MARTIN JENKINS

ECONOMIC IMPACT ANALYSIS OF TRANS-TASMAN RESOURCES OFFSHORE IRON SANDS PROJECT

South Taranaki/Whanganui; Taranaki/Whanganui; New Zealand

30 October 2015

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Table 1: List of abbreviations

Abbreviation	
AHT	Anchor Handling Tug
BGA	Business Growth Agenda
EIA	Economic Impact Analysis
FSO	Floating Storage and Offloading Vessel
FTEs	Full Time Equivalents
GDP	Gross Domestic Product or value added
GSV	Geotechnical Survey Vessel
HFO	Heavy Fuel Oil
IMV	Independent Mining Vehicle
I-O	Input-Output
ITP	Industry Training Provider
TTR	Trans-Tasman Resources Limited

PREFACE

This report has been prepared for Trans-Tasman Resources Limited by Jason Leung-Wai from MartinJenkins (Martin, Jenkins & Associates Limited). Nick Davis provided internal peer review.

MartinJenkins advises clients in the public, private and not-for-profit sectors, providing services in these areas:

- Public policy
- Economic development
- Evaluation and research
- Strategy and investment
- Performance improvement and monitoring
- Organisational improvement
- Employment relations
- Financial and economic analysis.

Our aim is to provide an integrated and comprehensive response to client needs – connecting our skill sets and applying fresh thinking to lift performance.

MartinJenkins is a privately owned New Zealand limited liability company. We have offices in Wellington and Auckland. The company was established in 1993 and is governed by a Board made up of executive directors Doug Martin, Kevin Jenkins, Michael Mills, Nick Davis and Nick Hill, plus independent directors Peter Taylor (Chair) and Sir John Wells.

EXECUTIVE SUMMARY

Trans-Tasman Resources' (TTR) proposed offshore iron sands project will have a positive economic impact on the South Taranaki, Whanganui and New Plymouth districts. The project will also make a significant contribution to the New Zealand economy through royalties, taxes and export earnings. The project complements existing industries in the region and will encourage high value economic activity in an area facing economic decline.

MartinJenkins was commissioned to undertake an economic impact analysis of the iron sands project on the local (South Taranaki and Whanganui), regional (South Taranaki, Whanganui, New Plymouth and Stratford) and national economies. The economic impact is based on Regional Input-Output Multiplier Analysis, which is an established and accepted approach to estimating economic impacts in a defined area from an activity.

The iron sands project

The iron sands project aims to extract iron ore from iron sand from the seabed of the South Taranaki Bight, in an area which is between 22 and 37 kilometres off the coast of South Taranaki. The iron ore will then processed at sea and exported to international markets.

TTR has a 20 year mining permit and the project is expected to recover 5 million tonnes of iron ore per annum. The operational expenditure for the project is estimated to be approximately $254 million annually. About $133 million of that annual expenditure will be spent in New Zealand. Of that approximately $73 million is expected to be spent in the Taranaki/Whanganui region, with $35 million spent directly in the South Taranaki and Whanganui districts each year.

The economic impact

The analysis in this assessment is underpinned by projected operational expenditure from the project in several study areas and applying Regional Input-Output Multiplier Analysis to measure the direct, indirect and induced GDP and employment impacts.

The total economic impact of the iron sands project on the local, regional and national economies is shown in the following table.

Total impact by study area	Expenditure $m	GDP $m	Employment FTEs
Local	45.1	18.6	299
Regional	115.7	50.6	705
National	349.1	159.0	1,666

Source: MartinJenkins

Each year the iron sands project is estimated, at the:

- local level, to generate an additional $45.1 million in expenditure, generating $18.6 million in GDP and supporting 299 jobs

- regional level, to generate an additional $115.7 million in expenditure, generating $50.6 million in GDP and supporting 705 jobs
- national level, to generate an additional $349.1 million in expenditure, generating $159 million in GDP and supporting 1,666 jobs.

The project will also contribute to Government income through royalties and taxes and to New Zealand's export earnings. At a conservative price of US$40/tonne and a US$/NZ$ exchange rate of $0.65, the project would contribute $6.15 million in royalties and about $312 million in export earnings each year. Government would also collect taxes from the venture.

The price of iron ore is unlikely to affect the economic impact analysis. The bulk of the economic impacts arise from the expenses associated with the project. Price rises will lead to greater royalties, taxes and profits, but these are less important contributors to economic impact and more unpredictable to forecast than operational expenditure. If iron ore prices fall, the royalties, taxes and profits will decline, but the economic impact will continue to occur until the price falls below the break-even point for a prolonged period forcing the project to cease operations.

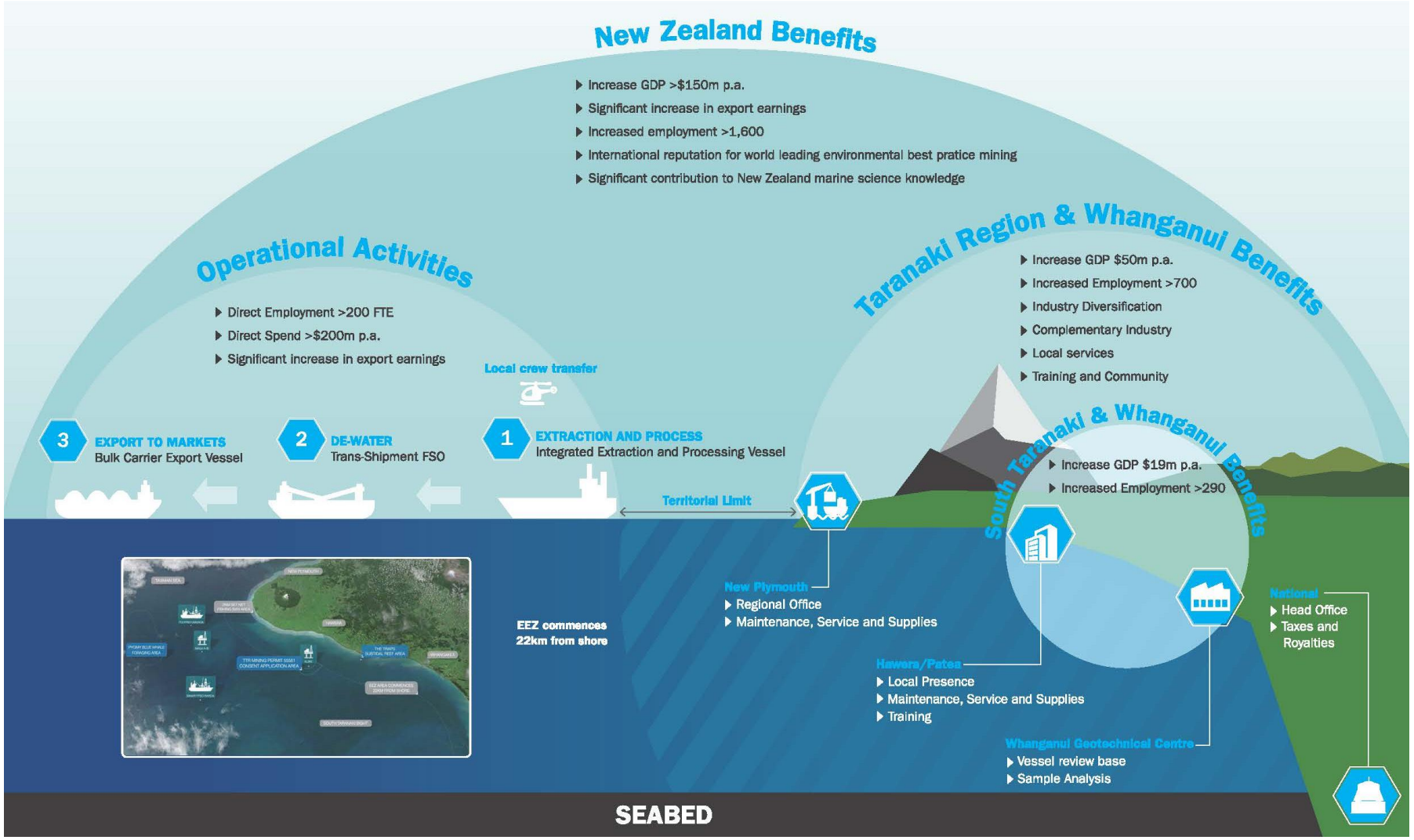
Wider benefits

The iron sands project will have a significant effect on the South Taranaki and Whanganui district economies. The location of the project in South Taranaki and Whanganui would encourage much needed activity in an area that is not performing well economically.

The project would add to the diversification of economic activity in the Taranaki/Whanganui region, which is heavily reliant on the oil and gas and dairy sectors. The project would improve the resilience of businesses in the region, where the key sectors are prone to global commodity prices and cycles. At the same time, the services required by the project are complementary to existing services demanded in the region, ensuring that local businesses will participate in and benefit from the activity.

TTR is well aware of their potential to make a meaningful contribution to the local economy. They recognise that a local focus will make for a more stable and successful business. TTR is seeking to encourage and support as much local engagement as reasonably and financially possible, both in their own activity, but also the services they purchase from out-of-region providers. Their own activities include encouraging servicing activity within the area, exploring the potential for setting up a training facility, and local labour content targets. Their main suppliers will also be set local labour content targets.

Figure 1: Economic benefits of the TTR iron sands project



INTRODUCTION

MartinJenkins has been engaged to undertake an economic impact analysis of Trans-Tasman Resources Limited's (TTR) proposed offshore iron sands project on the local (South Taranaki/Whanganui), regional (Taranaki/Whanganui), and national (New Zealand) economies.

Background

TTR is investigating an iron sands mining project off the west coast of South Taranaki. Based on a 20 year operational lifespan, it is expected that the project will have a positive impact on the study areas in terms of economic activity (expenditure and GDP) and jobs.

The project will also have qualitative impacts on the study areas in relation to:

- improving the resilience of the economy by providing diversification in a complementary area of activity
- encouraging regional economic development through operating as much as financially reasonably possible in the local area, engaging with the local community and encouraging local training and employment in the project.

There are also benefits to New Zealand through increasing exports, generating royalties on the mineral resource and meeting statutory and regulatory contributions including payment of taxes.

Method

The report identifies the economic impact at the local, regional and national levels as a result of the activity generated by the iron sands project.

Regional input-output multiplier analysis

The underpinning method is Input-Output (I-O) Multiplier Analysis, which estimates the economy-wide effects that an initial change in economic activity has on a particular economy.

Regional I-O tables and multipliers are constructed from a detailed set of industry accounts that measure the commodities produced by each industry and the use of these commodities by other industries and final users within the region. An initial change in economic activity results in diminishing rounds of new spending as leakages occur through saving or spending outside the region.

The economic impact analysis follows the accepted practice of identifying the impact from the direct expenditure associated with the project and then applying regional multipliers[1] to determine the indirect and induced effects of that initial expenditure in terms of gross output, value added (GDP), and employment.[2]

[1] There is no official set of regional input-output tables. Regional tables are calculated by several private providers. The input-output tables and multipliers used in this analysis were generated by Butcher and Partners limited and are based on the latest national input-output tables. Butcher and Partners are acknowledged and respected providers of regional input-output tables, which have been used in numerous economic impact studies in New Zealand over the years.

[2] Gross output, value added and FTE employment are defined in the appendix on p 33.

Direct impacts are those that are initially generated by the initial expenditure with businesses. Indirect impacts occur when those initial businesses purchase materials, goods and services from supplier firms, who in turn make further purchases from their suppliers and so forth. Induced impacts occur when employees in those businesses providing the materials, goods and services are paid wages and the enterprises generate profits that are then spent on consumption within the region.

Operational expenditure is assigned to the appropriate industry category and ratios and multipliers are applied. The totals for each industry are aggregated to provide the direct, indirect and induced economic impacts in terms of gross output (expenditure), value added (GDP) and employment (FTEs). Where estimates of direct employment are known, these are incorporated directly into the model (the employment to output ratio is over-ridden).

This approach is consistent with that used in a recent report on the economic impact of the oil and gas sector on the Taranaki and New Zealand economy (Venture Taranaki, 2015).

Economic activity

Direct activity is measured in terms of annual average operational expenditure. This has been provided directly by TTR and is derived from their business plan.

As well as expenditure, we have incorporated estimates of direct employment by TTR and by major suppliers to service the operation (such as for fuel bunkering). This provides a more accurate assessment of the likely employment impacts as a result of activity.

The analysis does not include economic activity from the initial set up and construction costs of the iron sands project. Nor does it include expenditure from the royalties and taxes paid by TTR to the government.

Study area

The report looks at the economic activity within three study areas – local, regional and national. The local study area consists of South Taranaki and Whanganui. It is where the iron sands operations will occur. The regional study area is made up of four local authorities - South Taranaki, Whanganui, Stratford, and New Plymouth. A large portion of expenditure will be within this regional study area. The national study area is New Zealand.

Prices

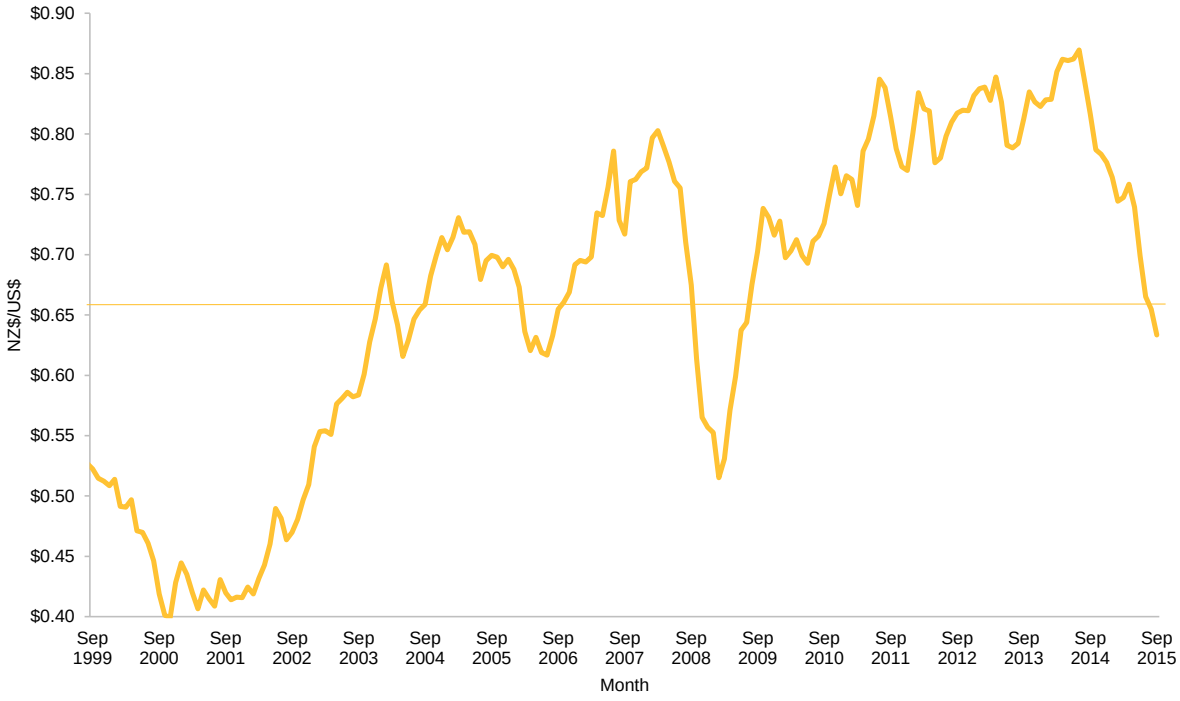
All prices are expressed in nominal New Zealand Dollars unless otherwise noted.

Exchange rates and fuel cost assumptions

The analysis is based on operational expenditure, which is less exposed to changes in exchange rates and commodity prices. However, there is still a large import component as Heavy Fuel Oil (HFO) is a major cost. Overseas expenditure is based on a NZ$/US$ exchange rate of 0.65. HFO is factored in at $350/t.

Historical trends in the NZ$/US$ exchange rate and HFO prices are shown in the following two figures.

Figure 2: NZ$/US$ exchange rate, 2006 to 2015

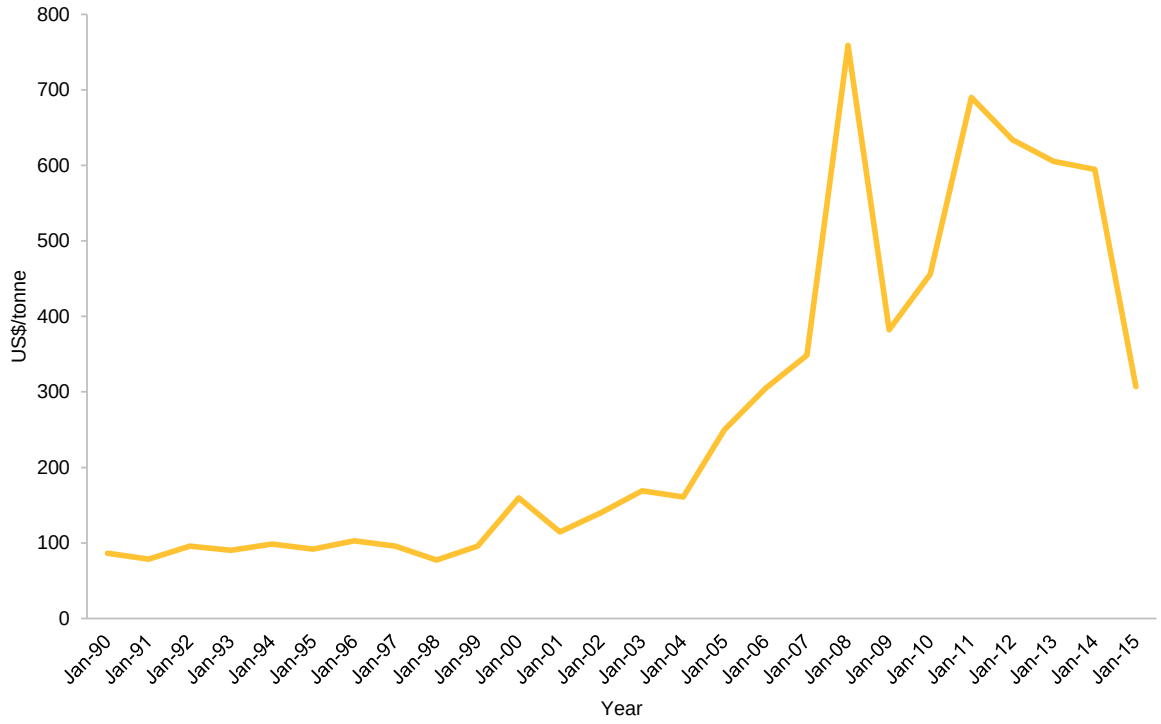


Source: Reserve Bank New Zealand

Over the last 10 years the New Zealand dollar has fluctuated within a fairly broad range of US$0.52 to US$0.87. Over the last 15 years, the average exchange rate has been US$0.66, while over the last 10 years it has averaged US$0.74. Most recently it has been declining from an historical high and is currently fluctuating between US$0.63 and US$0.66.

Volatility and short term fluctuations aside, we consider that the NZ$/US$ rate of 0.65 used in the analysis is reasonable and conservative. Ultimately, the analysis captures New Zealand operating expenditure in New Zealand dollars and so therefore fluctuations in the exchange rate will have only minor effects on the economic impact.

Figure 3: Heavy Fuel Oil spot price, 1990 to 2015



Source: National Institute of Statistics and Economic Studies (Insee)

The price of HFO stayed relatively constant over the 1990's before increasing over the 2000's, peaking at US$760/tonne before contracting sharply as a result of the global financial crisis. Prices had almost recovered before they started easing off in 2011. There has been a rapid fall over the last two years with the latest price being US$307/tonne (July 2015).

Looking ahead, HFO prices correlate to movements in crude oil prices, which are expected to stay subdued over the short to medium term. However, as noted earlier, the analysis is capturing the benefits from the level of activity rather than the price of inputs. Volumes are unlikely to change over time so operational activity and economic activity will not be significantly affected by changes in HFO prices.

Royalties and taxes

TTR is a permit holder and must pay to the Crown royalties in respect of all minerals obtained under that permit that are sold, used in the production process, are otherwise exchanged or removed from the permit without sale, or remain unsold on the surrender, expiry or revocation of the permit. The holder of a mining permit must pay the higher of –

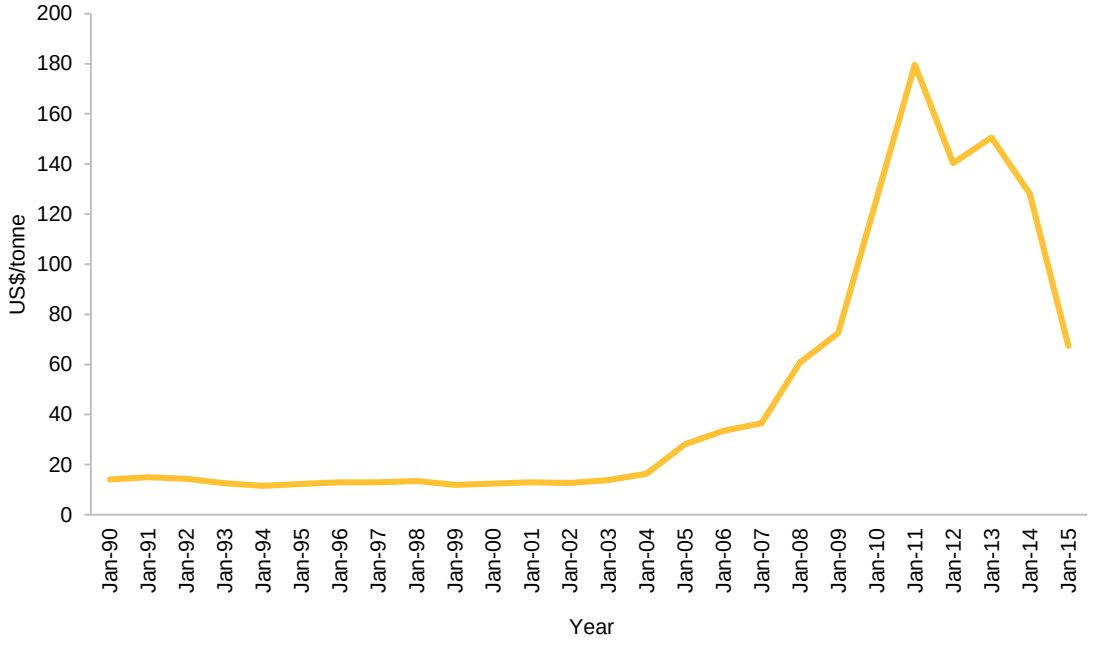
1 An *ad velorem* royalty of 2 percent of the net sales revenue of the minerals obtained under the permit and

2 An accounting profits royalty of 10 percent of the accounting profits, or provisional accounting profits, as the case may be, of the minerals obtained under the permit.

As a New Zealand corporate, TTR will also have to pay company tax. The maximum company Income Tax rate is 28 percent. New Zealand tax resident employees also pay tax on wages and salaries at rates up to 33 percent.

While the focus of the analysis is on expenditure, if revenues increase, then economic contribution in terms of royalties and taxation of the iron sands project will also increase. The contribution to royalties and taxation are influenced by exchange rate and input costs, but they are mostly dependent upon the price of iron ore concentrate.

Figure 4: Iron ore spot prices, 1990 to 2015



Source: National Institute of Statistics and Economic Studies (Insee)

Note: Iron ore – Chinese imports, Tianjin Port, Spot price – CIF, 62% Fe type. TTR iron sand is slightly different in that the iron ore content is 58%. Prices will be benchmarked against the Platts TSI 58 index price, which is a relatively new index. However, the trend in prices is likely to be relatively consistent with the above analysis.

The index price for iron ore stayed constant over the 1990s and into the early 2000's before increasing exponentially, peaking in January 2011 at US$180/t. Since then the index price fell to just over US$50/t in July 2015 and at the time of this report is approximately US$55/t.

The general consensus is that prices over the short to medium term will ease slightly due to oversupply in the market and reduced demand out of China. UBS forecasts a long-term iron ore price

of US$55/t, while Goldman Sachs has forecast prices to drop to US$40/t in 2017/18.[3] The World Bank has forecast iron ore prices of US$75/t in 2025.[4]

The price of iron ore is unlikely to affect the economic impact analysis. The bulk of the economic impacts arise from the expenses associated with the project. Price rises will lead to greater royalties, taxes and profits, but these are less important contributors to economic impact and more unpredictable to forecast than operational expenditure. If iron ore prices fall, the royalties, taxes and profits will decline, but the economic impact will continue to occur until the price falls below the break-even point for a prolonged period forcing the project to cease operations.

Limitations

Regional I-O Multiplier Analysis limitations

Regional I-O Multiplier Analysis is a static model that does not allow for price changes resulting from activity. Further the approach requires that economic activity applied to the model is additional to existing activity and that it does not include displaced activity from other areas of the economy.

While this project is significant, we do not consider that its operations will result in price changes. There are four reasons why we have come to this conclusion.

1 The activity will be additional as it is utilising a resource that currently has no economic value.

2 The project is relatively niche and so it will attract global capital that is unlikely to displace existing or potential projects.

3 There is currently excess capacity in the market so support activity can be absorbed without putting upward pressure on prices. Also, in the initial phases, employment will likely be filled from the international market. Very senior roles likely to be advertised are specialist positions and are unlikely to be sourced/filled from existing employees in the region.

4 Iron ore is a globally traded commodity. As a very small player (<1%), TTR entering the market will not have any influence on international prices for iron ore.

How this analysis addresses the limitations of I-O Multiplier analysis is presented in a table on page 34.

Accuracy of the Regional I-O Multipliers

The smaller the geographic area being assessed and the more aggregated the analysis of industries, the less accurate the model.

Our view is that the Taranaki region is a relatively isolated region with a strong supporting services industry built around energy and the dairy sector. As a result, the intermediate production and

[3] (Els, 2015)www.mining.com/iron-ore-price -rally-turns-into-dead-cat-bounce/. Published 29 April 2015. Downloaded on 09 September 2015

[4] (World Bank, 2015). World Bank Commodities Price Forecast (nominal US dollars). Released July 20, 2015.

leakages out of the region are clearer than for many other regions of New Zealand. For the same reasons, leakage out of South Taranaki is likely to be into New Plymouth.

Industry accuracy is enhanced by assigning expenditure into the appropriate industry rather than lumping it all into a single associated industry. This ensures that the multipliers and relationships between expenditure, GDP and output are as accurate as possible. Second, in our analysis we have incorporated estimates of direct employment where applicable. This ensures that our employment multipliers are consistent with our understanding of the likely level of employment activity.

There are no official regional I-O tables. There are several private sector providers of regional I-O tables. This analysis uses regional I-O tables supplied by Butcher Partners. Butcher Partners is a recognised supplier of regional tables that have been used in a number of economic impact analysis studies of industries and events throughout the regions of New Zealand.

Report structure

The report is split into three sections. The next section explores the economic activity likely to occur as a result of the iron sands project. It includes a description of the likely activity and provides a breakdown of estimated annual expenditure and direct employment by TTR.

From there we undertake the economic impact analysis. This uses average expenditure and employment estimates to calculate the direct, indirect and induced impacts of the iron sands project on the South Taranaki/Whanganui districts, Taranaki/Whanganui region, and New Zealand economies. It also explores the contribution of the project to New Zealand through royalties, taxes and exports.

The final section explores the wider impacts of the iron sands project on the area. These wider impacts are not quantifiable but rather demonstrate how the iron sands project aligns to, and improves economic sustainability and resilience in the South Taranaki and Whanganui districts and the wider Taranaki region. There is also a brief discussion on the cost of potential negative impacts on tourism and commercial and recreational fishing.

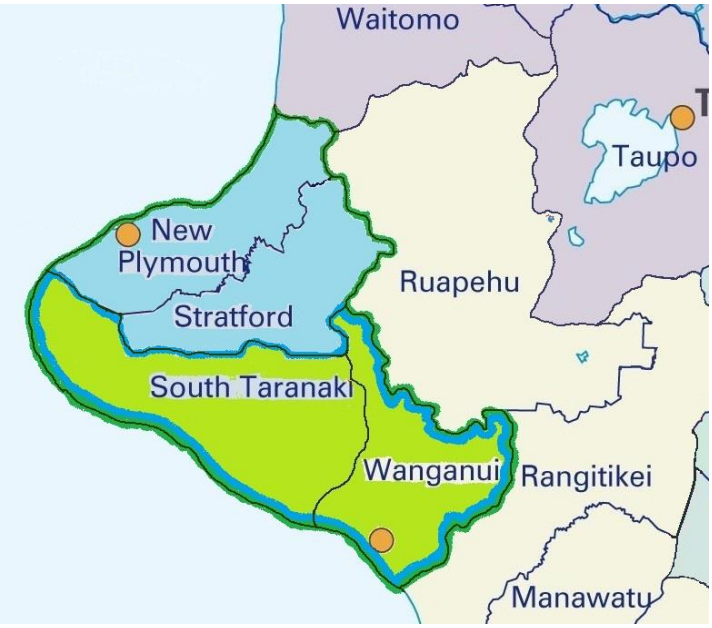
THE STUDY AREAS

There are three study areas where we consider the economic impact. The local area (Whanganui and South Taranaki district councils), the region area (the local area plus New Plymouth and Stratford district councils), and the country area (the whole of New Zealand).

The local area is a largely rural, agrarian-based economy in the hinterland of the western coast of the North Island.

In the region area, New Plymouth is the main service centre for the Taranaki region. Hawera is a smaller service centre in South Taranaki. Whanganui has a relatively large town centre, with people either travelling south to Palmerston North, or north to New Plymouth for the next tier of services.

Table 2: Map of the local and regional study areas



Source: Local Government New Zealand

Both South Taranaki and Whanganui have been experiencing a decline in economic activity over the last ten years in terms of population and GDP, while employment has been static. Unemployment is relatively high, particularly in Whanganui. This is reflected in the relatively high proportion of beneficiaries in the region.

The Taranaki economy has been led by growth in New Plymouth, on the back of good performances in the dairy and oil and gas sectors and subsequent improvements in the liveability of the district. The New Plymouth District has seen population, employment and GDP growing faster than the New Zealand average over the last ten years. When other districts in the study area are incorporated, growth across all indicators is below that for New Zealand as a whole.

Table 3 looks at three metrics of growth in the study areas over the last ten years – population, employment and GDP.

Table 3: Study area metrics, 2004 to 2014

Study area	Population 2014	%pa Growth 04-14	Employment 2014	%pa Growth 04-14	GDP $m	%pa Growth 04-14
South Taranaki/Whanganui	70,900	-0.1%	32,432	0.0%	3,761	-0.5%
Taranaki region/Whanganui	158,360	0.5%	75,269	0.9%	10,757	1.3%
New Zealand	4,509,900	1.0%	2,229,679	1.2%	241,262	1.8%

Source: Infometrics Regional Database

The South Taranaki/Whanganui area has not done as well as the wider Taranaki/Whanganui area, which has not done as well as New Zealand as a whole.

The South Taranaki/Whanganui area has a population of just under 71,000, provides employment for 32,400 people and contributes $3.5 billion to GDP. The population has been declining over the last ten years by 0.1 percent annually. Employment has remained static, while GDP has fallen by 0.5 percent per annum.

At the Taranaki/Whanganui area level, the metrics have been positive. The population of 158,400 has been growing by 0.5 percent annually over the last ten years. Employment has grown even faster at 0.9 percent per annum, while GDP has growth at 1.3 percent per annum. However, the rates of growth are below the New Zealand average, with population growing at half the national rate and employment and GDP at close to 75 percent of the national rate.

Table 4 shows the number of people on a benefit in the different study areas in June 2015.

Table 4: Benefits by area, June 2015

	Jobseeker	Sole Parent	Supported Living	Other Main Benefits	Total
Hawera	542	366	541	11	1,460
Whanganui	2,192	1,121	1,677	68	5,058
South Taranaki/Whanganui	2,734	1,487	2,218	79	6,518
Taranaki/Whanganui	4,313	2,344	4,083	88	11,117

Source: Ministry of Social Development

Over 2,700 people were looking for work in the South Taranaki/Whanganui study area. The majority of these (80 percent) were based in Whanganui.

A further 1,580 people were on a jobseeker benefit in the New Plymouth district. At the Taranaki/Whanganui area there were a total of 4,300 people looking for work.

Recent labour market statistics are not available at the district level. However, at the 2013 census Whanganui had an unemployment rate of 9.6 percent and a participation rate of 60.5. In South Taranaki, the unemployment rate was 5.8 percent and the participation rate was 68.4. For the

Taranaki region, the unemployment rate was much lower at 4.8 percent, with a participation rate of 70.5 percent.

To put this into context, the New Zealand unemployment rate at the time was 7.1 percent and the participation rate was 67.0.

A project of the magnitude of the TTR iron sands would be expected to generate a noticeable increase in economic activity in the South Taranaki and Whanganui economies. Similarly, at the Taranaki region level, the iron sands project would have an impact on economic activity as well as the viability and the resilience of a number of businesses that it would engage with.

TTR'S PROPOSED IRON SANDS PROJECT

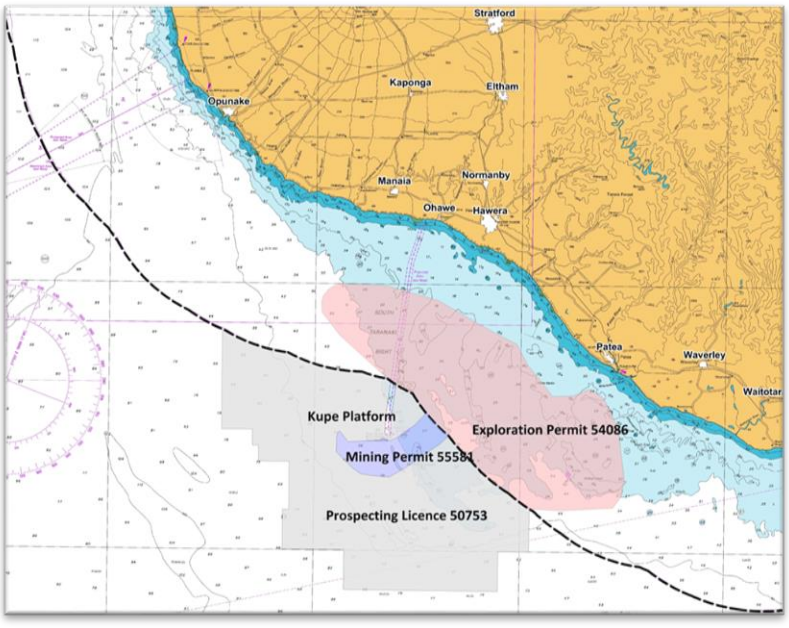
TTR is a New Zealand company, established in 2007 to explore and develop the North Island's offshore iron sand deposits. TTR is headquartered in Wellington and is funded by New Zealand and international investment. TTR is keen to build offshore iron ore extraction into a new resource industry for New Zealand. TTR's mission is to develop a world class, profitable and responsible iron sands export company.

Iron sand

Iron sand is magnetic iron ore that originated as crystals in the volcanic rocks of western Taranaki and the Taupo Volcanic Zone. The iron sand was transported to the coast by rivers, and then along the coast by currents, waves and wind settling in dunes. These dunes were covered by rising sea levels at the last marine transgression and became part of the seabed. The regular agitation of the sea over thousands of years by waves and currents has reworked the seabed to an expansive, relatively flat and featureless sandy seafloor.

Iron ore concentrate is produced when separated from the iron sands. It principally comprises magnetite, titanium oxide and vanadium oxide, each of which have commercial uses. These concentrates will be exported to global markets.

Figure 5: Map of the iron sands project permit area



Source: Trans-Tasman Resources Ltd

Activity

TTR has a 20 year Mining Permit granting exclusive mineral rights to approximately 66km^2 of the South Taranaki Bight (Figure 5).

TTR proposes to extract up to 50 million tonnes of iron-rich sediment from the seabed each year. The sediment will be processed aboard an Integrated Mining Vessel (IMV). From that, around 5

million tonnes of iron ore concentrate (about 10 percent of the extracted material) will be collected. The remaining sediment (45 million tonnes annually) will be re-deposited on the seafloor in a controlled manner, usually backfilling previously extracted areas. The iron ore concentrate from the IMV will be slurried to a transhipment vessel where it will be de-watered and stored ready for transfer to bulk carrier vessels for export to world markets. This entire process occurs in a single, controlled pass over each mining block.

The project will directly require over 200 people to operate the offshore vessels, with a further 50 staff required in support, engineering, administration, environmental and other contracting roles. The activity is expected to continue for 20 years.

The project will also purchase services from a number of other independent businesses. Many of these services can be delivered from within the study area. This includes fuel bunkering, environmental monitoring, repairs and maintenance, health and insurance, and business services.

It is understood that TTR has undertaken to work with the local community to encourage local engagement and participation on the project. This includes both in the delivery of support services, but also in encouraging local employment directly on the project as well as industry training.

Environmental impacts

The initial extraction activity will occur more than 22 kilometres off the coast of Patea in water depths of 20 to 45 metres and within an area of approximately 66 square kilometres.

There are no marine reserves or marine mammal sanctuaries in this area, and very few reefs. The seabed lies in an area of constantly shifting sands, so is largely featureless with no rare or vulnerable ecosystems.

Processing on the integrated mining vessel involves separation of the ore from the seabed material using gravity and magnetic processes, and does not involve the addition of any chemicals or other products. The extraction and processing method have been refined to minimise the potential environmental effects of the operations.

Operating activities

Although the activity occurs more than 20 kilometres off the coast there will be onshore operations associated with the project, with as much activity run out of South Taranaki, Whanganui and New Plymouth as reasonably and financially feasible. The majority of employment will be in providing support to the offshore operations.

The project's mining operations are centred on an IMV that contains the extraction, processing and tailings deposition mechanisms and a single Floating Storage and Offloading vessel (FSO) that will transfer the process concentrate from the IMV onto standard commercial bulk cape-size vessels for delivery to end users.

These large vessels will be supported by a mid-sized Anchor Handling Tug (AHT) that will assist with the provisioning of the vessels, transfer of equipment, and the connection of floating hoses during the concentrate transfer from the IMV to FSO, the berthing of the FSO to the conventional bulk cargo vessels[5], and anchor and mooring relocation. The AHT will also provide refuelling assistance and be

[5] The conventional bulk cargo vessels will be contracted by TTR and will not generate any employment in New Zealand.

equipped to assist in case of any fuel spillage and fire. A Geotechnical Survey Vessel (GSV) will undertake testing and monitoring activity for the project.

IMV and FSO

The IMV and FSO will be “on-station” 24/7 so therefore both vessels will be provisioned, refuelled and maintained while at sea. The crew and, where needed, ad-hoc maintenance staff, of both the IMV and FSO, will be transferred via helicopter from a proposed base in South Taranaki, while provisions and equipment will be transferred by the AHT out of New Plymouth.

Permanent manning requirements of the IMV and the FSO are 122 and 51 people respectively. This allows for two rotations and includes an allowance for relief during holiday periods. These people would be employed directly by TTR.

The equipment on board both these vessels has been designed to be modular in nature, enabling equipment to be transferred via the AHT to a contracted engineering facility in New Plymouth where major repairs or servicing will take place. It is envisaged that smaller repairs and emergency supplies would be sourced within the South Taranaki region and supplied to the operational vessels via helicopter or available vessel.

Servicing activity, including maintenance and repairs, would be contracted out to a third party supplier.

AHT

The AHT will be scheduled to return to new Plymouth periodically to refuel, change crew, collect provisions and, when required, maintain equipment.

The AHT operations will require 36 people. This allows for two rotations and includes an allowance for relief during holiday periods. These people would be employed directly by TTR.

GSV

The GSV will be based out of a proposed geotechnical base in Whanganui. It is envisaged that this vessel will sail on specific planned objectives and will be independent from the ongoing mining operation. It will be crewed, provisioned and supported from its base in Whanganui. The economic impact from the servicing vessel is included in the analysis through estimated expenditure on geotechnical services. The 17 people required to support these activities would be employed directly by TTR.

TTR Corporate Support

A further 35 people will be employed in corporate roles within TTR. All of these roles will be New Zealand based. About three-quarters of these will be based outside of the Taranaki region while about 10 percent will be based in South Taranaki. These ratios are estimates only and can change. For example, there is a chance that a larger portion of the corporate function could be based in New Plymouth.

Bunkering

The iron sands project has a high HFO component with an annual spend of close to $30 million. This fuel will be sourced in New Zealand through companies who import and refine or bunker fuel in New Zealand. The HFO demand is currently rather limited in New Zealand and is supplied out of Auckland.

However, there are a number of constraints that mean the iron sands project's demand for HFO requires a bespoke solution.

There is potential for the HFO to be supplied from the New Zealand Marsden Point refinery, with the supply being topped up during the summer (cruise season) by supply through either Singapore or Australia. This would result in increased economic activity out of Marsden Point in terms of processing and then storing that fuel. A third party supplier would then be contracted to transfer the HFO to the iron sands project as required. This would be through purchasing HFO from the Marsden Point refinery or offshore and then either shipping directly to the iron sands vessels, or bunkering the HFO in New Plymouth or Wellington and then transferring from there to the iron sands vessels.

The supply of HFO will be provided by a third party. The economic impact would be captured by inputting the expenditure on HFO fuel into the relevant industry multipliers. The economic impact analysis is based on a bunkering facility in New Plymouth, which would directly employ six people.

A potential catalyst for new activity

High demand for HFO fuel by the iron sands project could act as a catalyst for developing a dedicated HFO bunkering facility – something that New Zealand lacks outside of Auckland. A possible location could be Wellington. With other potential users based in Wellington there is strong justification for investment into such a facility. This would involve the construction of a HFO bunker farm tank and the purchase of a dedicated bunker barge, an estimated total investment of close to $50 million. Such an operation could result in up to 14 new direct jobs.

The potential to capture further business would be from other vessels travelling through the Cook Strait as well as vessels, such as cruise and container ships, calling into Wellington. While these ships are taking on fuel, other vessel support activity is likely to ensue such as provedoring, crew changes etc. This will all create additional activity, not directly related to the iron sands project, but catalysed by it.

Potential initiatives to encourage local activity

The following initiatives are being explored by TTR to encourage local activity. However, these are currently exploratory and so haven't been included in the economic impact analysis.

Heli-port

Currently it is expected that helicopter support would be provided out of New Plymouth. However, there is potential, with support from other users in the area, to base a helipad in South Taranaki to service activity off the South Taranaki coast. If this were to happen it would mean additional activity and jobs in the South Taranaki/Whanganui district, as well as reducing travel time and cost to the project. TTR is exploring the possibility and business case for basing a heli-port in Hawera.

A heli-port based in Hawera would employ about six people and have annual operating costs of about $750,000. Operators (helicopter companies) would be encouraged to employ local people. As the initiative is still being explored, the economic impact analysis currently has this activity being serviced out of New Plymouth.

Operator and trade training facility

TTR recognises the benefits from ensuring local people are employed in the operation. Possibly even more important is ensuring local people benefit from training, as this is an investment that will benefit the individuals, the community, and ultimately the project itself.

TTR is exploring with businesses and Industry Training Providers (ITP) the potential to develop an operator and trade training facility in the South Taranaki district, in Hawera or Patea. This facility will provide, amongst other skills, Marine Certification qualifications, which are a prerequisite for people to work on the iron sands project. It could also deliver engineering qualifications.

Early discussions suggest that the operator and trade training facility could employ about 11 people with operating costs of about $1.1 million annually. About 40 trainees would gain qualifications through the facility each year. As this project is still in the discussion phase it has not been included in the analysis.

TTR direct employment

As part of its business planning, TTR has estimated the direct employment for its operations.

The delivery of specialist geotechnical and environmental monitoring services will be provided by the crew of a relatively small support vessel (20m).

Table 5 sets out the employees that will be directly employed by TTR as well as the required level of experience and skills required.

Table 5: TTR personnel

Level	Experience	Number of jobs
Grade 1	15+ years	11
Grade 2	10+ years	19
Grade 3	10+ years, Technical Degree/Diploma,	22
Grade 4	10+ years, Trade/Technical Qualification,	107
Grade 5	5+ years, Trade Qualification,	17
Grade 6	2+ years,	51
Total, Marine Personnel		**227**
Corporate Positions		35

Source: TTR

The necessary level of experience and skills required for the project are broken down into six grades. It is highly unlikely that grade 1 or 2 people are available in New Zealand. These jobs will need to be filled from offshore. The opportunity to hire from New Zealand and from within the region or locally increases for lower grade roles.

Local employment is expected to increase over time as participation in the project and training programmes continue. Initially, opportunities will be in the lower grade occupations, but will move up over time as local employees gain experience and skills.

As we are aware of these direct employment allocations we have over-ridden the direct employment calculation in the model and inputted these figures directly. Indirect and induced impacts are then calculated using the Regional I-O Multiplier Analysis model.

TTR direct expenditure

Based on the project budget there will be an annual spend of approximately $254 million, of which a portion will be spent in New Zealand. Of this portion, some will be spent directly in the local area, some will be spent in the region area, and the rest will be spent outside of the Taranaki/Whanganui region. This expenditure is broken down by industry grouping and the geographic area where it is likely to occur in Table 6.

Table 6: Operational expenditure by industry, annual average

Industry	Expenditure ($m)		
	South Taranaki/ Whanganui	Taranaki/ Whanganui	New Zealand
Fabricated metal product manufacturing	21.3	21.3	21.3
Exploration and other mining support services	7.6	17.2	34.4
Scientific, architectural and engineering services	3.7	15.8	15.8
Other transport	2.0	10.4	10.4
Basic material w holesaling	0.0	6.5	32.6
Legal and accounting services	0.0	2.1	14.2
Health and general insurance	0.0	0.0	3.9
Total	**34.6**	**73.4**	**132.7**

Source: MartinJenkins

Of the estimated $254 million in annual spend, just over half (52.2 percent) is expected to be in New Zealand. Of this $73.4 million is expected to be spent in the Taranaki/Whanganui region, with just under half of this again ($34.6 million) spent within South Taranaki/Whanganui.

Expenditure is spread across seven industry groups in New Zealand. For Taranaki/Whanganui it is spread across six industry groups, and within South Taranaki/Whanganui, expenditure is concentrated in four industries.

Looking at the total New Zealand spend, the two main sectors where expenditure occurs are exploration and other mining support services, and basic material wholesaling. A total of $34.4 million is spent in the exploration and other mining support services sector, which is mainly third party provision of services to the offshore mining vessel. Expenditure of $32.6 million in the basic material wholesaling sector is made up solely of the purchase of HFO for operating the vessels. This is followed by fabricated metal product manufacturing sector expenditure ($21.3 million), which is for

repair and maintenance work on the vessels. Other technical support services related to the activity will add another $15.8 million to costs and is categorised as scientific, architectural and engineering services. Corporate expenditure in New Zealand, which we have classified as legal and accounting services is at $14.2 million. A further, $10.4 million is to be spent on direct labour costs related to the mining vessel and is classified as other transport. Finally, there are annual insurance costs of $3.9 million.

Of the annual expenditure in New Zealand, 26 percent will be spent directly with businesses in the South Taranaki and Whanganui districts. All of the expenditure in fabricated metal product manufacturing ($21.3 million) will be initially spent in South Taranaki or Whanganui. About $7.6 million will be spent in the exploration and other mining services sector and $3.7 million will be initially spent in South Taranaki and Whanganui in the scientific, architectural and engineering services sector. Finally about $2 million will be spent in South Taranaki/Whanganui to support the geotechnical servicing role, which is categorised in the scientific, architectural and engineering services sector.

The Taranaki/Whanganui region captures approximately 55 percent of the project's total New Zealand expenditure annually, or $73.4 million. The region accounts for 100 percent of activity in three industries - fabricated metal product manufacturing, scientific, architectural and engineering services industries, and other transport. It also captures half of the New Zealand expenditure in the exploration and other mining support services industry and about 20 percent of activity in the basic material wholesaling industry ($6.5 million). Finally, the region captures 15 percent of the activity in legal and accounting services.

ECONOMIC IMPACT ANALYSIS

Economic impact analysis (EIA) shows the additional impact to economic activity (gross output, GDP and employment) directly attributable to an event or action, in this case the iron sands project. The EIA has been calculated for three study areas – local (South Taranaki and Whanganui districts), regional (the Taranaki region and Whanganui district), and New Zealand. The three sets of economic outcomes are not additive. That is, the New Zealand impact includes the regional impact, which includes the local impact.

The EIA does not include the impact from taxes and royalties collected by the government. Nor does it consider the additional economic benefits to the country from increased exports. These are quantified and discussed separately.

Local (South Taranaki/Whanganui)

The iron sands project is expected to generate about $18.6 million in GDP and employ 299 people in the South Taranaki/Whanganui economy each year over 20 years.

About $34.6 million is expected to be spent directly on activities and businesses based in South Taranaki/Whanganui each year. The impact of this direct spend is estimated to generate $13.6 million in GDP and direct employment of 173 people. The direct, indirect and induced impacts of the iron sands project on the South Taranaki and Whanganui districts is presented in Table 7.

Table 7: Economic impact of activity on the South Taranaki district

South Taranaki/ Whanganui	Direct	Direct + Indirect	Direct + Indirect + Induced
Output ($m)	34.6	41.2	45.1
GDP ($m)	13.6	16.3	18.6
Employment (FTEs)	173	256	299

Source: MartinJenkins

Including indirect and induced impacts, the initial direct expenditure of $34.6 million is estimated to contribute $18.6 million to the South Taranaki and Whanganui economy and employ 299 people annually.

To put this into context, the South Taranaki/Whanganui economy has an estimated GDP of $3.5 billion and employs about 32,400 people. The TTR iron sands project would increase GDP by half of a percent and employment by close to one percent.

Regional (Taranaki/Whanganui)

The iron sands project is expected to generate about $50.6 million in GDP and employ 683 people in the Taranaki/Whanganui economy each year over 20 years.

The business plan suggests that $73.4 million is expected to be spent directly on activities and businesses based in the Taranaki/Whanganui region each year. The economic impact of this direct spend is estimated to be $30.4 million in GDP and direct employment of 367 people. The direct, indirect and induced impacts of the iron sands project on the Taranaki/Whanganui region is presented in Table 8.

Table 8: Economic impact of activity on the Taranaki/Whanganui region

Taranaki/ Whanganui	Direct	Direct + Indirect	Direct + Indirect + Induced
Output ($m)	73.4	100.5	115.7
GDP ($m)	30.4	41.9	50.6
Employment (FTEs)	367	585	705

Source: MartinJenkins

Including indirect and induced impacts, the initial direct expenditure of $73.4 million is estimated to contribute GDP of $50.6 million to the Taranaki/Whanganui economy and employ 705 people annually.

To put this into context, the Taranaki/Whanganui economy has an estimated GDP of $10 billion and employs about 75,300 people. The TTR iron sands project would have a similar impact as in South Taranaki/Whanganui, increasing GDP by half of a percent and employment by almost one percent.

New Zealand

The iron sands project is expected to generate about $159 million in GDP and employ 1,666 people in the New Zealand economy each year over 20 years.

About $132.7 million is expected to be spent directly on activities and businesses in New Zealand each year. The impact of this direct spend is estimated to be $59 million in GDP and direct employment of 453 people. The direct, indirect and induced impacts of the iron sands project on the New Zealand economy is presented in Table 9.

Table 9: Economic impact of activity on New Zealand

New Zealand	Direct	Direct + Indirect	Direct + Indirect + Induced
Output ($m)	132.7	254.2	349.1
GDP ($m)	59.0	111.1	159.0
Employment (FTEs)	463	1,146	1,666

Source: MartinJenkins

Including indirect and induced impacts, the initial direct expenditure of $132.7 million is estimated to contribute $159 million to the New Zealand economy and employ 1,666 people annually.

To put this into context, the New Zealand economy has an estimated GDP of $224.6 billion and employs about 2.2 million people. The TTR iron sands project would have a smaller impact than in Taranaki/Whanganui increasing GDP by seven-tenths of one percent and employment by less than one-tenth of one percent.

Other quantitative impacts

The economic impact analysis only considers the GDP and employment generated from the operational expenditure of the project. The project is also expected to contribute royalties and taxes to the New Zealand government. This revenue will likely be spent generating further employment and GDP.

As well, the iron ore produced by TTR will be exported. This will generate export earnings, which is a key growth goal for New Zealand.

The estimated minimum royalty payment to New Zealand each year is about $6.15 million, and the project would contribute about $312 million to New Zealand exports.

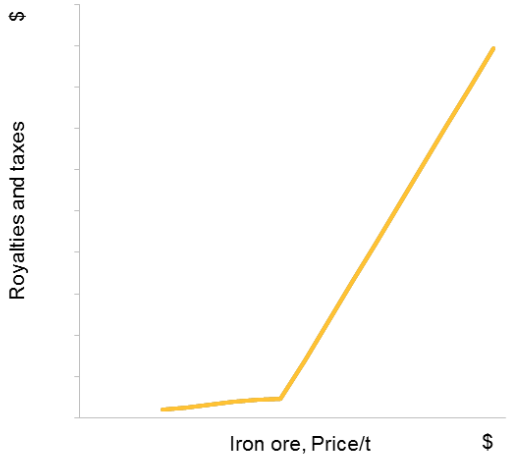
Royalties and Taxation

Based on the assumptions at the time of this report the estimated minimum royalty is expected to be around US$4 million or $6.15 million annually.

To put this into context, petroleum, minerals and coal royalties in 2015 were about $285 million of which minerals accounted for $6 million (2 percent). Minerals and coal royalties were not expected to increase in 2016, while petroleum royalties were expected to decline by about 20 percent.[6]

The iron sands project would more than double the annual contribution from minerals to $12.15 million and increase minerals' contribution to royalties to about 5 percent.

Figure 6: Royalties and taxes



Source: MartinJenkins

Price rises in iron ore will lead to greater royalties and taxes. Income Tax and Accounting Profits Royalty are dependent on profitability, which cannot be estimated at this time, as the final project cost and capital structure are unknown. These affect the deductible items of depreciation, amortisation and interest. In general Figure 6 illustrates the relationship.

[6] (The Treasury, 2015)

Royalties provide a constant revenue stream to government, which also benefits from the upside of profitable operations. As the sales revenue from the iron ore increases with price, the royalties paid increases. Further, as the project moves into profitability, the amount of tax paid increases. At a certain level of profitability, royalties move from a proportion of sales revenue to a proportion of accounting profits.[7]

TTR will also have other statutory and regulatory compliance costs including ACC levies, Kiwisaver contributions, and applicable taxes such as Income Tax, Non Resident Withholding Tax, Fringe Benefit Tax, etc.

Royalties and company income tax are not tied to a certain expenditure area but are put into general crown revenue where they contribute to the delivery of the full range of government services that benefit New Zealand. There is significant upside to government revenue from an upswing in iron ore prices and the resulting profitability of the project.

Exports

Based on the pricing assumptions as outlined in this report, iron ore exports are expected to exceed approximately US$200 million ($312 million) annually.

Iron ore exports of $312 million would put it into the top 20 of items exported from New Zealand. Combined with iron and steel and articles of iron and steel, the category would have exports of close to $1 billion.

The New Zealand Government has set a Business Growth Agenda (BGA) target of increasing exports to 40 percent of GDP by 2025. Step-change increases in exports such as from the iron sands project, will go some way toward achieving that target.

[7] The New Zealand royalty regime stipulates the payment of the higher of a 5 percent ad valorem royalty or a 20 percent accounting profits royalty.

Table 10: New Zealand's principal exports, year to June 2015

Export category	$m
Dairy	12,036
Meat	6,376
Wood	4,596
Wine	1,424
Seafood	1,407
Machinery and Mechanical Appliances	1,353
Oil	1,215
Methanol	c…
Kiwifruit	1,182
Aluminium	1,071
Electrical Machinery and Equipment	808
Wool	805
Precious Stones, Metals and Jewellery	688
Iron and Steel and Articles of Iron and Steel	638
Apples	562
Plastic Materials and Articles of Plastic	452
Vegetables	395
Live Animals	370
Iron Ore	***312***
Carpets and other Textile Floor Coverings	128
Fabrics, Textiles and Apparel	125
Printed Books, Newspapers etc	53

Source: Statistics New Zealand

Exports in 2015 (year to June) were about $46 billion. Iron sands exports at $312 million, are about 0.7 percent of total merchandise exports. However, on its own it would still be one of the top 20 items exported, with a greater contribution than carpets and fabrics, textiles and apparel.

Including iron sands exports into the iron and steel and articles of iron and steel category, then the industry would have exports of close to $1 billion, about two percent of total exports.

Note that the $312 million in exports is at a net received iron ore price of US$40/t. If the net received price of iron ore were to recover to about US$60/t, iron ore exports would move up even further to 16th, and when grouped with iron and steel and articles of iron and steel, into the top 10.

QUALITATIVE IMPACTS

As well as the quantitative impacts in terms of GDP, employment, government revenue there are several qualitative benefits from the iron sands project on the study areas.

Complementarity and diversification

Complementarity

The Taranaki region has well developed oil and gas, dairy and engineering sectors. The Taranaki region is New Zealand's only oil and gas producing region and has a comparative advantage in that sector. Each year, the oil and gas sector contributes about $1.6 billion to the Taranaki region economy and employs about 7,000 people in the Taranaki region.[8]

As oil and gas and dairy activity has grown, businesses, particularly in the structural and mechanical engineering sectors, have adapted and developed their capability to provide support services to both sectors. Offshore mining for iron ore will complements the existing oil and gas sector. In particular, the range of support services for offshore mining will be very similar to those used for the oil and gas industry. This means that the infrastructure and services are already in place and the sector does not have to start from scratch or import all of its services.

For businesses and job seekers in the industry, this has a positive impact as it provides another source of demand for their services and skills. In some cases, the presence of the iron sands project could also make certain businesses or services more viable or sustainable.

For the Taranaki region, which considers itself to be the energy capital of New Zealand, the iron sands project will further add to its reputation and help build its capability to support natural resource extraction industries.

Diversification

Countries, and indeed regions, are continually trying to diversify their economies so that they are not overly reliant on any one industry. Industry diversification is often an economic development objective for economic development agencies or even national agencies.

The study areas (South Taranaki/Whanganui and Taranaki/Whanganui) both have a strong dependence upon the dairy sector and the oil and gas sector.

Although iron ore is a commodity and there is some correlation of prices with oil and gas, it does provide some diversification within the Taranaki region. Having diversification within the extraction industries will contribute increased economic resilience to shocks.

[8] (Venture Taranaki, 2015, p. 3)

Local development

The main area of activity is likely to be in South Taranaki and Whanganui. This is a relatively small economy in a rural area where the effects of a project will have a noticeable impact on the local economy, particularly as new jobs are generated. While there is oil and gas and extraction activity in South Taranaki, much of this is serviced out of New Plymouth, limiting the benefits to the local region.

It is understood that TTR is looking to have as much positive impact on the local area as it possibly can. This includes establishing support functions in the rural area (rather than basing it in New Plymouth), utilising local services where possible (ie engineering services), and working with the community to encourage participation from the local workforce.

TTR has advised that it envisages that, at project initiation, approximately 30 percent of all TTR employed persons would be New Zealand citizens with approximately 10 percent of those being from local South Taranaki and Whanganui communities. It is TTR's aspiration that after five years of operation, sufficient technology and skills transfer has taken place that 80 percent of the people employed directly will be New Zealand citizens, and that a significant proportion of those would be from South Taranaki/Whanganui communities.

To achieve this, TTR is exploring the possibility of basing a training school in South Taranaki, working with an ITP and regional businesses to assess the viability.

Long term, main contractors and service suppliers will also be required to ensure a progressively increasing local quota with regards to people employed within their organisation working on the TTR operation. These contractors and service suppliers will also be required to include local firms on tender lists.

The GSV would be based out of Whanganui harbour, providing much needed activity in the local area. As mentioned on page 17, there is potential to develop a heli-pad in Hawera or Opunake, which would provide services to offshore activity.

Investing in training and employment of local people will benefit the individuals, the community, the region and, ultimately, the project itself.

POTENTIAL NEGATIVE IMPACTS

It has been argued that the iron sands project could have detrimental effects on other industries or activity in the district/region, in particular tourism and fishing (commercial and recreational).

The initial extraction activity will occur in an area of approximately 66 square kilometres in the Taranaki Bight, more than 22 kilometres off the coast of Patea. About 5 square kilometres would be worked on each year, a total of 0.3 percent of the entire Bight. Mining will be in water depths of 20 to 45 metres. There are no marine reserves or marine mammal sanctuaries in this area, and very few reefs.

An independent assessment of the ecological effects from the project (NIWA, 2014) stated that

> *'for all zooplankton, seabird, and marine mammal species, and most fish species, there should be negligible effects of mining 50 million tonnes per annum according to standard evaluation criteria. This is principally because the scale of the mined area and the areas of elevated suspended sediment concentrations are small compared to the area used by the populations of these species. Consequently they are likely to be displaced from, or experience a decrease in prey abundance or availability over a very small part of their distribution. For coastal kaimoana species, the proposed mining activity should not add significantly to the levels of suspended sediments currently experienced inshore in frequently turbid waters.'*

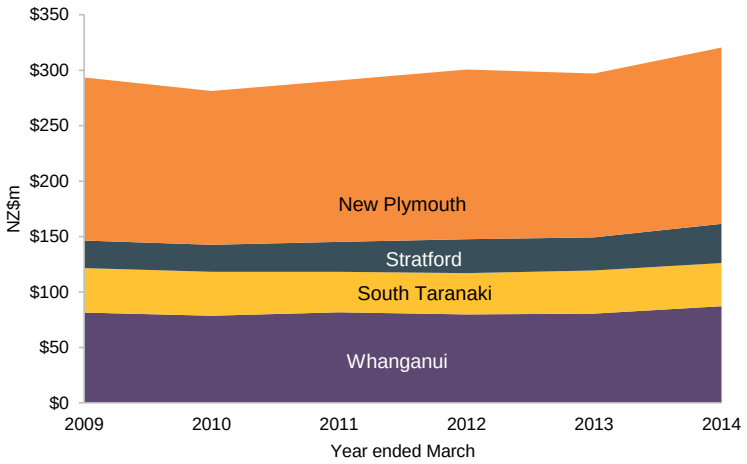
Notwithstanding this assessment, a description of the scale of these industries is provided for context.

Visitors

Visitor expenditure in Taranaki has increased markedly in 2014, consistent with the sector's performance at a national level.

In the year ending March 2014, it is estimated that visitors to the South Taranaki/Whanganui area spent $126 million. Visitor expenditure has been growing by 0.7 percent annually. However, this has been driven by Whanganui, with South Taranaki seeing a decline of -0.7 percent annually.

Table 11: Visitor expenditure, 2009 - 2014



Source: (Ministry for Business Innovation and Employment, 2015)

At the Taranaki/Whanganui regional level, visitor expenditure in the year ending March 2014 was $321 million. For the Taranaki/Whanganui region, visitor expenditure increased from a low in 2010 of $281 million. The South Taranaki and Whanganui districts account for about 39 percent of the region's visitor spend.[9]

Most visitor activity is onshore. As the site is not easily visible from the shore, the impacts on tourism from any environmental effects would be minimal. In fact, one could argue that there could actually be a small increase in visitor numbers due to the increased activity because of the project, in particular, relatives of employees and business travellers, possibly including their families too.

Commercial fishing

There were no people employed in fishing and aquaculture in the South Taranaki district in 2014 and two people employed in seafood processing. Whanganui had seven people employed in fishing and aquaculture and two employed in seafood processing.

In the Taranaki region, a further 26 people were employed in fishing and aquaculture. Egmont Seafoods Limited, based in New Plymouth, is the only fishing company/seafood processor in the region, and directly employs 16 full-time staff.

Applying the output to FTE ratios in the multiplier tables suggests that commercial fishing generated expenditure of about $2.3 million in South Taranaki/Whanganui and about $26.5 million in the Taranaki/Whanganui region.[10] This suggests total contribution to GDP of $700,000 in South Taranaki/Whanganui and $8.2 million in Taranaki/Whanganui.

We note from TTR's 2013 marine consent application that the Ministry for Primary Industries (MPI) submission and expert evidence of Dr Gibbs (April 2014) agree that there is unlikely to be any negative impact on the commercial fishing industry.[11]

Recreational fishing

The value of recreational fishing is only relevant if there is a counterfactual of no fishing. At one end of the spectrum, the loss of small areas to fishing may simply mean effort is transferred to other locations. If there were any impacts from the iron sand project, it would be isolated and concentrated in a small area where limited fishing occurs anyway. Therefore, taking the argument that affected fishermen would simply fish elsewhere, the economic cost to recreational fishing is likely to be minimal.

For the sake of analysis, any cost to recreational fishers would therefore be based on the unsupported assumption that the iron sands project means that some or all existing recreational fishers can no longer fish at all.

9 (Ministry for Business Innovation and Employment, 2015).

10 Business demography statistics and national accounts for GDP estimates by industry.

11 (Ministry for Primary Industries, 2013), (Gibbs, 2014).

A range of studies have put the indicative annual value of recreational fishing per fisher at $130 to $2,000. The two New Zealand studies in that range (Schischka & Marsh, 2008), (Kerr, Hughey, & Cullen, 2003) put the value at $495 and $130 per fisher annually.

The number of recreational fishers in the South Taranaki/Whanganui area is unknown. Studies of fishing participation in New Zealand put the participation rate at between 9.7 percent and 39 percent. Applying the participation rates to the South Taranaki/Whanganui population using the New Zealand estimated annual value of recreational fishing and applying a hypothetical chance that one percent of fishers were no longer able to fish suggests a value in a wide range from $8,900 to $137,000.

Another separate approach (Kerr & Latham, 2011) valuing the fish caught by recreational fishermen puts the commercial value for recreationally harvested species at about $180 million annually. With South Taranaki/Whanganui accounting for about 1.6 percent of the New Zealand population and assuming they account for a consistent share of recreational fishing, suggests a value of recreational fishing to the South Taranaki/Whanganui area of $2.9 million.[12]

An online search for fishing charter businesses in South Taranaki and Whanganui identified two operators operating in South Taranaki - South Taranaki Fishing Charters out of Patea and Hy-jinks Charters out of Eltham; and one operating out of Whanganui – Fluffy Duck Charters. A further four charters companies were identified operating out of New Plymouth but they would be unlikely to be materially affected. TTR has chartered vessels from the local area in the past to assist in their operations, so anecdotally there could be an increase in demand for their services.

We note from TTR's 2013 marine consent application that the MPI submission states the impact on recreational fishing is likely to be negligible or non-existent.[13]

Summary of economic costs

Taking the maximum estimate for each of these areas (visitors, commercial fishing and recreational fishing) suggests a total value (gross output) of $142 million for South Taranaki/Whanganui and $369 million for Taranaki/Whanganui.

Taking a risk approach and assuming, for example, that there was a 1 percent chance of negative impacts from the iron sands project and that the impact would result in, also for example, a 10 percent decline in activity in each of those industries would put the costs of negative impacts at $142,000 for South Taranaki/Whanganui and $369,000 for Taranaki/Whanganui. This is well below the expected direct gross output from the direct activity in South Taranaki/Whanganui ($34.6 million) and Taranaki/Whanganui ($73.4 million).

We would note that the one percent likelihood and share of industry impacted used in this example is high and the example is just to illustrate costs. The nature and location of the iron sand activity and ecological reports undertaken for this project suggest the likelihood of negative impacts on zooplankton, seabird, and marine mammal species, and most fish species would be negligible.

[12] This analysis is only applied at the South Taranaki/Whanganui area level as it is not likely that New Plymouth or Stratford recreational fishers would be affected.

[13] (Ministry for Primary Industries, 2013)

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APPENDIX 1: REGIONAL I-O MULTIPLIER ANALYSIS

Underlying logic

The underlying logic of Regional I-O Multiplier Analysis is that enterprises create flows of expenditure (direct impacts) that are magnified or 'multiplied' as they flow on to the wider economy. This happens in two ways:

1 indirect impacts - the enterprise purchases materials and services from supplier firms, who in turn make further purchases from their suppliers and so forth

2 induced impacts - employees in the enterprises and in firms supplying services are paid a wage and the enterprises generate profits, which is then spent on consumption.

The total impact is then the sum of the direct, indirect and induced impacts.

Multipliers

Regional multipliers are used to capture the indirect and induced impacts at a regional or national level. They are also used to calculate GDP. Multipliers are derived from the I-O tables published by Statistics New Zealand and the local (South Taranaki and Whanganui districts) and the regional (Taranaki region and Whanganui district) I-O tables supplied by Butcher Partners Limited.

The size of the multiplier depends upon the degree of economic self-sufficiency. The more self-sufficient a region or nation is, the higher the multiplier is likely to be. Initial expenditure is assigned to the industry where it occurs. Each industry has a different multiplier based on the average pattern of purchases of goods and services, capital formation, profits, wages and salaries.

Measures of economic activity

An analysis allows for the determination of three measures of economic activity – Gross Output, Value Added and Employment.

Gross Output is the value of production, which is built up through the national accounts as a measure of gross sales or turnover. It is essentially the initial expenditure incurred by the activity.

Value Added is the increase in output generated along the production process, which when aggregated totals GDP. Value Added is the sum of:

- compensation of employees (salaries and wages)
- income from self-employment
- depreciation
- profits and
- indirect taxes less subsidies.

Employment is generally expressed as full-time equivalents (FTEs) to allow for comparison. FTEs is the number of full-time employees and working proprietors. FTEs provide a measure of total labour demand associated with gross output for one year. For example, four full-time jobs running for three months would be shown as one FTE.

Limitations of Regional I-O Multiplier Analysis

There are acknowledged limitations of Regional I-O Multiplier Analysis. However, we consider that the nature of the iron sands project and where the activity is located means that it is not overly affected by the limitations as shown in the following table.

Table 12: Addressing the limitations of regional I-O multiplier analysis

Limitation	Application in this analysis
Additionality and displacement – the I-O multiplier analysis assumes that the activity or event being analysed is new activity and does not displace existing activity.	Additionality and displacement needs to be considered separately before the activity is inputted into the model. Our assessment is that the project is additional and will not displace existing activity. Offshore iron sand extraction is a new industry and is operating in an area where there is currently limited economic activity. As such it is most likely that the entirety of activity is additional. In terms of displacing resources, the project is in a niche area of resource extraction, which attracts sophisticated, niche investors who focus on these types of investments globally. This means it is unlikely to displace investment in other industries. In relation to labour and servicing industries, there is surplus capacity within the region that will be absorbed within existing businesses rather than displace engagement with existing activity.
Static model - It is assumed that an activity will not have an impact on relative prices.	The larger the activity, or the more concentrated it is in a single industry or region, the more likely it is that relative prices would change. A relatively large share of inputs, particularly labour and capital, will initially come from offshore, meaning there is unlikely to be significant impacts on input prices. The product is also globally traded and in insufficient volume to impact on price.
Aggregation and accuracy of multipliers - Each industry has its own unique inputs and outputs and thus multipliers. The more aggregated the level of analysis, the less accurate these inputs and outputs become. It is therefore important to apportion the initial expenditure to the industry where it occurs.	With regards to aggregation limitations impacting on accuracy, TTR expenditure has been broken down into individual expense areas and then allocated to the most relevant industry. The current analysis allocates activity across seven separate industries, which provides a higher level of accuracy. However, we accept that the accuracy is likely to be greater for the larger study areas as spending is quite focused in the South Taranaki district but broadens across a larger number of industries in Taranaki and New Zealand.
Regions and boundaries - The smaller or less defined a region and its boundaries, the less accurate the multiplier analysis will be. Similarly, the easier it is to move across boundaries, the less accurate the analysis will be.	With regards to region and boundary accuracy, the South Taranaki district is a small economy with a high level of leakage. However, much of this leakage will be to New Plymouth due to the isolation of the Taranaki region. The region is also fairly isolated with clear boundaries and distances to other economic regions. As well, the Taranaki region has strong oil and gas and dairy industries, with the supporting service sector also likely to support the iron sands project. This means that activity can be serviced out of New Plymouth. As such the analysis at the Taranaki region level is likely to be more accurate than in, say, a more central region surrounded by other, high activity areas.