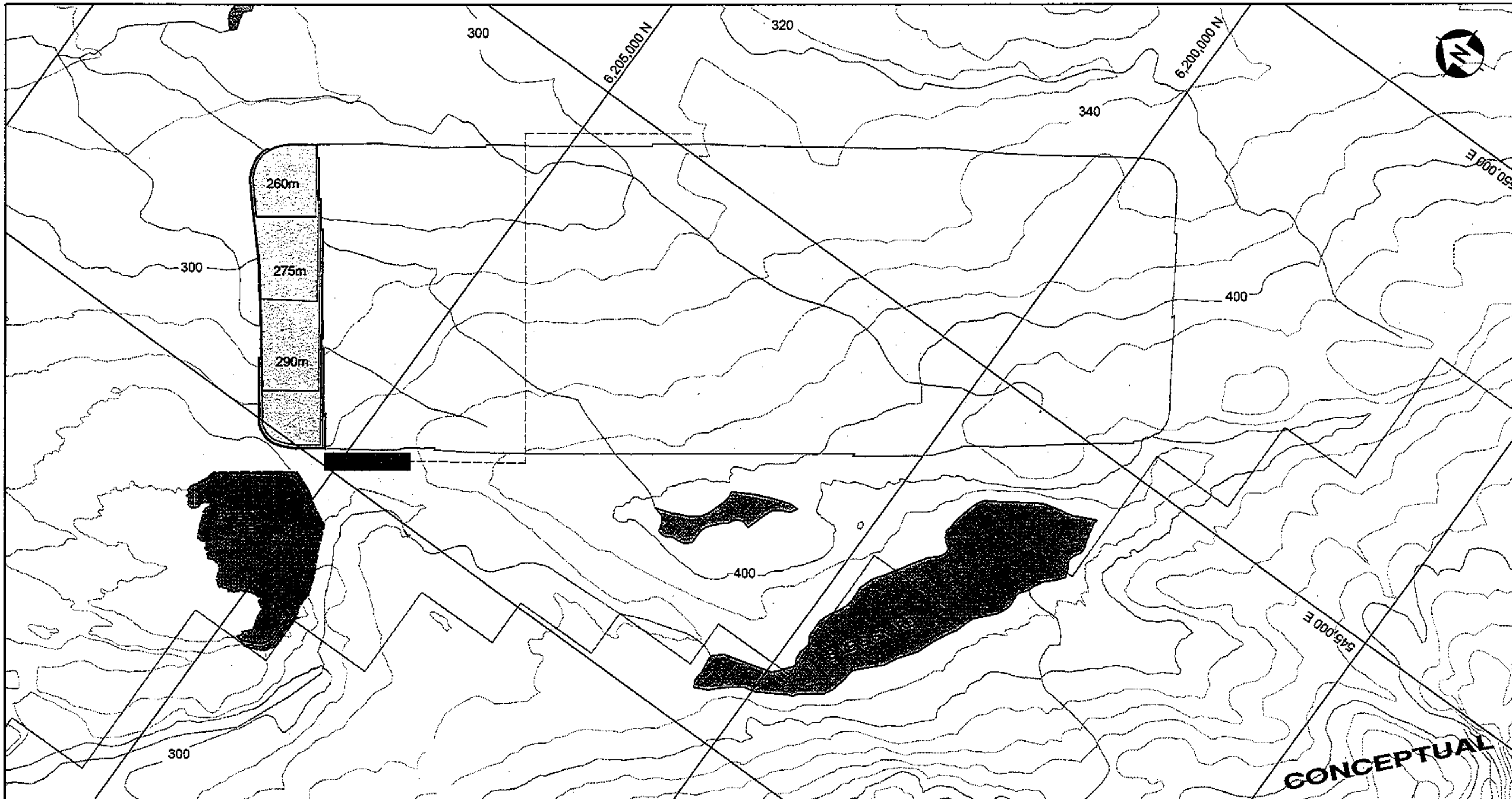

LEGEND

ULTIMATE PIT LIMIT	TOPO CONTOURS (20m)	PIT AREA	WASTE DUMP	TAILINGS
RIVERS	TOPO CONTOURS (100m)	PIT OUTLINE	DUMP FOOTPRINT	CONVEYOR LAYOUT
LAKES	ADRIANA CLAIMS	PIT CONTOURS (15m)	DUMP CONTOURS (15m)	SEMI-MOBILE CRUSHERS

500 1000 2000

Metres

DRAWING NO	TITLE
REFERENCE DRAWINGS	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REVISIONS				

DESIGNED J CISSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CISSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY

MINE

END OF YEAR 2

DRAWING NO. A1-2010-082-0507-MN REV. A

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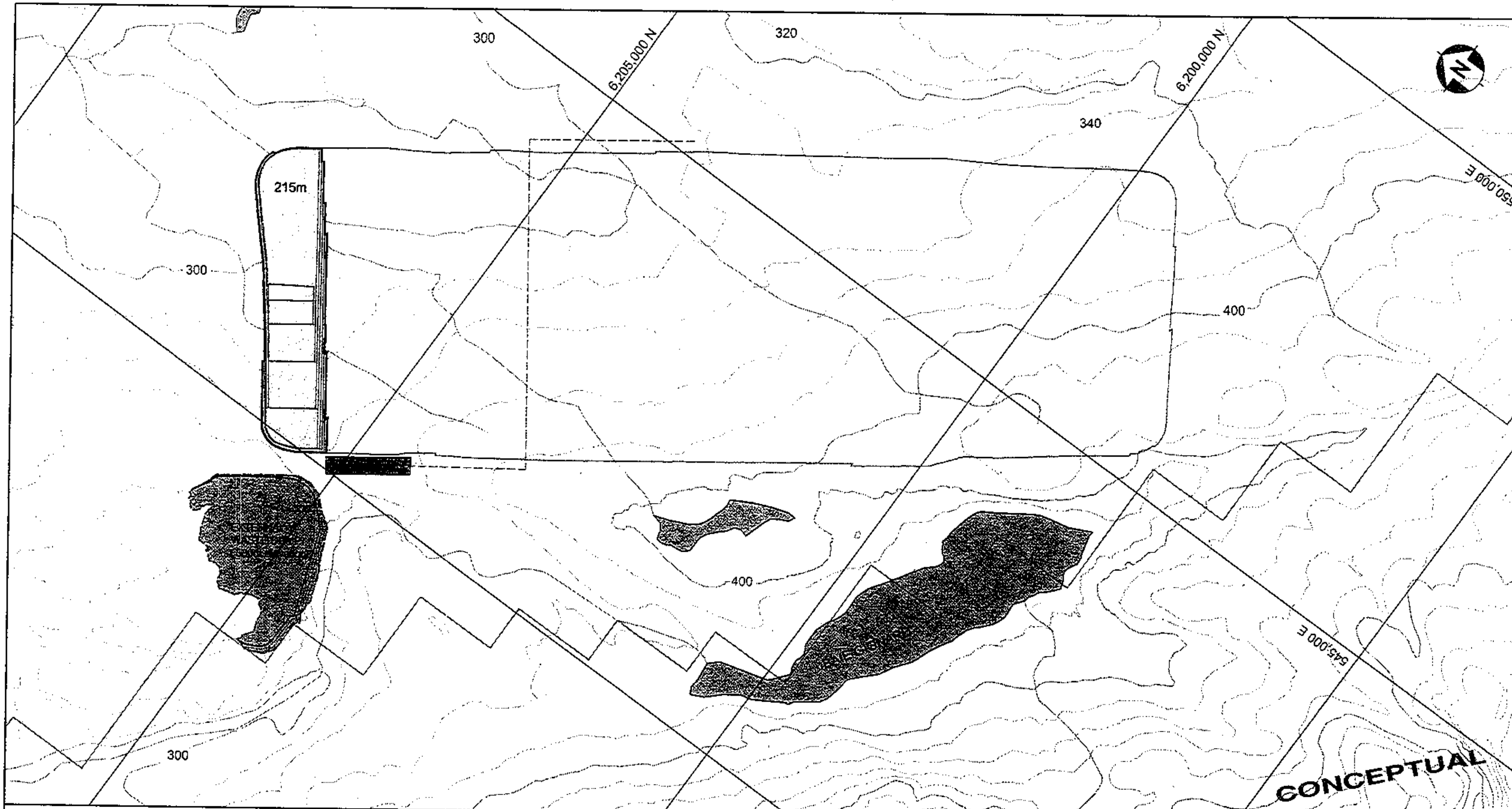

LEGEND

ULTIMATE PIT LIMIT	TOPO CONTOURS (20m)	PIT AREA	WASTE DUMP	TAILINGS
RIVERS	TOPO CONTOURS (100m)	PIT OUTLINE	DUMP FOOTPRINT	CONVEYOR LAYOUT
LAKES	ADRIANA CLAIMS	PIT CONTOURS (15m)	DUMP CONTOURS (15m)	SEMI-MOBILE CRUSHERS

500 1000 2000

Metres

DRAWING NO	TITLE
REFERENCE DRAWINGS	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REVISIONS				

DESIGNED J CISSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CISSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY

MINE

END OF YEAR 3

DRAWING NO. A1-2010-082-0508-MN

REV. A

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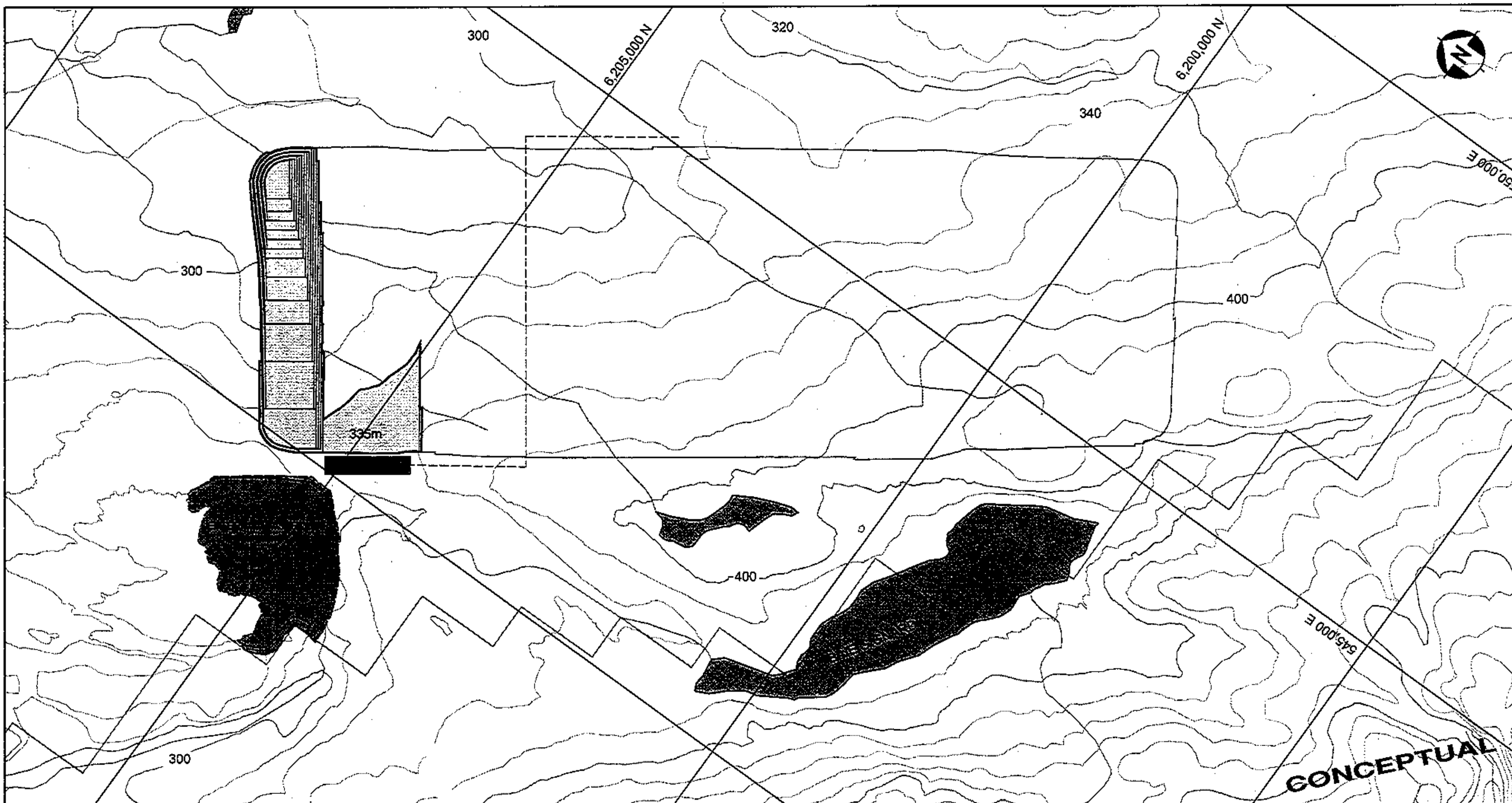

LEGEND

ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

ADRIANA RESOURCES INC.
MET-CHEM
Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 4

DESIGNED	DATE	CHECKED	DATE
J CASSOFF	11/02/14		
DRAWN	DATE	APPROVED	DATE
J CASSOFF	11/02/14		
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		

REVISIONS

DRAWING NO	TITLE

REFERENCE DRAWINGS

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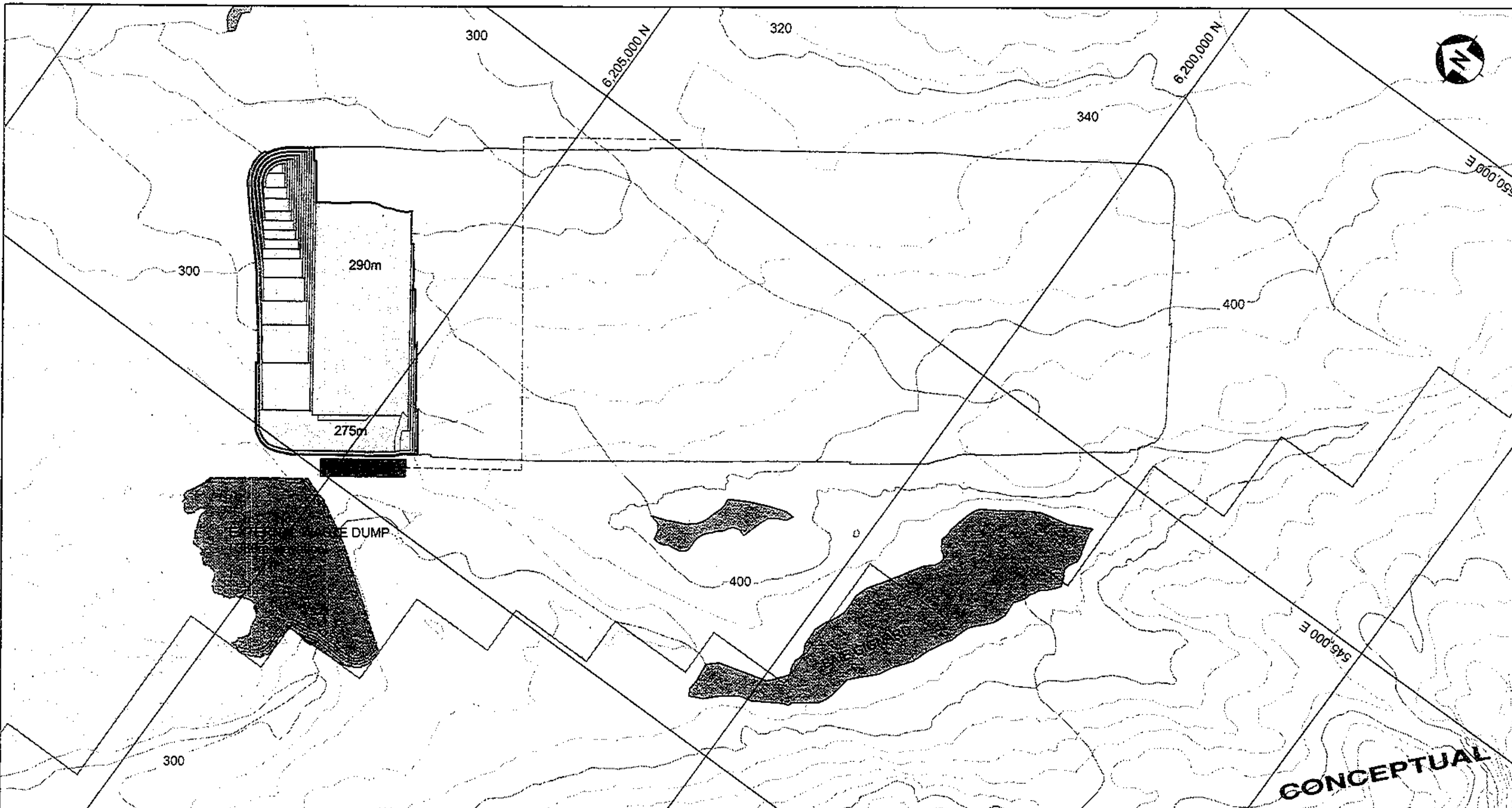

LEGEND

ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

DRAWING NO	TITLE	NO.	DATE	TITLE	BY	APP
		A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REFERENCE DRAWINGS		REVISIONS				

DESIGNED	DATE	CHECKED	DATE
J CRISSIFF	11/02/14		
DRAWN J CRISSIFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY MINE

END OF YEAR 5

DRAWING NO. A1-2010-082-0510-MN REV. A

File: P:\2010-082\Autocad\Mine-Geology\Pit Design_cur.dwg - Feb 14, 2011 - 8:28am

LEGEND

- ULTIMATE PIT LIMIT
- RIVERS
- LAKES
- TOPO CONTOURS (20m)
- TOPO CONTOURS (100m)
- ADRIANA CLAIMS
- PIT AREA
- PIT OUTLINE
- PIT CONTOURS (15m)
- WASTE DUMP
- DUMP FOOTPRINT
- DUMP CONTOURS (15m)
- TAILINGS
- CONVEYOR LAYOUT
- SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

DRAWING NO	TITLE
REFERENCE DRAWINGS	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REVISIONS				

DESIGNED J OSSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J OSSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 5

DRAWING NO. A1-2010-082-0511-MN
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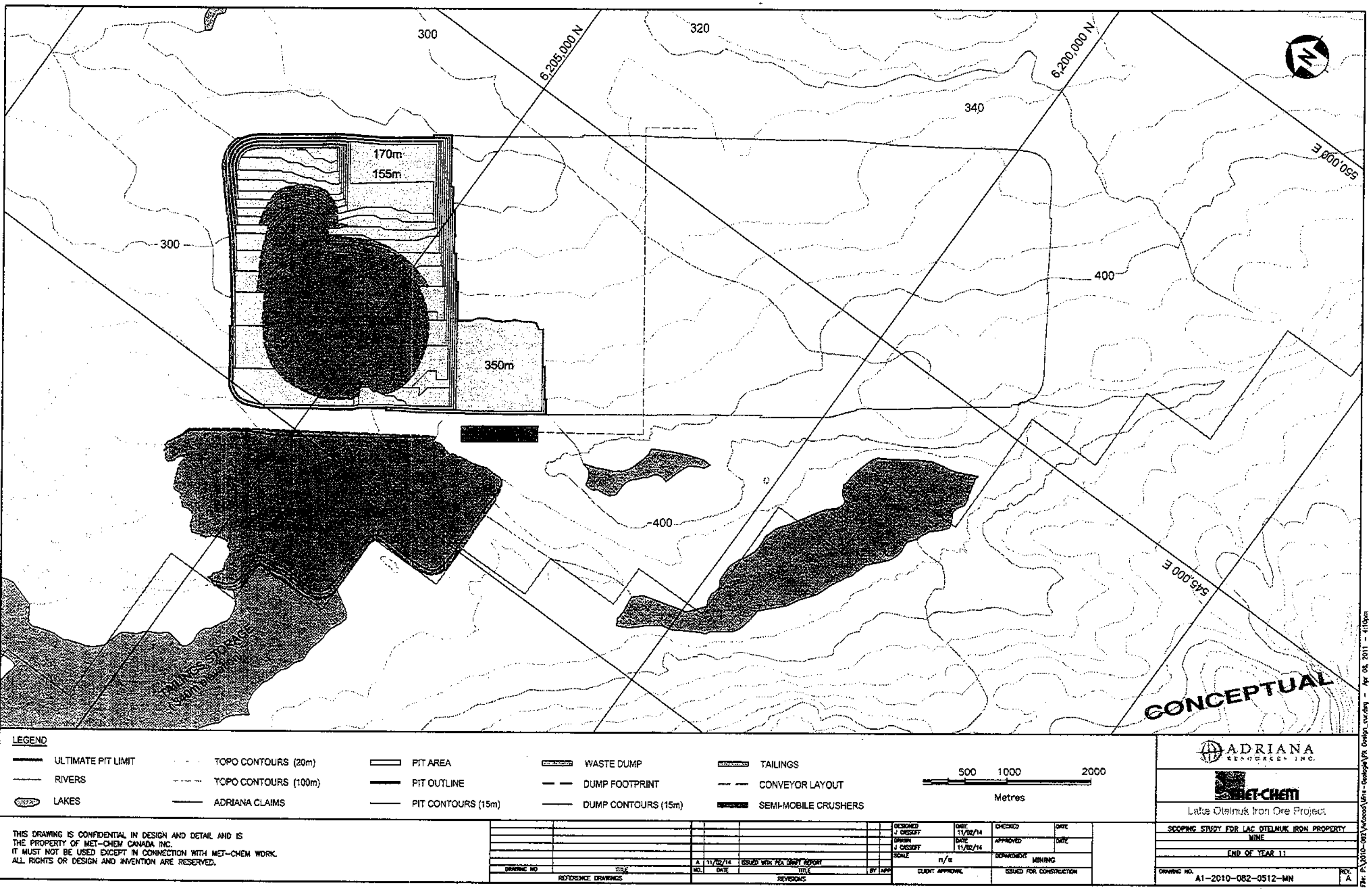
300
320
6,205,000 N
6,200,000 N
340
550,000 E
170m
155m
300
400
350m
400
545,000 E
CONCEPTUAL
LEGEND
ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS
500 1000 2000
Metres
ADRIANA RESOURCES INC.
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TITLE
REFERENCE DRAWINGS
A 11/02/14 ISSUED WITH PEA DRAFT REPORT
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REVISIONS
DESIGNED J DISSOFF DATE 11/02/14
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SCALE n/a
CHECKED DATE
APPROVED DATE
DEPARTMENT MINING
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SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 11
DRAWING NO. A1-2010-082-0512-MN
REV. A

LEGEND

ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

DRAWING NO	TITLE	NO.	DATE	TITLE	BY	APP
		A	11/02/14	ISSUED WITH PEA DRAFT REPORT		
REFERENCE DRAWINGS		REVISIONS				

DESIGNED J CASSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CASSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

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SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 14

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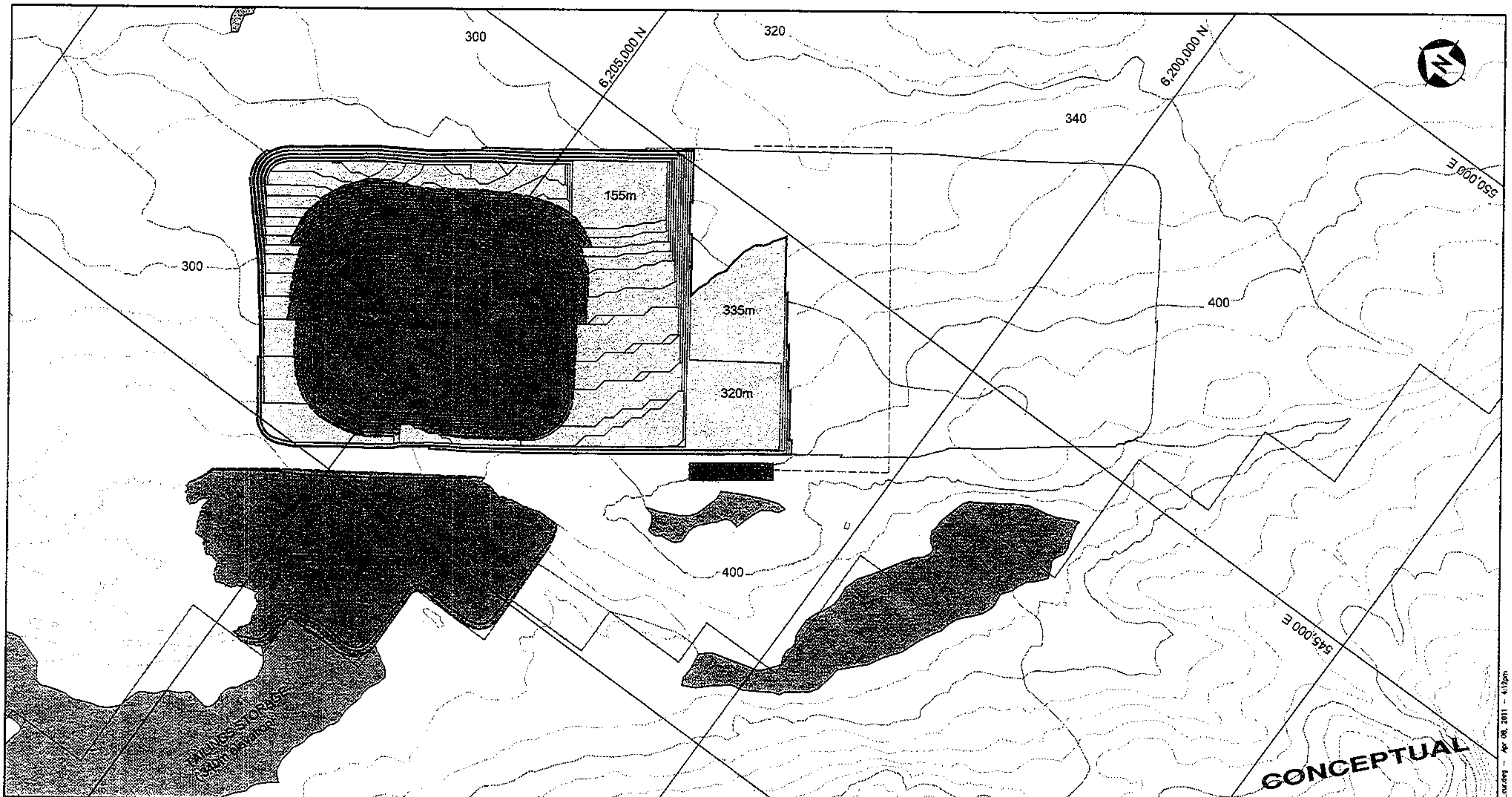

LEGEND

ULTIMATE PIT LIMIT	TOPO CONTOURS (20m)	PIT AREA	WASTE DUMP	TAILINGS
RIVERS	TOPO CONTOURS (100m)	PIT OUTLINE	DUMP FOOTPRINT	CONVEYOR LAYOUT
LAKES	ADRIANA CLAIMS	PIT CONTOURS (15m)	DUMP CONTOURS (15m)	SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PEA DRAFT REPORT		

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DESIGNED J CASSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CASSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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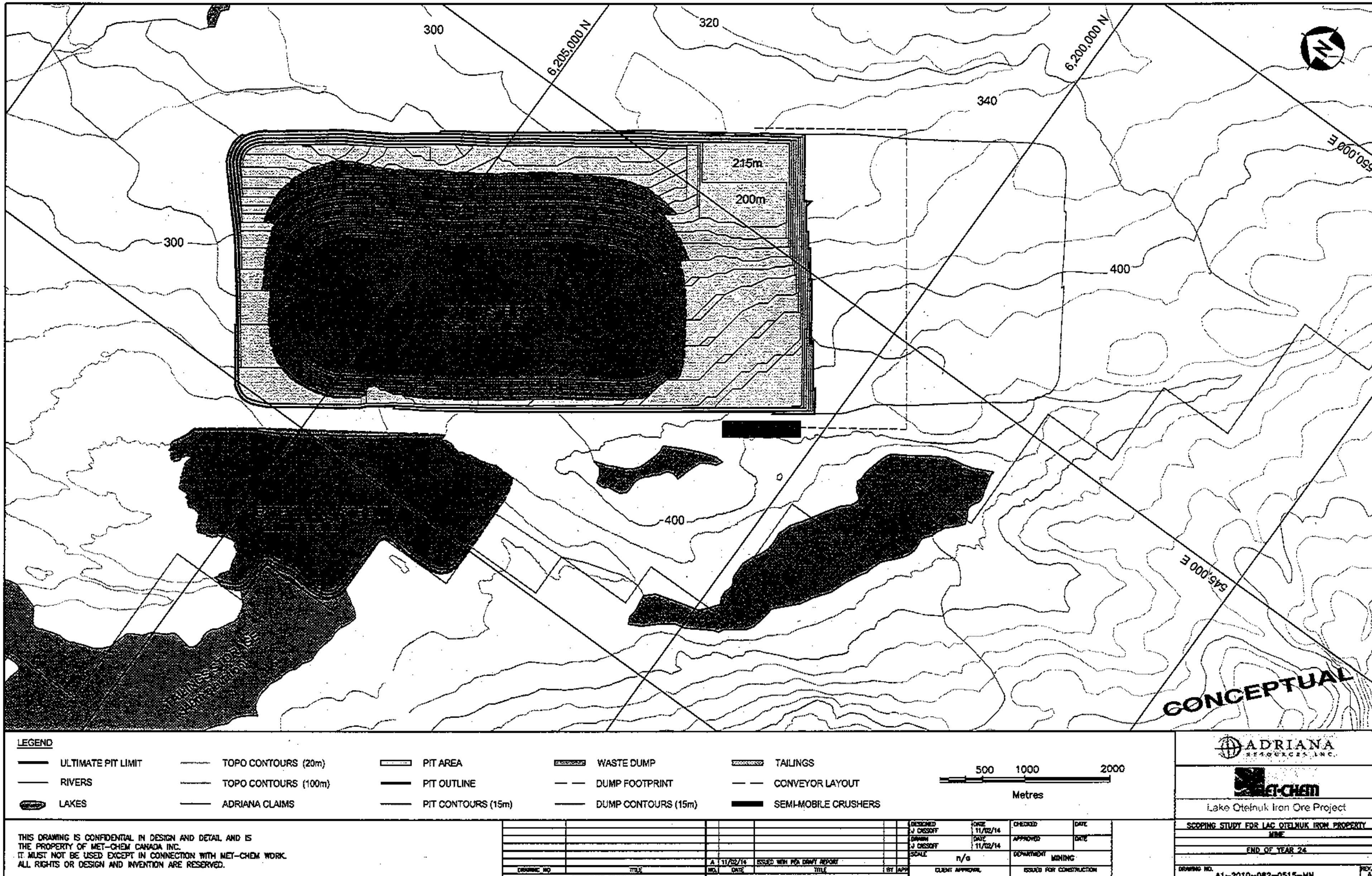
Lake Otelnuk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY MINE

END OF YEAR 19

DRAWING NO. A1-2010-082-0514-MN REV. A


300
320
340
400
6,205,000 N
6,200,000 N
550,000 E
545,000 E
215m
200m
CONCEPTUAL
LEGEND
ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS
500 1000 2000
Metres
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REVISIONS
DESIGNED J CASSOFF DATE 11/02/14
DRAWN J CASSOFF DATE 11/02/14
SCALE n/a
DEPARTMENT MINING
CLIENT APPROVAL
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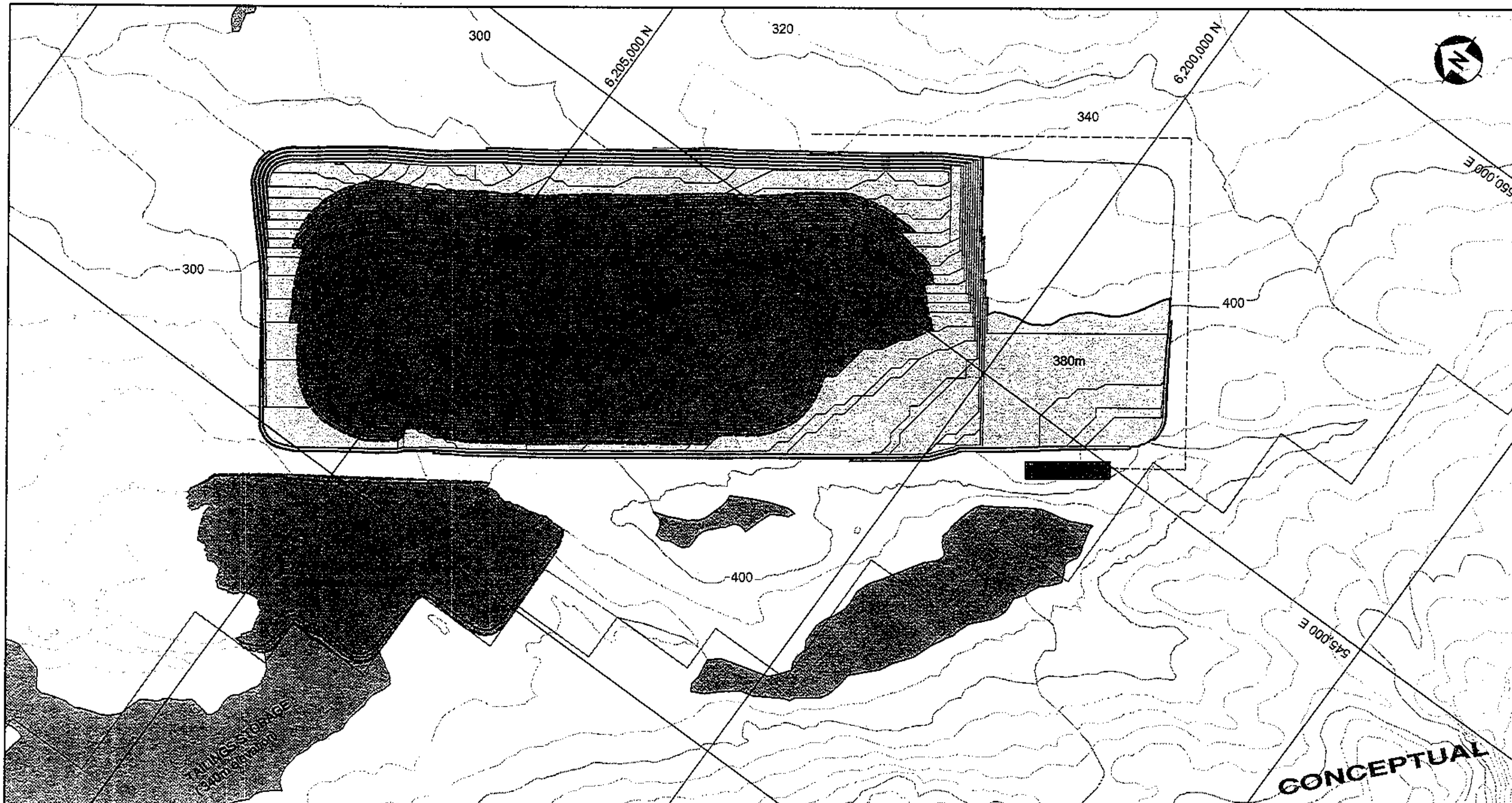
ADRIANA RESOURCES INC.
MET-CHEM
Lake Otelnuk Iron Ore Project
SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 24
DRAWING NO. A1-2010-082-0515-MN
REV. A



LEGEND

ULTIMATE PIT LIMIT
RIVERS
LAKES
TOPO CONTOURS (20m)
TOPO CONTOURS (100m)
ADRIANA CLAIMS
PIT AREA
PIT OUTLINE
PIT CONTOURS (15m)
WASTE DUMP
DUMP FOOTPRINT
DUMP CONTOURS (15m)
TAILINGS
CONVEYOR LAYOUT
SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

ADRIANA RESOURCES INC.

MET-CHEM

Lake Otelnuk Iron Ore Project

DRAWING NO	TITLE
REFERENCE DRAWINGS	

NO.	DATE	TITLE	BY	APP
A	11/02/14	ISSUED WITH PCI DRAFT REPORT		
REVISIONS				

DESIGNED J CRISSOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CRISSOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY MINE

END OF YEAR 29

DRAWING NO. A1-2010-082-0516-MN REV. A

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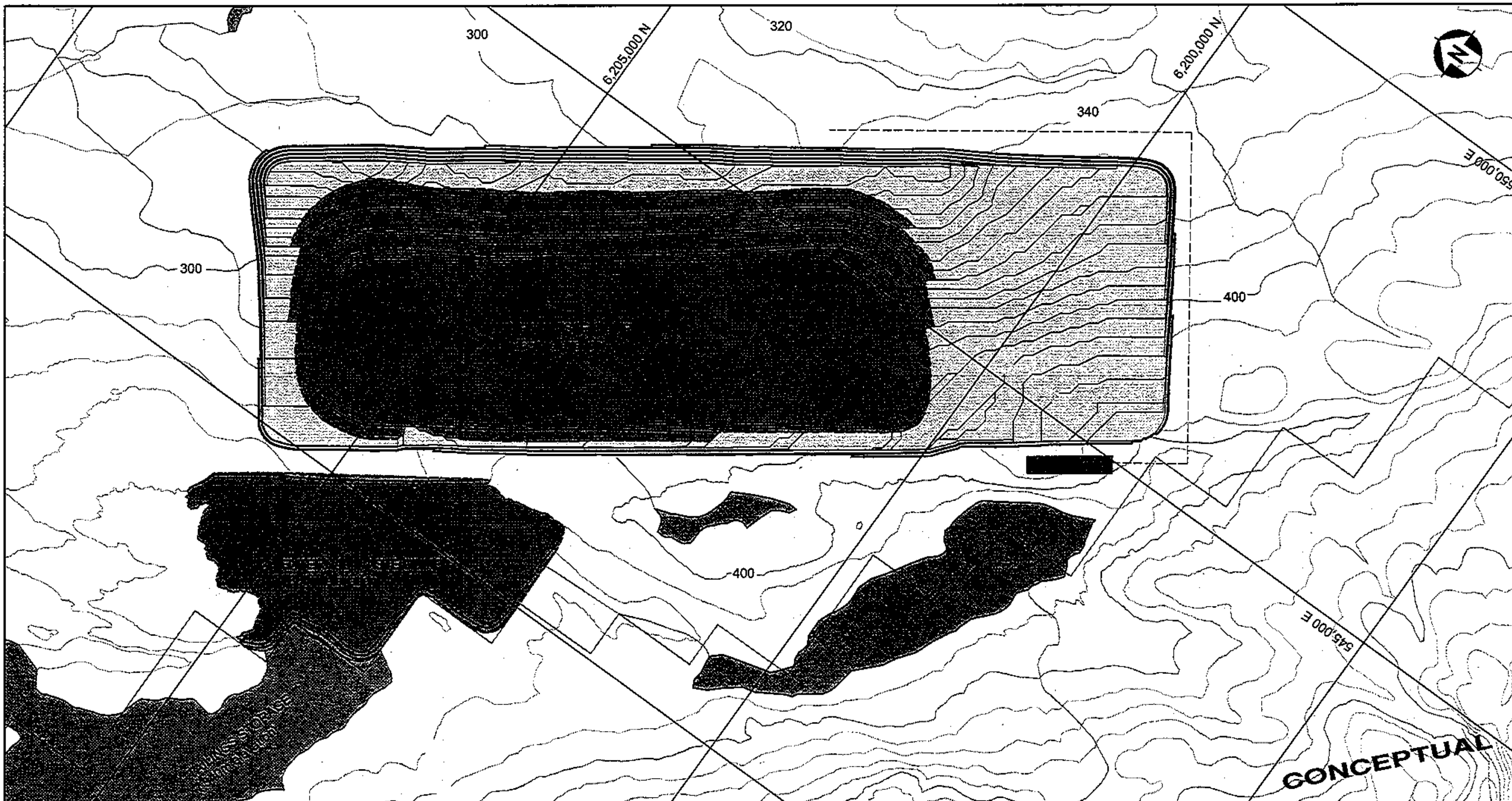

LEGEND

ULTIMATE PIT LIMIT	TOPO CONTOURS (20m)	PIT AREA	WASTE DUMP	TAILINGS
RIVERS	TOPO CONTOURS (100m)	PIT OUTLINE	DUMP FOOTPRINT	CONVEYOR LAYOUT
LAKES	ADRIANA CLAIMS	PIT CONTOURS (15m)	DUMP CONTOURS (15m)	SEMI-MOBILE CRUSHERS

500 1000 2000
Metres

REFERENCE DRAWINGS		REVISIONS			
DRAWING NO	TITLE	NO.	DATE	TITLE	BY APP
		A	11/02/14	ISSUED WITH PEA DRAFT REPORT	

DESIGNED J CRISOFF	DATE 11/02/14	CHECKED	DATE
DRAWN J CRISOFF	DATE 11/02/14	APPROVED	DATE
SCALE n/a		DEPARTMENT MINING	
CLIENT APPROVAL		ISSUED FOR CONSTRUCTION	

ADRIANA RESOURCES INC.

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Lake Oteluk Iron Ore Project

SCOPING STUDY FOR LAC OTELNUK IRON PROPERTY
MINE
END OF YEAR 34

DRAWING NO. A1-2010-082-0517-MN REV. A

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Appendix C – Detailed Mass Balance for Concentrator

MET-CHEM

Adriana Resources Inc.
Lac Otelnuk Iron Property
Material Balance
One of three identical Modules

2010-082
Revised: 2/10/2006

Flow No.	ITEM	Solids t/h	Water t/h	Solids %	Total t/h	Solids sp.gr.	Pulp M³/h	Pulp gpm	Pulp sp.gr.	Process Water, M³/h
Primary Crushers										
1	Primary Crushers Capacity	8326	258	97.0	8584	3.45				
Secondary Crushers										
2	New Feed to Secondary Crushers	8268	256	97.0	8524	3.45				
5	Screen Oversize	7658	237	97.0	7895	3.45				
3	Total Feed to Secondary Crusher	7658	237	97.0	7895	3.45				
4	Screen Feed	15926	493	97.0	16419	3.45				
5	Screen Oversize	7658	237	97.0	7895	3.45				
6	Screen Undersize(-50mm)	8268	256	97.0	8524	3.45				
HPGR's										
7	New Feed to HPGR	7695	238	97.0	7933	3.45				
11	Screen Oversize	6156	535	92.0	6691	3.45				
8	Total Feed to HPGR	13851	773	94.7	14624	3.45				
9	Screen Feed	13851	773	94.7	14624	3.45	4788			
10	Water to Screen	0	6000		6000	1.00	6000	26400	1.00	6000
11	Screen Oversize	6156	535	92.0	6691	3.45	2319	10205	2.88	
12	Screen Undersize	7695	6238	55.2	13933	3.45	8469	37262	1.65	
13	Water to pumpbox	0	3167		3167	1.00	3167	13934	1.00	3167
14	Pumped to Cobbers	7695	9405	45.0	17100	3.45	11635	51196	1.47	
Cobber Magnetic Separators										
15	Cobber Magnet Feed	7695	9405	45.0	17100	3.45	11635	51196	1.47	
16	Drum Wash Water	0	220		220	1.00	220	968	1.00	220
17	Cobber Magnet Tailings	3078	5847	34.5	8925	3.09	6847	30125	1.30	
18	Cobber Magnet Concentrate	4617	3778	55.0	8395	3.75	5009	22038	1.68	
Hydrosizer										
19	Hydrosizer Feed	3078	5847	34.5	8925	3.09	6844	30112	1.30	
20	Water to Hydrosizer Feed	0	1200		1200	1.00	1200	5280	1.00	1200
21	Hydrosizer Overflow	463	5304	8.0	5767	3.09	5454	23997	1.06	
22	Hydrosizer Underflow	2615	1743	60.0	4358	3.09	2590	11394	1.68	
22	Hydrosizer Overflow	463	5304	8.0	5767	3.09	5454	23997	1.06	
26	Water to Pumpbox	0	500		500	1.00	500	2200	1.00	500
27	Pumped to Tailings Launder	463	5804	7.4	6267	3.09	5954	26197	1.05	
Dewatering Cyclones										
18	Cobber Magnet Concentrate	4617	3778	55.0	8395	3.75	5009	22038	1.68	
28	Push Water (Cobber Concentrate)	0	800		800	1.00	800	3520	1.00	800
43	Rougher Screens Oversize	2770	923	75.0	3694	4.41	1552	6827	2.38	
29	Push Water (Rougher Screen O/S)	0	1000		1000	1.00	1000	4400	1.00	1000
30	Water to pumpbox	0	450		450	1.00	450	1980	1.00	450
31	Pumped to Dewatering Cyclones	7387	6951	51.5	14338	3.97	8810	38765	1.63	
32	Dewatering Cyclone Underflow	6471	2157	75.0	8628	3.97	3787	16663	2.28	
33	Dewatering Cyclone Overflow	916	4794	16.0	5710	3.97	5023	22103	1.14	
Ball Mills										
34	Ball Mill Feed	6471	2157	75.0	8628	3.97	3787	16663	2.28	
33	Dewatering Cyclone Overflow	916	4794	16.0	5710	3.97	5025	22109	1.14	
	Water to Pumpbox	0	738		738	1.00	738	3246	1.00	738
35	Pumped to Rougher Magnets	7387	7689	49.0	15076	3.97	9549	42018	1.58	

Rougher Magnetic Separators										
35	Pumped to Rougher Magnets	7387	7689	49.0	15076	3.97	9549	42018	1.58	
36	Water to Rougher Feed	0	1340		1340	1.00	1340	5896	1.00	1340
37	Rougher Magnet Feed	7387	9029	45.0	16416	3.97	10890	47914	1.51	
38	Drum Wash Water	0	300		300	1.00	300	1320	1.00	300
39	Rougher Magnet Tailings	2155	5048	29.9	7202	3.10	5743	25268	1.25	
40	Rougher Magnet Concentrate	5233	4281	55.0	9514	4.48	5449	23977	1.75	
Rougher Stacksizer Screens										
40	Rougher Magnet Concentrate	5233	4281	55.0	9514	4.48	5449	23977	1.75	
41	Water to Rougher Screens Feed	0	951		951	1.00	951	4186	1.00	951
42	Feed to Rougher Screens	5233	5233	50.0	10465	4.48	6401	28163	1.64	
43	Rougher Screens Oversize	2770	923	75.0	3694	4.43	1549	6816	2.38	
44	Rougher Screens Undersize	2462	4309	36.4	6772	4.54	4852	21347	1.40	
Deslimer										
44	Desliming Thickener Feed	2462	4309	36.4	6772	4.54	4852	21347	1.40	
45	Water to Deslimer	0	7000		7000	1.00	7000	30800	1.00	7000
46	Deslimer Overflow	115	8962	1.3	9077	3.10	8999	39595	1.01	
47	Deslimer Underflow	2347	2347	50.0	4695	4.62	2855	12564	1.64	
Finisher Magnetic Separators										
47	Deslimer Underflow	2347	2347	50.0	4695	4.62	2855	12564	1.64	
48	Water to Finisher Magnet Feed	0	2012		2012	1.00	2012	8853	1.00	2012
49	Finisher Magnet Feed	2347	4359	35.0	6707	4.62	4868	21417	1.38	
50	Drum Wash Water	0	210		210	1.00	210	924	1.00	210
51	Stage Repulping Water	0	3600		3600	1.00	3600	15840	1.00	3600
52	Finisher Magnet Tailings	269	6091	4.2	6361	3.10	6179	27185	1.03	
53	Finisher Magnet Concentrate	2078	2078	50.0	4156	4.93	2500	10998	1.66	
	Finisher concentrate push water	0	462		462	1.00	462	2032	1.00	462
Concentrate Thickener										
57	Finisher Concentrate	2078	2540	45.0	4618	4.93	2961	13030	1.56	
	Miscellaneous	0	200		200	1.00	200	880	1.00	200
61	Concentrate Thickener Feed	2078	2740	43.1	4818	4.93	3161	13910	1.52	
62	Thickener Overflow	0	1849	0.0	1849	1.00	1849	8137	1.00	
63	Thickener Underflow (to Storage Tank	2078	891	70.0	2969	4.93	1312	5773	2.26	
Tailings Thickener										
27	Pumped to Tailings Launder	463	5804	7.4	6267	3.09	5954	26197	1.05	
39	Rougher Magnet Tailings	2155	5048	29.9	7202	3.10	5744	25275	1.25	
	Deslimer Overflow	115	8962	1.3	9077	3.10	8999	39596	1.01	
52	Finisher Magnet Tailings	269	6091	4.2	6361	3.10	6178	27183	1.03	
65	Other Flows	0	1600		1600	1.00	1600	7040	1.00	1600
66	Total Tailings Thickener Feed	3002	27505	9.8	30507	3.10	28475	125290	1.07	
67	Tailings Thickener Overflow	0	23836	0.0	23836	1.00	23836	104878	1.00	
68	Tailings Thickener Underflow	3002	3669	45.0	6671	3.10	4639	20412	1.44	
Tailings Pumps										
68	Tailings Thickener Underflow	3002	3669	45.0	6671	3.10	4639	20411	1.44	
	Hydrosizer Underflow	2615	1743	60.0	4358	3.09	2589	11393	1.68	
69	Water to Tailings Pumpbox	0	205		205	1.00	205	902	1.00	205
70	Pumped to Tailings Pond	5617	5617	50.0	11234	3.10	7432	32700	1.51	

Total Process Water Used, m3/h **31,955**

Water Balance

			m^3/h
	Water in	238 m^3/h, with plant feed	
			238
	Water out	891 m^3/h, with filter cake	
		5617 m^3/h, with tailings	
			6508
		Water deficit	**6270**
		Process Water used	31,955
		Thickener overflows	25,685
		Water deficit	**6,270**

Appendix D – Pellet Plant Location Comparison Matrix

Pellet Plant Location Comparison

Element	Mine Site	Port Site	Comments
Material transport			
Material	Pellets	Concentrate	
Tonnage	50 MTPY	49.1 MTPY	Essentially the same tonnage
Cost	Same cost essentially		Transport cost based on tonnage.
Degradation during transport	Possible???	No	Less handling of pellets if Pellet Plant located closer to Port
Degradation during unloading	Possible???	No	
Dust during unloading	Minor dusting	More dust expected	
Product freezing in cars	Not an issue	During sub-zero transport	Need to remove moisture before sub-zero transport, or include thaw sheds
Unloading equipment			Similar equipment
Material Storage			
Concentrate	Slurry	Stockpile cake at Mine and Pellet plant	Need to dry concentrate before rail transport. Would probably want covered storage for the stockpiled dry concentrate.
Pellets	Stockpiles at Mine and Port	Stockpile at Port	The pellet stockpile at the mine site is mainly emergency.
Reclaiming equipment			Similar?
Energy availability			
Electricity	Power will be available; adjust accordingly	Should be power available. Able to tap existing supply for Port Facilities and Pellet Plant?	
Process fuel (coal or oil)	Transfer by railway?	Closer to Port and/or existing supplies?	Fuel needed for Pellet Plant or for dryers. Will need to add fuel tanker cars in either case.
Bulk reagents	Transfer by railway?	Closer to Port and/or existing supplies?	Quantity of limestone and bentonite?
Gasoline	Will need at the mine/concentrator site. Transfer by railway? Requirement?	Closer to Port. Existing facilities?	Quantity of gas?
Meteorological data			
Temperature	Sub-Arctic climate with temperatures averaging 12°C in July and -25°C in December. The average annual temperature is -6°C.	15.3°C in July; -11.3°C in December and -15.3°C in January with an average annual temperature of 0.8 °C	
Humidity	Average relative 75.5% (0600LST) Average relative 64.0% (1500LST)	Average relative 75.4% (0600LST) Average relative 67.3% (1500LST)	Similar relative humidity
Wind	Annual average 16.5 km/hr from the NW	Annual average 14.7 km/hr from the East	
Rainfall	Average 410 mm annually	Average 757 mm annually	Heavier rainfall along coast.
Snow	Average 440 cm annually	Average 412 cm annually	Similar
Wind Chill	Average 44.8 Days < -40 annually	Average 5.3 Days < -40 annually	
General	Winters are harsh and often lead to poor flying conditions. Generally speaking, exploration programs are not carried out in the winter months although theweather would not impact on a mining operation.		

P:\2010-082\Chiffriers\Procede\Pellet Plant Location\[Pellet Plant Location Comparison_CUR.xlsx]Matrix

Pellet Plant Location Comparison Cont'd

Element	Mine Site	Port Site	Comments
General	No road access to the Property; accessible from Schefferville via chartered fixed-wing float or ski-equipped aircraft.		
Trucking	Possibility from Caniapiscau	Available	
Passenger services	None, but will have to develop services	Established	
Port facility	None	Available or build capacity	
Air transport	Closest airport is Schefferville; Airport will have to be built regardless.	Established	
Water supply			
Availability	Yes	Yes	
Capacity	There is a more than adequate supply of water available for exploration and mining purposes.	Unknown	
Quality	-	-	
Cost of supply	-	-	
Cost of purification	-	-	
Waste disposal			
Existing facilities and capacity	No	Yes	
Permissible tolerance levels	Unknown	Unknown	
Need for additional capacity	Unknown	Unknown	
Labor supply	None locally; closest is small unskilled force in Schefferville	There is skilled and unskilled labor; however, might be in competion.	Will need to build a campsite or develop a town for mine/concentrator so additional Pellet Plant workforce 20-30% more.
Prevailing pay scales	-	-	
Restrictions on work hours	-	-	
Competing industries	No?	Yes?	
Competing facilities	Yes (Mine & Conc)	Yes?	
Local turnover rates	-	-	
Culture	-	-	
Skill	Not available locally	Available?	
Training requirements	Likely high	Perhaps less	
Productivity	-	-	
Safety and Environmental measures			
Occurance of natural events	-	-	
Fire hazards and response	-	-	
Medical facilities	-	-	
Community factors	No inhabitants; closet community is Schefferville	Local communities especially in Sept-Isle area	
Cultural facilities			
Established community	No	Yes	
Local government	Kativik Regional Government ("KRG")		
Municipal debt	-	-	

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Pellet Plant Location Comparison Cont'd

Element	Mine Site	Port Site	Comments
Site characteristics			
Topography	Topography is flat to gently rolling, with the occasional more precipitous area. A several kilometres long, northwest-southeast trending, 5-10 m high cliff face representing the surface exposure of the iron formation occurs on the northern half of the Property. Elsewhere on the northern half of the Property, there is reasonable exposure, while on the southern half of the Property there is less exposure. The elevation varies from 260 to 380 m above sea level and relief is 120 m. The Property is poorly drained, has extensive swampy areas and is covered by sparse northern boreal forest consisting of stunted spruce, alders and willows.	Low lying (< 100 m) around the Bay. Western side has marshy areas. Eastern side developed and established; IOC located in that area.	
Soils	-	-	
Cost of land	-	-	
Local building costs	-	-	
Living conditions	Harsh		
Availability of space	There is ample room available on the Property for the establishment of mining and processing operations, waste piles and a tailings management area.		
Space for expansion	Yes		
Taxation and legal restrictions			
Provincial taxes	-	-	
Local taxes	-	-	
Incentives	-	-	
Zoning	-	-	
Building codes	-	-	
Transportation	-	-	

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Appendix E – Concentrator Operating Costs

Operating Cost

The estimated annual operating costs for the concentrator, which starts with primary crushers at one end and ends with concentrate thickeners at the other, are summarized in the table below. These costs are broken down into four primary components: Energy, Manpower, Consumables and Maintenance. These costs were derived from supplier information, from Met-Chem's database or factored from similar operations.

Table A1. Summary

	Cost ($/yr)	Unit Cost	
		$/t of crude ore	$/t of pellets
Energy	77,368,322	0.42	1.55
Manpower	52,406,400	0.29	1.05
Consumables	131,914,308	0.72	2.64
Maintenance Supplies	30,286,878	0.17	0.61
Total Cost	**291,299,969**	**1.60**	**5.85**

Energy

In addition to the electrical power required for motors, pumps, etc., Bunker 'C' fuel oil will be used to produce steam to heat the building. The unit cost of electricity has been taken as $0.036/kWh. The Bunker C unit cost was taken from the internet on the market exchange, converted to Canadian dollars and increased to include transportation to the mine site. Details of the estimated annual costs are given in Table A2.

Table A2. Energy Cost

Electricity	Load (kW)	Hours/yr	MWh/yr	Cost ($/kWh)	Cost ($/yr)
Primary Crushers	10,329	5778	59,681.0	0.036	2,148,516
Secondary Crushers	11,214	5778	64,794.5	0.036	2,332,602
HPGR's	66,044	7884	520,690.9	0.036	18,744,872
Concentrator	183,412	7884	1,446,020.2	0.036	52,056,727
Tailings	1,808	7884	14,254.3	0.036	513,155
Sub-total					**75,795,872**
Fuel			**Tonnes /yr**	**Cost ($/t)**	
Bunker "C"			2,859	550.00	1,572,450
Total					**77,368,322**

Manpower

In the concentrator, which includes the crushers and tailing pumping, it is estimated that there will be 452 employees including maintenance personnel, for a total annual cost of $52.4 million. A summary of the distribution of manpower is presented in Table A3.

Table A3. Manpower

	Number of employees on site	Total number of employees	Total with 30% fringe ('000 $/yr)
Management	26	52	$ 6,593.60
Operating Labour	99	198	$15,795.00
Maintenance Labour	101	202	$17,994.60
Total Employees	226	452	$40,383.20
Sub-total			$40,383.20
Room and Board	$80./day/man		$ 6,599.20
Travel	6 trips/year/man at $2000./trip		$ 5,424.00
Total			**$52,406.40**

Concentrator Maintenance Supplies

The yearly maintenance supplies cost was pegged at 3% of the capital equipment cost, which is estimated to be about $1,009,652,616. The anticipated annual maintenance supplies cost is therefore $30,286,878.00.

Consumables

The basis for the consumables costs are described below and summarized in Table A4.

a) Crushers

The requirement for the mantles, concaves, bowls and tires for the different crushers was obtained from suppliers. For each of the six primary crushers the concaves and the mantles will have to be replaced 2 times a year.

For each of the secondary crushers, the mantles and the concaves (Bowls) will have to be replaced 3 to 4 times a year, say 3.5 times. There is a total of 12 secondary crushers, therefore the number of replacements will be 42.

b) High Pressure Grinding Rolls

The HPGR's will require 1 set of liner change per year. The tires are worth $1.5 million per set, which for 15 units amounts to $22.5 million per year. Other consumables such as cheek plates and lubricants will cost about $60,000.00 a year per unit or 900,000.00 per year.

c) Grinding Mills

The nine 8.5m dia. X 17m long ball mills will need a liner replacement about once a year. One set of liners will cost about $ 900,000.00

Balls will have to be added at least once per shift. Based on other iron ore operations, ball consumption should be approximately 0.03 kg/kWh for chromium balls. The total ball consumption will be 53,217 t/year at a cost of $1,600 per tonne.

d) Screen Decks

There are three different screening applications. The first screening application at the secondary crushers will require three estimated changes of the decks per year. There will be twelve screens for this duty and the total anticipated cost is $2,188,800 per year.

The HPGR screening application will need an estimated three changes of the screen deck per year. There will be thirty screens for this application and the total anticipated cost is $882,000.00

The fine screening in the closed circuit classification in each ball mill will be done by Stacksizer screens with five screen cloths each. Two hundred and sixteen units will be in operation in the plant. It is anticipated that the urethane screen media will have to be replaced three times per year for a total cost of $1,992,600.

e) Magnetic Drum Liners

The drum liners on the magnetic separators will have be replaced from time to time. The liners of the cobbers and the roughers will have a life of two and a half years, and each liner costs $3000.00. The average yearly cost for the cobbers and roughers, a total of 270 magnetic separators, and since these are single drum units there are also 270 drums, will be $324,000.

The drum liners of the finisher magnetic separators will have a life expectancy of four years. There is a total of 81 finisher magnetic separators and since these are three drum units, there is a total of 243 drums. The average yearly cost for the finisher drum liners will be $ 183,000.

f) Reagents

The only reagent used in the concentrator will be tailings thickener flucculant. Some 71 million tonnes will be processed per year in three tailings thickeners. Previous preliminary tests indicated that 22 grams of flocculant will be required per tonne of tailings. The total requirement for flocculant will therefore be 1,562,000 kg per year and, at a unit cost of $3.50 per kilogram, the total annual cost will be $4,686,000.

Table A4. Consumables					
	Consumption /unit	**Units**	**Total Number of Items**	**Cost per Item $**	**Total ($/yr)**
Primary Crushers	**Set/year/unit**		**Sets/yr**	**Cost/set**	
Mantles and Concaves	2	6	12	$137,100	1,645,200.00
	Buckets/set	# of sets	# of Buckets	$/Bucket	
Epoxy	635	12	7620	97	739,140.00
Secondary Crushers	**Set/year/unit**		**Sets/yr**	**Cost/set**	
Mantles and Bowls	3.5	12	42	$60,500	2,541,000.00
	Buckets/set	# of sets	# of Buckets	$/Bucket	
Epoxy	32	42	1344	97	130,368.00
Secondary Crusher Screens	**Set/year/unit**		**Sets/yr**	**Cost/set**	
Screen (double deck)	3	12	36	$60,800	2,188,800.00
HPGR's	**Set/year/unit**		**Sets/yr**	**Cost/set**	
Tires	1	15	15	1,500,000	22,500,000.00
Others	1	15	15	60,000	900,000.00
HPGR Screens	**Decks/year/ unit**		**Decks/yr**	**Cost/deck**	
Screen Medium	3	30	90	9,800	882,000.00
Ball Mills	**Set/year/unit**		**Sets/yr**	**Cost/set**	
Liners	1	9	9	895,000	8,055,000.00
	Kg/kWh	kW installed	Tonnes/yr	Cost/tonne	
Grinding Media	**0.03**	**225,000**	**53,217**	**1,600**	**85,147,200.00**
Stacksizers	**Decks/year/u nit**		**Decks/yr**	**Cost/deck**	
Screen Medium	**3**	**216**	**2160**	**922.50**	**1,992,600.00**
Magnet Drum Liners	**Set/year/unit**	**No. Of Drums**			
Cobbers	0.4	126	50.4	3000	151,200.00
Roughers	0.4	144	57.6	3000	172,800.00
Finishers	0.25	243	61	3000	183,000.00
Reagents	**g/t**	**Tonnes (10^6)**	**kg/yr**	**$/kg**	
Flocculant	22	71.0	1,562,000	3.50	4,686,000.00
Total Consumables					**131,914,308.00**
Cost per Ton of Pellets					**2.64**

Tailings Pond Operating Cost

The operating costs of disposing of the process plant tailings is mainly composed of electric power to operate the tailings pumps and manpower, covering tailings line pump attendants and repairmen. All those costs are included in the appropriate concentrator costs.

The cost of the periodic raising of the tailings dikes and the lengthening of the pipes will be significant, but it was considered in the capital cost and therefore was included with the annual provision for sustaining capital every operating year.

Appendix F – Pellet Plant Manpower

ADRIANA RESOURCES INC. 2011			
MANNING TABLE			
Rev1, Jan 31, 2011	17 M Tonnes, 2 Lines, 2 shifts		
Position	Day	Shift	Total
General Administration and Services			
Plant Manager	1		2
Operation Superintendent	1		2
Chief Process Engineer	1		2
Process Engineer	2		4
Maintenance Superintendent	1		2
Security Guard	1	4	10
Shipping Coordinator	1		2
Training Supervisor	1		2
First Aid Attendant	1		2
Quality Control	1		2
Secretary	3		6
Process Clerk	3		6
Accounting Clerk	2		4
Warehouse Clerk	2		4
Total Management	**21**	**4**	**50**
Pellet Plant			
Yard Foreman	1		2
Shift Foreman		2	4
Control Room Operator		4	8
Stacker Operator		0	0
Slurry Reception and Bentonite Plant Attendant		2	4
Filter Attendant		4	8
Balling Attendant		4	8
Burner Attendant		2	4
Induration & Screening Attendant		4	8
Technician		2	4
Lab Technician	2	2	8
Laborer	3	6	18
Equipment Operators	2	2	8
Total Pellet Plant	**8**	**34**	**84**
Maintenance			
Plant Engineer	1		2
Mechanical Foreman	2		4
Electrical Foreman	1		2
Instrumentation Foreman	1		2
Shop Foreman	1		2
Mechanical Planner/Inspector	2		4
Electrical Planner/Inspector	2		4
Feed & Wet Section Maintnance	8	2	20
Yard & Induration Section Maintnance	8	2	20
Shop Trades	8		16
Electrician	4	2	12
Instrument Man	4	2	12
Helper	6	2	16
Maintenance Clerk	2		4
Equipment Operators	3		6
Total Maintenance	**53**	**10**	**126**
Plant Total	**82**	**48**	**260**

Appendix G – Economic Analysis Base Case

Adriana Resources Inc.
Lac Otelnuk Iron Ore Project
Preliminary Economic Evaluation
Option - 50 Mtpy

Description	Factor	Units	Total																																							
Mining																																										
Depletion																																										
Ore Tonnage		Mt	5,975.6	5,975.6	5,975.6	5,975.6	5,975.6	5,975.6	5,975.6	5,943.0	5,874.4	5,799.1	5,635.8	5,441.8	5,247.6	5,053.3	4,859.1	4,680.4	4,501.7	4,322.9	4,134.2	3,937.5	3,746.8	3,550.0	3,371.2	3,184.3	2,997.5	2,810.7	2,617.0	2,423.2	2,229.5	2,035.7	1,842.0	1,656.3	1,470.6	1,284.9	1,099.1	913.4	730.7	548.1	365.4	182.7
Waste Tonnage		Mt	4,366.7	4,366.7	4,366.7	4,366.7	4,366.7	4,366.7	4,291.9	4,266.8	4,259.4	4,189.6	4,118.4	4,027.2	3,887.7	3,748.5	3,608.8	3,458.0	3,307.1	3,156.3	3,025.4	2,890.4	2,757.5	2,613.6	2,469.8	2,325.9	2,182.1	2,056.2	1,876.8	1,715.3	1,553.9	1,392.4	1,231.0	1,091.0	952.7	813.6	674.5	535.4	420.5	321.2	214.1	107.1
Production																																										
Ore Tonnage																																										
2a		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2b		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2c		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3a		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3b		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Waste																																										
Low Grade		Mt	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Waste		Mt	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total		Mt	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stripping Ratio			[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Process																																										
Weight Recovery		%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Concentrate Production																																										
Tonnage		Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dry Tonnage	2.0%	Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pellets																																										
Tonnage	1.0175	Mt	[illegible]	0.0	0.0	0.0	0.0	0.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Economics																																										
Capital Expenditures																																										
Total CAPEX		MCAD$	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Closure Costs		MCAD$	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Capital Expenditures	1.0	MCAD$	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Operating Costs																																										
Unit Operating Costs																																										
Mining		CAD$/t ore		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Concentrator		CAD$/t pellet		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tailings		CAD$/t pellet		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pellet Plant		CAD$/t pellet		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Railway		CAD$/t pellet		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G&A		CAD$/t pellet		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Yearly Operating Costs																																										
Mining		MCAD$	11,303.0	0.0	0.0	0.0	0.0	232.8	99.1	126.7	296.4	266.3	340.9	373.6	373.6	373.6	362.7	362.7	362.7	339.3	339.3	339.3	343.4	343.4	343.4	343.4	343.4	362.4	362.4	362.4	362.4	362.4	339.0	339.0	339.0	339.0	339.0	309.2	309.2	309.2	309.2	309.2
Concentrator		MCAD$	8,984.2	0.0	0.0	0.0	0.0	0.0	50.2	111.2	179.3	200.9	271.5	280.6	280.6	280.6	279.6	279.6	279.6	281.8	281.8	281.8	281.8	281.8	281.8	281.8	281.8	282.1	282.1	282.1	282.1	282.1	279.2	279.2	279.2	279.2	279.2	284.9	284.9	284.9	284.9	284.5
Tailings		MCAD$	165.9	0.0	0.0	0.0	0.0	0.0	3.9	3.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	5.0	5.0	5.0	5.0	5.0
Pellet Plant		MCAD$	16,721.8	0.0	0.0	0.0	0.0	0.0	102.4	262.8	329.5	379.8	394.4	322.7	322.7	322.7	320.8	320.8	320.8	325.0	325.0	325.0	325.0	325.0	325.0	325.0	325.0	325.5	325.5	325.5	325.5	325.5	320.1	320.1	320.1	320.1	320.1	330.6	330.6	330.6	330.6	330.6
Railway		MCAD$	7,969.8	0.0	0.0	0.0	0.0	0.0	60.3	99.1	162.5	171.3	237.0	245.3	245.3	245.3	244.4	244.4	244.4	246.4	246.4	246.4	246.4	246.4	246.4	246.4	246.4	246.6	246.6	246.6	246.6	246.6	244.1	244.1	244.1	244.1	244.1	249.0	249.0	249.0	249.0	249.0
Port		MCAD$	1,951.2	0.0	0.0	0.0	0.0	0.0	10.1	20.5	34.5	40.1	57.2	60.0	60.0	60.0	59.8	59.8	59.8	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.5	60.5	60.5	60.5	60.5	59.7	59.7	59.7	59.7	59.7	60.9	60.9	60.9	60.9	60.9
G&A		MCAD$	2,344.5	0.0	0.0	0.0	0.0	0.0	26.8	43.8	61.4	69.9	85.4	85.4	85.4	85.4	85.1	85.1	85.1	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.4	85.5	85.5	85.5	85.5	85.5	84.6	84.6	84.6	84.6	84.6	86.3	86.3	86.3	86.3	86.3
Total Operating Costs	1.0	MCAD$	49,720.0	0.0	0.0	0.0	0.0	232.8	378.8	698.1	1,089.5	1,124.1	1,301.4	1,574.6	1,574.6	1,574.6	1,557.3	1,557.3	1,557.3	1,543.1	1,543.1	1,543.1	1,547.3	1,547.3	1,547.3	1,547.3	1,547.3	1,567.4	1,567.4	1,567.4	1,567.4	1,567.4	1,531.5	1,531.5	1,531.5	1,531.5	1,531.5	1,526.9	1,526.9	1,526.9	1,526.9	1,526.9
Revenue		MCAD$	167,226.7	0.0	0.0	0.0	0.0	0.0	849.6	1,796.7	3,194.2	3,510.3	5,001.6	5,252.4	5,252.4	5,252.4	5,233.0	5,233.0	5,233.0	5,275.1	5,275.1	5,275.1	5,274.9	5,274.9	5,274.9	5,274.9	5,274.9	5,279.8	5,279.8	5,279.8	5,279.8	5,279.8	5,225.4	5,225.4	5,225.4	5,225.4	5,225.4	5,331.7	5,331.7	5,331.7	5,331.7	5,331.7
Cash Flow		MCAD$	103,085.3	-10.0	-199.2	-426.7	-2,608.4	-4,032.0	-1,011.9	-396.6	905.3	712.9	3,327.9	3,654.1	3,654.1	3,654.1	3,662.6	3,662.6	3,662.6	3,709.6	3,709.6	3,709.6	3,696.9	3,696.9	3,696.9	3,696.9	3,696.9	3,647.5	3,647.5	3,647.5	3,647.5	3,647.5	3,630.7	3,630.7	3,630.7	3,630.7	3,630.7	3,805.7	3,805.7	3,805.7	3,805.7	3,805.7
Cumulative Cash Flow		MCAD$		-10.0	-209.2	-636.0	-3,244.3	-7,276.4	-8,288.3	-8,685.1	-7,779.8	-7,066.6	-3,737.7	-83.6	3,570.4	7,224.5	10,887.1	14,349.7	18,912.3	21,721.8	25,431.4	29,141.0	32,837.9	36,534.9	40,231.8	43,928.7	47,625.7	51,273.2	54,920.7	58,568.2	62,215.7	65,863.2	69,093.9	73,124.7	76,779.4	80,410.1	84,040.8	87,852.5	91,648.2	95,473.9	99,279.6	103,085.3
Discount Rate	1.0	%	8%																																							
NPV		MCAD$	27,432																																							
Cumulative NPV		MCAD$		-9.5	-180	-476	-2,095	-5,139	-5,877	-6,229	-5,719	-5,242	-3,429	-2,203	-902	342	1,799	2,945	4,082	5,015	5,962	6,880	7,296	8,336	9,010	9,640	10,222	10,756	11,249	11,702	12,126	12,520	12,883	13,216	13,556	13,913	14,077	14,336	14,575	14,795	15,000	15,189
IRR		%	20.0%																																							
Payback Period		Years	[illegible]																																							