

# GLADSTONE PACIFIC NICKEL LTD

## GLADSTONE NICKEL PROJECT

**Benefiting from Regional Resources, Australian Infrastructure,  
Proven Technology and Chinese Project Implementation**

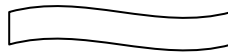


**ALTA 2008 NICKEL/COBALT CONFERENCE**

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## ABSTRACT

Gladstone Pacific Nickel Limited (GPNL) owns a substantial saprolitic nickel laterite resource at Marlborough, Queensland, and has 49% joint venture ownership of a substantial limonitic nickel resource at Ouinné, New Caledonia. It intends to construct one of the world's largest nickel refineries in the Yarwun Precinct of the Gladstone State Development Area adjacent to the deepwater Port of Gladstone in central Queensland. The refinery will incorporate the now well proven technologies of High Pressure Acid Leach, Sulphide Precipitation, and Metal Refining (including re-leach, solvent extraction and hydrogen reduction). GPNL has signed an MOU with China Metallurgical Construction (Group) Corporation ("MCC") under which MCC will provide a commercial offer for construction and financing of the Project, with the potential to establish an off-take agreement. GPNL will be responsible for operation of the Project.



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## 1.0 INTRODUCTION

Gladstone Pacific Nickel Ltd (GPNL) was originally founded in 2003 as the Pearce Matheson Group Pty Ltd (PMG). The objective of PMG was to develop the Gladstone Nickel Project (GNP) based on ore from twelve mining leases (MLs) held by Marlborough Nickel Pty Ltd (MNPL) in Stage 1 and imported ore from the SW Pacific in Stage 2. PMG acquired MNPL from Preston Resources Limited, which owned IP, those 12 MLs, existing environmental approvals, and a Native Title Agreement. (The company has subsequently purchased a further 4 MLs from Candala Resources, and has also applied for 4 MDLs to securely access relevant mining rights in the vicinity).

GPNL is a public company, which listed on the Alternative Investment Market (AIM) of the London Stock Exchange, 17 March 2005 after raising £11 million. At listing, GPNL had a capital valuation of £36 million.

As a result of raising £11 million on the AIM, GPNL was able to proceed with seeking environmental approval for the GNP and undertook a Definitive Feasibility Study (DFS).

The DFS focussed on Stage 1 of the GNP, which was based solely on ore from Marlborough and was designed to produce up to 50,000 t/a nickel and 1,600 t/a cobalt. The project incorporated a beneficiation plant near the Marlborough deposits, with a slurry pipeline to transport the ore 180km to the refinery at Gladstone. This study was completed late 2006.

Late in 2006, GPNL's board of directors decided to bring forward the introduction of offshore ore to benefit from blending of higher grade New Caledonia with the lower grade ore from Marlborough. The commencement of studies on the new Wiggins Island Wharf, and New Caledonian Government support for limonite exports, together with good progress towards accessing New Caledonian laterites for the project, all contributed to this strategy. This decision resulted in the DFS being developed further into an integrated Definitive Feasibility Study (iDFS), which was based on the treatment, after beneficiation of 3.73 Mt/a New Caledonian ore and 1.25 Mt/a Marlborough ore with a revised output for Stage 1 of 63,000 t/a nickel and 6,000 t/a cobalt. The iDFS was completed in December 2007.

A considerable amount of metallurgical testwork has been completed over the years, including continuous pilot testing of the high pressure acid leach (HPAL) and parallel atmospheric pressure leach, treating ore from both Marlborough and New Caledonia. There have been no results indicating unusual response from these ores and although further work is in progress to optimise certain aspects of the process, there is sufficient data for the project to proceed confidently into Front End Engineering Design (FEED).

It is the intent of GPNL that the project embraces the concepts of sustainable development. Seawater will be used in the process to minimise fresh water demand. By utilising a hydrometallurgical process and recovering much of the



energy released in the production of sulphuric acid for power generation, the project will have lower greenhouse gas emissions than most nickel producers. Furthermore, potential waste disposal synergies with local alumina producers will be investigated to minimise environmental impact.

In April and May 2007 the Environmental Impact Statement (EIS) was submitted for 'public display'. In February 2008, an EIS Supplement was submitted in response to all comments received from the public and Government agencies, and EPA approval for the project is now imminent.

By August 2007, a Joint Venture agreement had been signed with Société Minière Georges Montagnat. In March 2008, the new Joint Venture Company, Ouinné SAS, was established with 100% ownership of the Ouinné deposit in New Caledonia. GPNL has a 49% ownership of the Joint Venture. Recently the JV was granted Autorisation Personelle Minière (APM), which means the company has been approved as an entity that has the right to mine in the Southern Province of New Caledonia.

Late in 2007, following a restructure of the Board, a Memorandum of Understanding (MOU) was signed with China Metallurgical Construction Company (MCC), who consequently has until late July 2008 to present a proposal for turnkey construction & financing of the Gladstone Nickel Project.

In recognition of the importance of the GNP, the Queensland Government, in November 2005, declared Stage 1 of the project a "significant project" under the *State Development and Public Works Organisation Act, 1991*. In June 2006, the Federal Minister for Industry, Tourism and Resources, the Hon Ian Macfarlane MP, granted the project Major Project Facilitation Status.

The GNP will be developed in three stages:

- Stage 1 will produce 63,000 t/a nickel (LME grade briquettes) and 6,000 t/a of cobalt (also as metal briquettes). High Pressure Acid Leach (HPAL) will be used for the limonitic ore along with atmospheric leach for the saprolitic ore.
- Stage 2 will duplicate Stage 1, approximately doubling the output to 126,000 t/a of nickel and 12,000 t/a of cobalt. Environmental approval is being sought for Stage 2 from the outset.
- Stage 3 will potentially be able to re-double the size of the plant, subject to market needs, and would use mainly imported ore.

## **2.0 PROJECT UPDATE**

The project has been described previously (ALTA 2006, Park and Becker). Therefore, recent developments only are given below.

## **2.1 *Technical and Engineering***

The geology and mining of Marlborough has been well described previously, but its perspective is Section 3.1 below.

New Caledonian ore resources are described in Section 3.2. There are many laterite deposits in the SW Pacific (especially on the East Coast of New Caledonia) that are of good quality, but not of the size to justify their own treatment facilities. In concert with Gladstone Pacific Nickel, these deposits become part of a viable project, and create small business development opportunities for stakeholders, without the worry of investment in significant infrastructure or waste disposal in difficult environmental and climatic conditions.

With GPNL now having part ownership of the Ouinné deposit in New Caledonia, the first phase of the project has switched to processing of ores from both New Caledonia and Marlborough (the previous plan was to initially only treat the latter). The project thus benefits from the ability to process higher grade limonitic ore from Ouinné through the pressure leach whilst taking advantage of an atmospheric leach to treat the more saprolitic ore from Marlborough. This configuration, which is expected to suit a wide range of limonitic ores from the region, was successfully piloted in 2007 using ore from alternative sources in New Caledonia.

The consequential reduction in the annual quantity of Marlborough ore being treated has led to a re-evaluation of the mode of transport of that ore to the Yarwun refinery. Rather than installation of a slurry preparation plant at Marlborough, with all the ancillary infrastructure, it is now intended that the ROM ore be railed to a beneficiation plant at Yarwun. This will obviate the need for the 180 km slurry pipeline.

The Wiggins Island coal export wharf will facilitate the import of the large tonnages of ore required to satisfy all stages of the Gladstone Nickel Project through assignment of infrastructure and berth space for this purpose.

## **2.2 *Land, Environmental and Cultural Considerations***

### **2.2.1 *Yarwun and Aldoga***

The Company has entered into purchase arrangements with the Queensland State Government for the 250 hectare refinery site at Yarwun, and the approximately 2,000 hectare residue storage facility at Aldoga (both within the Gladstone State Development Area). The Queensland State Government is currently preparing an Assessment Report which will outline the conditions under which the project may proceed. The release of this report is imminent (June 08).

### 2.2.2 *Marlborough Environment*

The activities planned at Marlborough have existing approvals which will require minor amendments. These are based on an original EIS from 1998 and a subsequent Environmental Authority (EA) of August 2003. For the planned haul road and rail load-out option, environmental studies have been carried out recently. These will be included in updated information to be provided to authorities during requests for amendment of the EA and related documentation (environmental management overview strategy (EMOS) now known as environmental management Plan (EMP)).

### 2.2.3 *New Caledonian Permitting*

There are several stages of approvals required for the progression of mine development for the activities proposed for New Caledonia. For exploration, a relatively minor level of environmental assessment is required. However, to obtain a mining operations permit, a complete environmental impact study has to be prepared. The current focus is on the Quinné area and is based on the following timing:

- Ongoing baseline fieldwork Q4 2007 – Q3 2008.
- Declaration for mine permit Q4 2008.
- Other approvals will be required once sufficient design details are available: Industrial activities (ICPE) and coastal land use (DAODPM) Q1 2009

### 2.2.4 *Cultural Heritage/Native Title*

The table below summarises the status of the different agreements required in the different areas impacted by the project.

**Native Title and Cultural Heritage**

Agreement	Mining Leases	Marlborough Project Area	Pipeline to Raglan Creek	Pipeline/Refinery Gladstone Area
(TO Group)	(Darumbal, & BBKY)	(Darumbal, BBKY & Jetimarala)	(Darumbal)	(PCCC)
Native Title	Project Agreement in place (1999)	ILUA signed July 2006. Registered 17 July 2007	ILUA In negotiation (compensation basis agreed)	ILUA to be drafted in those areas external to the GSDA
Cultural Heritage	In place (1999)	In place (1999)	CHIMA signed 11 July 2006. DNRW approval 26 July 2006	CHIMA signed 16 March 2007. DNRW approval 10 May 2007

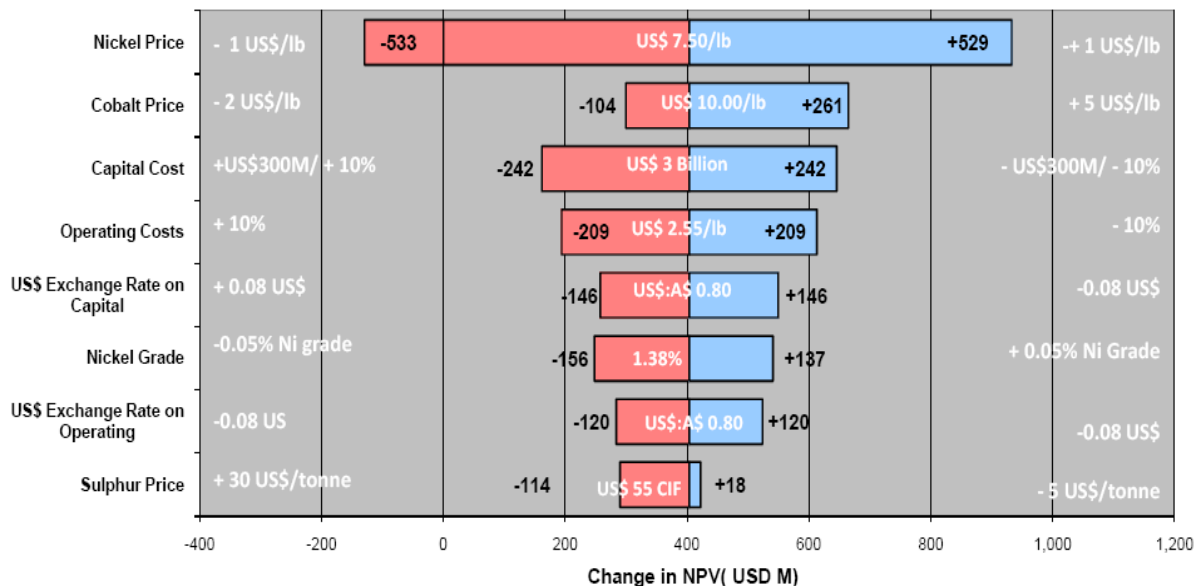
It should be noted that the 1999 Project Agreement has resulted in what can be described as one of the most successful arrangements between a mining company

and Traditional Owners. It has spawned Coorumburra Rural Enterprises – an extremely viable and profitable cattle-raising business.

No specific legislation exists for dealing with cultural heritage issues in New Caledonia. However, cultural heritage issues potentially relevant to the Ouinné area are being assessed as part of the information required to be presented to the New Caledonian mines department for mine development approval. Other potential ore supply areas in New Caledonia will also be investigated later this year.

### 2.3 Project Financial Assessment

Gladstone Nickel Project NPV and sensitivities as estimated for the integrated Definitive Feasibility Study:



### 3.0 REGIONAL RESOURCES

Gladstone is close to 70% of the world's laterite resources. It is thus an ideal location to install a refinery capable of not only feeding off the Marlborough resources, but also the many limonite resources scattered around the SW Pacific. Having a central refinery may well allow exploitation of many smaller deposits that would not be able to justify a refinery in their own right.

The availability of several ore sources will ensure that a centrally located refinery will survive for the long haul and will also mitigate the risk of lost production due to unscheduled interruptions from any single source, no matter what the cause.



### **3.1**      *Marlborough*

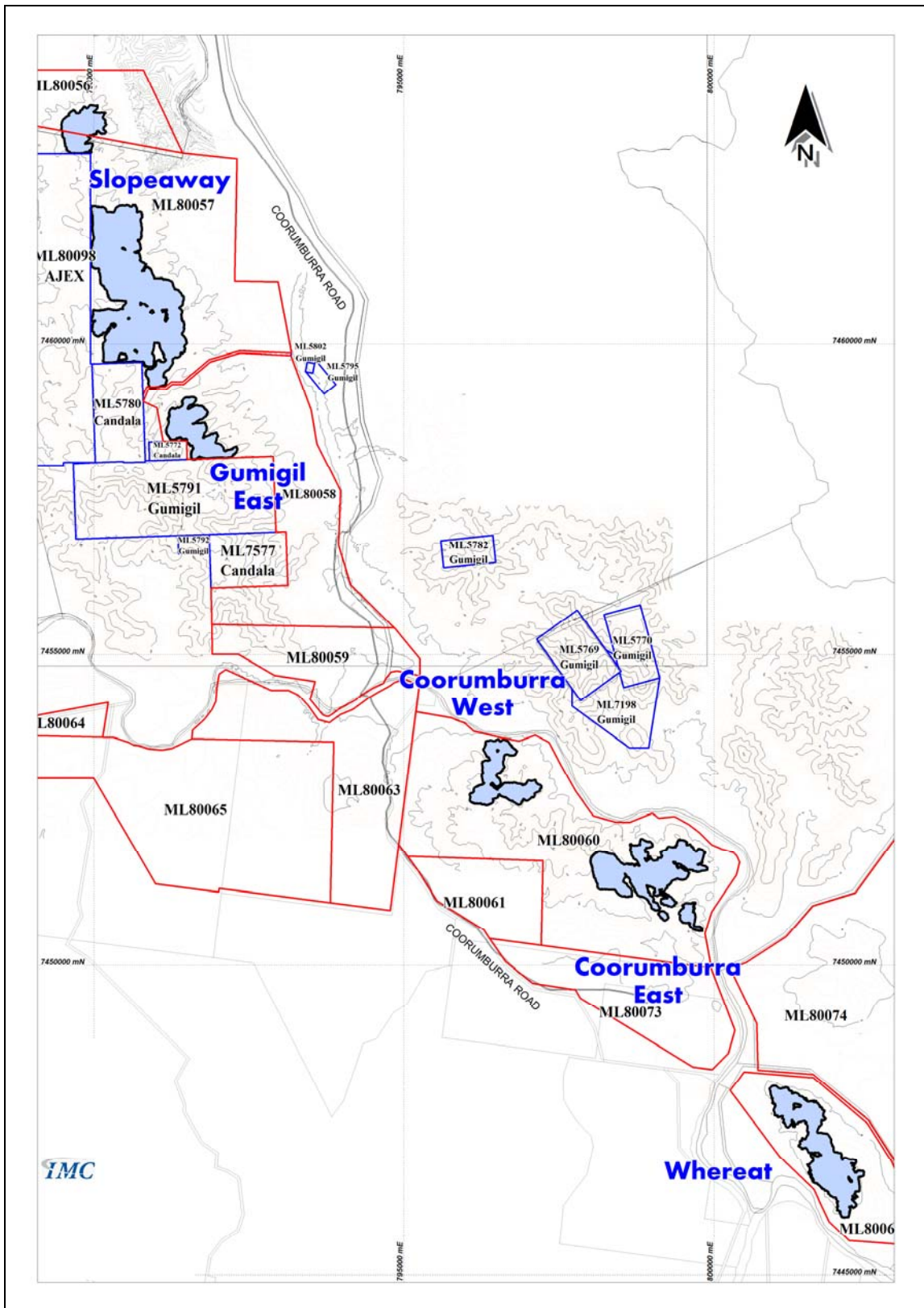
The Marlborough nickel deposits occur along a northwest-southeast trending belt centred approximately 70 km northwest of Rockhampton in Central Queensland over an area of 40 km by 20 km. Thirteen laterite bodies, known as the Slopeaway, Gumigil East, Magpie, Wattle Hill, Coorumburra (East, Central and West), Whereat, Woodstock, Kurrawong, Surfers, Moores, and Lagoon Hill deposits, extend over a distance of 40 km within the 100% owned GPNL tenements. A further two lateritic nickel deposits, known as Brolga and Canoona, occur some 15 km east of the main zone and outside GPNL tenements.

Marlborough has a JORC compliant geological ore resource (measured, indicated and inferred) of 73Mt @ 0.91% Ni (0.7% cut off grade) in 5 of the 13 deposits so far evaluated.

In the remaining 8 deposits, there is a potential for 30-50 Mt additional mineral resource at similar grades as the current reserve that could eventually be added to the mine plan.

At a lower cut-off grade of 0.5% Ni, the global resource at Marlborough is approximately 350 Mt at 0.7% Ni (pre beneficiation) – comparable with Ravensthorpe.

### Marlborough Tenement Map



### 3.2 *New Caledonia*

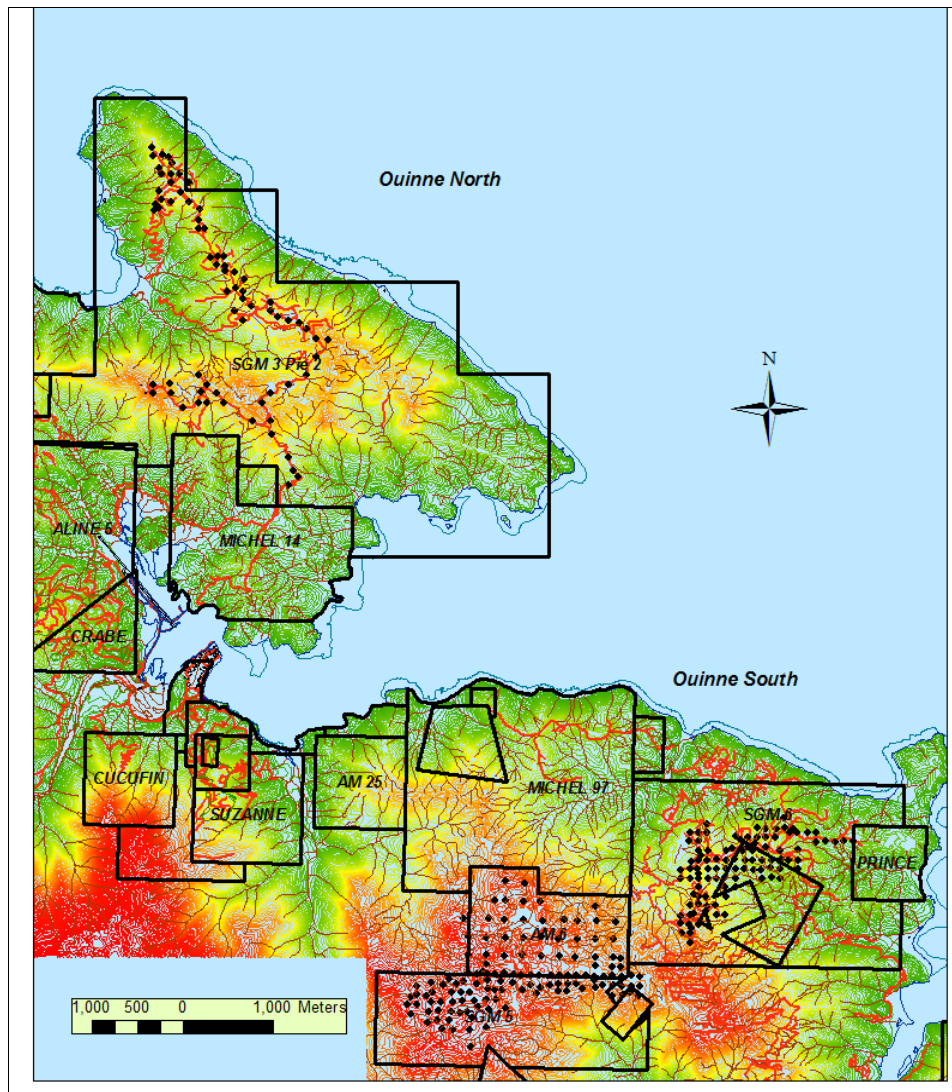
Security of ore supply from New Caledonia will be based on:

- The 49% joint venture with Société Minière Georges Montagnat (SMGM) covering the Ouinné deposit.
- A Heads of Agreement with Société des Mines de la Tontouta (SMT) for the Bogota ore body and purchase agreements for ore from Nakéty and Cap Bocage.

Ouinné is located in the Southern Province of New Caledonia on the East coast. The other resources are further North along the same coast.

Ouinné South has an IMC estimated (not yet JORC compliant) geological ore resource of 32Mt @ 1.4% Ni (1.2% cut off grade). This does not include the Ouinné North resource and the potential addition of further Ouinné South resources in the vicinity. Thus significant additional tonnage is expected at similar grade.

#### Distribution of Historical Ouinné Drill Holes

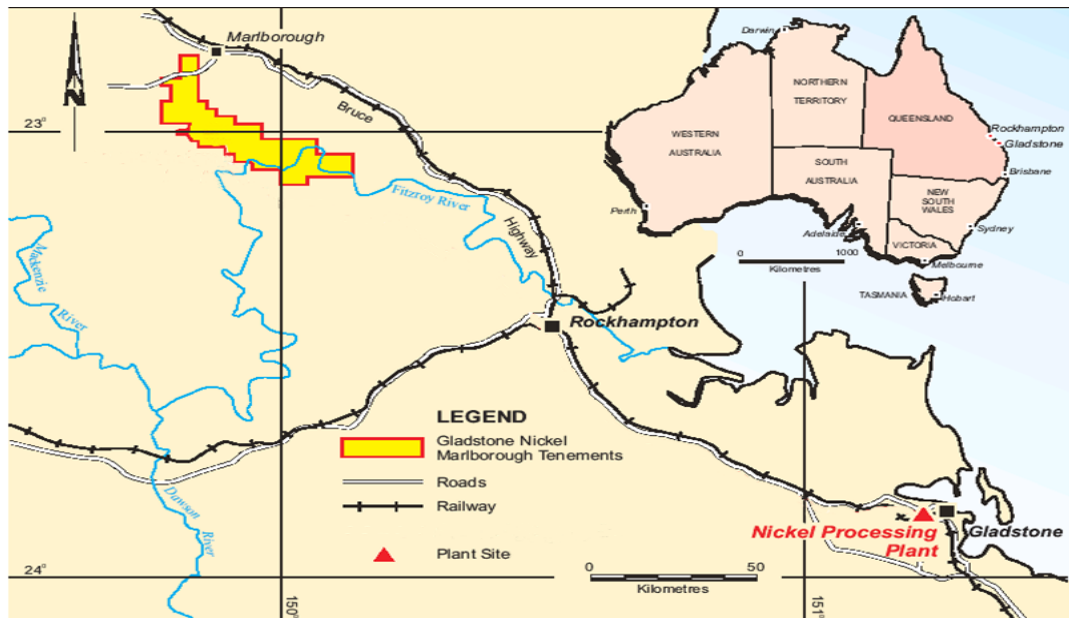


### 3.3 *Other SW Pacific Sources*

Exploration efforts will continue in coming months and years with a view to diversifying our ore supply base. Focus will be on the Solomon Islands, as well as the Philippines and Indonesia

### 4.0 AUSTRALIAN INFRASTRUCTURE

The Marlborough resource is close to the town of Marlborough in central Queensland, through which run both of the State’s major North-South road and rail links. These links will provide ease of access and transportation between the mine and refinery, which is to be built adjacent to the deep water port at Gladstone.

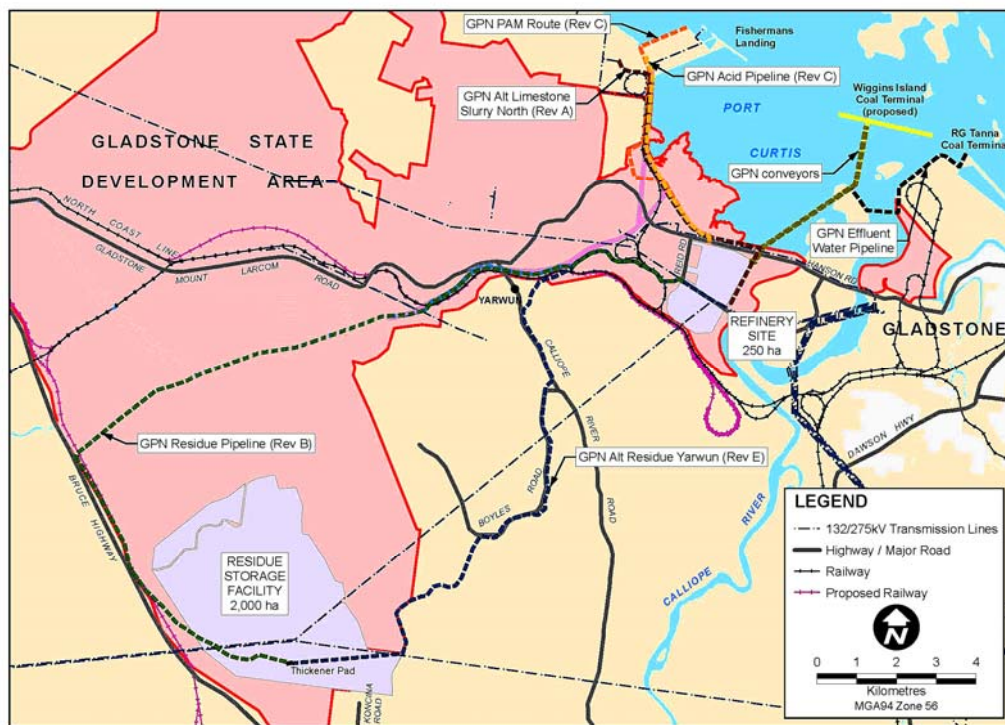


Major Gladstone-based infrastructure has been developed to support two alumina refineries, an aluminium smelter, facilities for the export of coal and other local industries. This infrastructure includes:

- The Gladstone power station and Ergon electricity network
- A natural gas distribution network.
- The Gladstone Area Water Board (GAWB) fresh water distribution network.
- Fisherman’s Landing general cargo wharf (which will be developed for Pre-assembled Module (PAM) unloading).
- R.G. Tanna coal export wharf.
- Future (recently approved) Wiggins Island coal export wharf (with berths and infrastructure assigned for nickel ore and sulfur import).
- Several limestone quarries.

The Gladstone State Development Area (GSDA) was established to encourage local industry. GPNL has a heads of agreement with the State Government to purchase sufficient land within the GSDA for the construction of all three stages of the nickel refinery (up to a capacity of ~240,000 t/a nickel) plus the residue storage facility.

### Gladstone State Development Area



The proximity to alumina producers presents an opportunity for co-disposal of the acidic laterite leach residue with the alkaline bauxite leach residue. This could reduce limestone/lime consumption and provide each party with an acceptable quality effluent.

The presence of a multitude of heavy and light industry service companies in the region will help support the new refinery. Furthermore, there is an extensive skills base in the region and the attractive regional lifestyle bodes well for workforce retention.

Other potential future projects poised to take advantage of the local infrastructure in the Gladstone region include:

- LNG production and export facilities
- Steel mill

## 5.0 PROVEN TECHNOLOGY

It is now close to 10 years since the West Australian high pressure acid leach plants were commissioned. It was not plain sailing for any of those operations

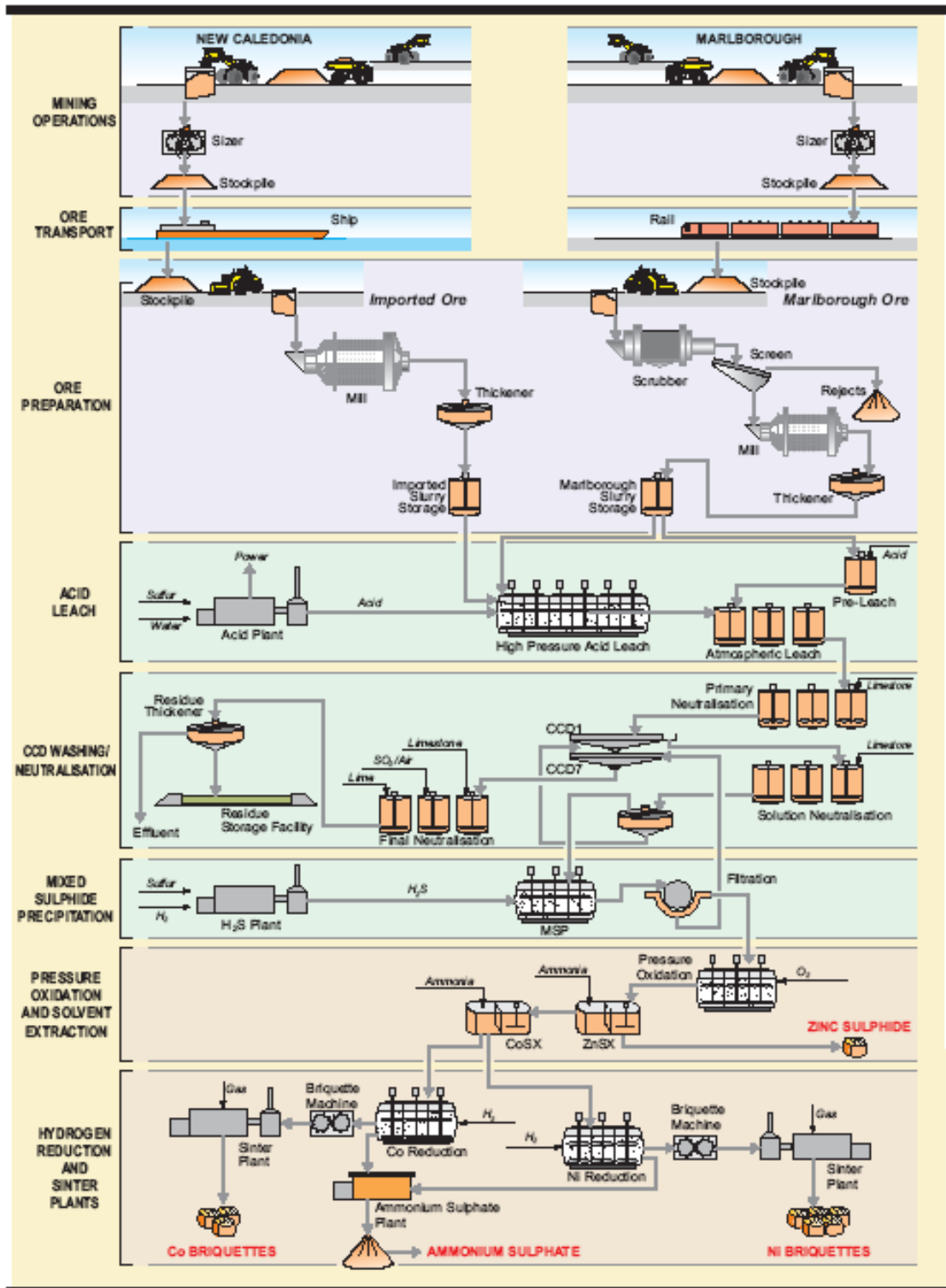
and as a result many lessons can be learnt by those currently planning similar projects. GPNL will endeavour to avoid the pitfalls by encompassing the following philosophies:

- Avoid novel / high-risk technologies
- Be cognisant of previous shortcomings
  - ore blending; leach feed preparation; standby facilities (e.g. for de-scaling); surge to de-couple process sections; etc.
- Select equipment and materials proven over 10 years of operation in W.A.
- Do not compromise on fabrication quality or installation procedures
- Ensure good QA & QC ... ‘expect what you inspect’
- Employ an experienced team
  - current GNP team members have been involved with Cawse, Bulong, Murrin Murrin, Coral Bay, Goro and Ramu

The Gladstone Nickel Refinery flowsheet will not depart significantly from the proven path. There will be two distinctive ore types: limonite from overseas and saprolite from Marlborough. These will be processed separately through the leach to promote metal recovery while avoiding the issues associated with pressure leaching of ore with high magnesium content. Hence the process will entail:

- Ore slurry preparation and beneficiation
  - Dedicated circuits for limonitic and saprolitic ores
- Straightforward leach process incorporating:
  - HPAL for low Mg, high Fe ores (Ouinné)
  - Atmospheric leach for high Mg, low Fe ores (Marlborough)
- Selective precipitation of a mixed sulfide intermediate
- Treatment and disposal of residue
  - Mn oxidation with SO<sub>2</sub>/air.
- Standard refining process to Ni & Co metal
  - Oxidative re-leach of sulfides
  - Purification and metal separation by solvent extraction
  - Reduction with hydrogen
  - Briquetting and sintering
  - Crystallisation of ammonium sulfate by-product

## Schematic Flowsheet



Gladstone Nickel Project

## **6.0 CHINESE PROJECT INVESTMENT**

### **6.1 *Market need***

China is hungry for Australian resources to fuel her hunger for growth. This is especially true for those commodities that are not produced to any great degree within that country – and nickel is one of those (iron ore and coking coal are others). Nickeliferous pig iron has filled the supply / demand gap of late, but can only do so at relatively high cash prices. Despite the high capital barrier to entry of HPAL, the comparatively low cash costs will stand such projects in good long-term stead.

### **6.2 *Financial capacity***

There has been considerable wealth generated in recent years in China, and whilst much is being invested internally – there's a tremendous capacity for investment in the right off-shore resource projects, many of which are in Australia. Chalco, and several Western Australian iron ore projects are just a few recent examples (and interestingly the investment in Macarthur Coal by Arcelor Mittal has indicated that the Indians are similarly seeking to invest in foreign resource suppliers). This represents a tremendous opportunity for the Gladstone Nickel Project.

Investment in Australian resource projects by large and respected Chinese and Indian companies should be encouraged – it'll do the same as the Japanese did for us in the 70s and 80s, but more so; and who knows? - one day soon we'll each be driving a Chinese hybrid Chery Compact or VW Baolai, instead of a Toyota Landcruiser, or a Lexus. (Please note, the hybrid vehicles will also have nickel foam batteries – the circle is complete!).

### **6.3 *Engineering and Fabrication support (current skills shortage)***

As is widely recognised, the ability to attract the right skills and achieve a competitive fabrication and construction environment is very limited at present (especially in Australia), although Gladstone has lots going for it compared to most other locations. With appropriate attention to HSEC, engineering standards and fabrication inspection, China can play a pivotal role in the engineering design, fabrication and construction of the Gladstone Nickel Project. The Yarwun refinery site is ideally located for the delivery of pre-assembled modules.

### **6.4 *Provides jobs for Australians (long-term)***

Once the skill resource constrained construction 'hump' is over, Gladstone can look forward to a substantial new industry, with jobs and training for some 530 employees (with yet more at Marlborough and in New Caledonia). This project has the location and robustness to be a significant part of the Gladstone community and industrial environment for many decades.

## **6.5**      *Value adding (not ‘Quarry Australia’ approach)*

Importantly, this project will not only supply the growing needs of China, creating exports for our nation, but will be actually value-adding here in Australia (because a substantial part of the ore to be treated will be coming from off-shore). So the project not only spreads investment dollars and job opportunities around the SW Pacific, but also benefits Queensland and the local Gladstone community at the same time as the project philosophy is somewhat different to the typical ‘Quarry Australia’ approach.

This will thus be a ‘win-win’ for Australia, China and New Caledonia.

## **7.0**      **CONCLUSION**

The Gladstone Nickel Project will provide the S.W. Pacific with a new laterite ore processing facility incorporating state-of-the-art proven technology, such that high purity nickel and cobalt can be extracted from many different ore bodies in the region with minimal environmental impact.

The project will benefit from the proximity of these ore bodies, the extensive industrial infrastructure that exists in and around Gladstone, the knowledge gained in recent years with respect to the selected processes and equipment, and the desire, capability and capacity of the Chinese to implement a project of this nature.

Thus, in conclusion, the GNP is considered to be robust, to have low risk and the potential to be one of the world’s major nickel producers for many decades to come.

## **8.0**      **ACKNOWLEDGEMENTS**

The authors would like to thank the management and board of GPNL for permission to present this paper, and their project team-mates for appropriate input and comment. The vision of the project’s founders Peter Matheson, and Robert Pearce, and its new Chairman Clive Palmer, is also acknowledged.

## **9.0**      **REFERENCES**

L. Park and G. Becker, Gladstone Nickel Project: Location, Location, Location, ALTA 2006 Nickel/Cobalt.