



Department of  
**State Development**

Our Ref: OUT16/2268

7 APR 2016

Mr Peter Russo MP  
Chair  
Finance and Administration Committee  
Parliament House  
Corner of George and Alice Streets  
BRISBANE QLD 4000

Email: [fac@parliament.qld.gov.au](mailto:fac@parliament.qld.gov.au)

Dear Mr Russo

I write in relation to the Parliamentary Finance and Administration Committee's inquiry into the proposed North Stradbroke Island sand mining bills, the draft North Stradbroke Island Economic Transition Strategy and the Sand Mining Workers Assistance Scheme.

As part of developing the Economic Transition Strategy, a report was commissioned by the Department of State Development titled *Economic and Employment Impact of Sand Mining on North Stradbroke Island, and the Broader Region*.

The department would like to provide the full report (enclosed) to the Committee to assist in its inquiry.

Please note the authors of the report, Deloitte Access Economics, have prepared a covering statement to be read in conjunction with the analysis. This statement outlines the purpose of the analysis, its limitations and caveats on its interpretation.

If you require any further information, please contact Mr Matthew Andrew, Executive Director, Industry Development, Department of State Development, on [REDACTED] or [REDACTED] who will be pleased to assist.

Yours sincerely

[REDACTED]  
Michael Schaumburg  
Director-General

Enc

61 Mary Street Brisbane  
PO Box 15009 City East  
Queensland 4002 Australia  
Telephone +617 3452 7100  
Website [www.statedevelopment.qld.gov.au](http://www.statedevelopment.qld.gov.au)  
ABN 29 230 178 530

Danielle Ellem  
Director, Economic Strategy and Policy  
Office of the Chief Economist  
Department of State Development  
Level 2, 63 George Street, Brisbane Queensland 4000

21 March 2016

Dear Danielle

**Re: Deloitte Access Economics Statement on the Use of the *Economic and Employment Impact of Sand Mining on North Stradbroke Island, and the Broader Region Report***

Deloitte Access Economics have consented to this report being provided to the Finance and Administration Parliamentary Committee in response to a request from the Department of State Development. This Statement sets out the original purpose of the report and the limitations of the analysis, and should be read in conjunction with the report.

**Original requirement for the report**

The *Economic and Employment Impact of Sand Mining on North Stradbroke Island* report was prepared in response to the State of Queensland (acting through the Department of State Development)'s Request for Quote (RFQ) No. DSD – 3234 – 15, dated 17 April 2015. The RFP provided to Deloitte Access Economics was as follows:

*“A report is sought on the likely economic and employment impacts of closing sand mining operations on the island, and the broader region. The report must include:*

- *Impact on local economy of NSI and the Redland City, including Gross Regional Product and employment.*
- *Estimated number of direct jobs and value added lost due to closure of the mining operation, broken down by:*
  - *Location: i.e. jobs on North Stradbroke Island vs the mainland*
  - *Type: i.e. operational vs. administration jobs, full time vs. part time*
  - *Employee profile: i.e. NSI residents vs mainland residents, indigenous vs non-indigenous, age.*
- *This will be supported by a qualitative assessment of any potential broader economic impacts, including indirect employment impacts.*

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- *Estimated number of retained/ongoing jobs and value added associated with rehabilitation obligations.*
- *Viable alternate industries on North Stradbroke Island where additional employment could be supported, and any barriers to growth in these industries, noting existing new developments in the catchment.*
- *The average wage and labour productivity of jobs in these alternate industries, compared to the average wage and labour productivity of the mining industry.*
- *A discussion of other impacts, particularly potential for increased business input costs on NSI, and other potential impacts as identified by the successful offeror and discussed with the Department of State Development.*

*The response to this request must specifically outline the proposed economic modelling approach. Proposals must provide a justification for the proposed approach along with a discussion of assumptions, issues and any limitations."*

The final report was delivered to the Department of State Development on 8 September 2015.

### **Limitations of the analysis**

The *Economic and Employment Impact of Sand Mining on North Stradbroke Island* Report must be considered in conjunction with the assumptions and limitations that underpin the analysis. These assumptions and limitations, as set out in the report, are highlighted and provided below.

- This report only seeks to quantify the direct economic and employment impact of closing sand mining operations on North Stradbroke Island (NSI). The indirect impact of sand mining closure to NSI and the broader Redland City region are explored, but only qualitatively discussed.
- Deloitte was not provided with Sibelco's employment and financial records (which are private documents). The analysis was therefore conducted using public information from the Australian Bureau of Statistics' 2011 Census of Population and Housing data on employment and income. There are a number of limitations to using this dataset that should be noted. These include:
  - At the time of compiling the report, the Census was circa four years old;
  - Between 2011 and the time of the Report, there have been a number of developments in the sand mining industry on NSI. The major event being the decommissioning of the Yarraman mine in August 2015 and the cessation of full time production of the Vance mine in June 2013;
  - Between 2011 and the time of the Report, many other factors would have impacted the employment number, such as Sibelco's business decisions on the production, mining productivity changes and government policy changes on the closure date of certain mines.
- One hundred and forty-one mining jobs were identified in the 2011 Census and have been assumed to be the number of direct sand mining jobs on NSI in 2019. It is noted that the Census captured the employment associated with all three mines, including the Yarraman Mine, which, once closed, is expected to reduce the volume of mineral sands mined on the island by 34%. Hence, Deloitte Access Economics acknowledges that identifying these one hundred and forty-one positions as sand mining jobs in 2019, based on 2011 Census data (at which time all three mines were operating), represents an upper limit of the direct employment impact of the closure of the Enterprise mines that comprise the scope of this study.

- The direct economic activity (measured by Gross Regional Product (GRP)/Gross Value Added (GVA)) generated by the sand mining operations on NSI only captures the economic activity **produced** in the region; it is unable to further estimate the proportion of economic activity that is **retained** within this region. As a result, although GRP captures the amount of economic activity that is happening in the region, it does not necessarily reflect the wealth or welfare of the local community in the region. For example, there may be a large amount of economic activity in a remote area, but this may be due to foreign companies conducting resource extraction activities making use of the local resources but then repatriating the profits back to parent companies overseas. The standard GRP estimate for the region does not take into account this loss of profit (gross operating surplus) from the region.

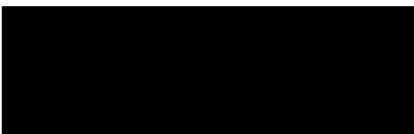
For NSI's sand mining operations, there are three components of income that are produced in this region but which are not retained locally:

- **Compensation of employees for the non-resident workers:** non-resident workers make up approximately 33% (46 workers) of total mining work force on NSI;
- **Gross operating surplus and gross mixed income:** this represents return to Sibelco in the form of profit. They are 100% repatriated overseas, as Sibelco is 100% foreign owned company; and
- **Production taxes less subsidies:** although there will be some rates and license fees paid to the local government (and as a result retained broadly in the Redland LGA), the majority of these production taxes are repatriated to the state and federal government in the form of royalties and company tax.

Therefore, the estimate of sand mining operations' contributions to NSI and the broader region are likely to represent the upper limit of GRP foregone in the region as a result of the cessation of sand mining activities.

- \$55 million was established to be the current total contribution of sand mining operations on NSI; however, this does not imply that the cessation of sand mining operations on NSI will take \$55 million worth of economic activity out of NSI. This is because while some economic activity will leave the NSI region as a result of the mines closure, it is expected that there will also be some local labour that will find alternative employment on the island, which in turn creates alternative economic activity. The magnitude of GRP generated by such alternative economic activity is not within the scope of this study.
- The loss of direct job and GRP estimates assumes constant rate of production throughout the mine life until the mine closes, in the absence of published mine production schedule for the Enterprise mines. This estimate therefore does not reflect any possible reduction in employment and the corresponding GRP towards the end of any mine production as the mining resources gets depleted.

Yours sincerely



Mark Ingham  
Partner  
Deloitte Access Economics Pty Ltd

Deloitte Access Economics

Economic and employment  
impact of sand mining on  
North Stradbroke Island,  
and the broader region

*Final Report*

Department of State  
Development

September 2015

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# Glossary

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ABS	Australian Bureau of Statistics
DAE-REV-M	Deloitte Access Economics Regional Economic Value Model
DZ	Destination zone
GRP	Gross Regional Product
GVA	Gross Value Added
ICC	Individually Calculated Customer
IVA	Industry Value Added
LGA	Local Government Area
ML	Mining lease
NSI	North Stradbroke Island
NSIPS	North Stradbroke Island Protection and Sustainability Act
NSIPSAAA	North Stradbroke Island Protection and Sustainability and Another Act Amendment
PURP	Place of usual residence
POWP	Place of work
SA1	Statistical Area 1

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# Executive Summary

Sand mining first began on North Stradbroke Island (NSI) in the 1950s. Sibelco Australia Limited – a Belgian owned multi-national mining company – currently operates three sand mining sites on the island, including the Enterprise, Vance and Yarraman mines.

The Queensland Government is reviewing the policy that governs sand mining activity on NSI. As part of the review process, the Department of State Development (DSD) has engaged Deloitte Access Economics to investigate the economic and employment impact of closing sand mining on NSI.

As required by the DSD's Request for Quote, this report only seeks to quantify the direct economic and employment impact of closing sand mining operations on NSI. The indirect impact of sand mining closure to NSI and the broader Redland City region are also explored, but only qualitatively discussed.

## Direct economic impact

In the absence of Sibelco's employment and financial records (which are private documents), the next best information available for analysing these impacts is the Australian Bureau of Statistics' 2011 Census of Population and Housing data on employment and income.

Utilising the 2011 Census data, Deloitte Access Economics identified 141 sand mining jobs on NSI. Of these 141 people, 95 also recorded NSI as their place of usual residence, with the remaining 46 recording their place of usual residence in Redland LGA and Greater Brisbane. Table i presents an overview of the workforce characteristics.

**Table i: Characteristics of North Stradbroke Island's sand mining workforce**

<i>Average income</i>	\$76,682	
<i>Average age</i>	45.4 years old	
<i>Employment status</i>	92% full-time	8% part-time
<i>Gender</i>	85% male	15% female
<i>Ethnicity</i>	84% non-indigenous	16% indigenous

To establish the direct economic activity (measured by Gross Regional Product/Gross Value Added) generated by the sand mining operations on NSI, two approaches were used – the income approach and the production approach (see Section 3.3 for details on these two approaches). In the absence of Sibelco's actual financial data, the two approaches provide an estimated range on the direct economic activity:

- Under the production approach, the estimate ranges between \$62.8 million and \$86.0 million of GVA generated by the sand mining operations on NSI each year; and
- Under the income approach, NSI's sand mining operations contribute \$55 million each year to Redland's GRP (in GVA).

The impact analysis of **closing sand mining operations** has been conducted on the policy proposition of the closure of the Enterprise mine by 2019, as opposed to by 2035 as specified in the previous policy legislated in the *NSIPSAAA Bill 2013*<sup>1</sup>. This represents 16 years of production loss and, based on the current employment and GRP figures, represents a **maximum** loss of the following jobs and GRP produced on NSI:

- Annual direct job loss for 95 workers – this only captures direct mining jobs and does not include estimates of the loss of any indirect jobs. The indirect jobs associated with the sand mining operations are discussed qualitatively in Chapter 3.5.
- Annual direct GVA (contribution to GRP) loss of between \$55 million and \$86 million, which amounts to a Net Present Value (NPV) of between \$563 million and \$880 million over the 16 year timeframe using a 10% nominal discount rate. If a lower discount rate is used (7%), the NPV increases to between \$673 million and \$1,052 million over the 16 years.

Deloitte Access Economics notes that these estimates must be considered in conjunction with the assumptions and limitations that underpin the calculations, which are explained in detail in the report.

The employment generated from rehabilitation of the sites (after closure of the mines) is expected to offset some of the employment and GRP reduction. It is estimated that a total amount of \$54 million will be spent by Sibelco on decommissioning and rehabilitation of closed mines (the years over which this will be spent is still to be determined) (Department of Environment and Heritage Protection).

### **The North Stradbroke Island economy**

As of 2011, there were a total of 768 jobs on NSI, with the mining and tourism industries being the island's two biggest employment sectors. 141 of these people were employed in the mining industry and receive the highest income across all industries on the island (average of \$73,231 per annum).

The labour market on NSI was found to be quite mobile in working between the island and the mainland; approximately 27% of NSI's residents travel to the mainland for work, while around 20% of the individuals who work on NSI arrive from the mainland. Of those workers in the mining industry, 41 of them were found to commute to the island to work in the sand mining operations.

With sand mining operations on NSI due to face closure in the future, state and local governments have recognised the need for an economic transition strategy for the island. Tourism, construction, health, education and manufacturing industries have been proposed by the local council as key future growth areas, with a number of planned projects in the pipeline (see Redlands City Plan 2015).

However, it is anticipated that future ex-sand mining workers will seek to leverage the skills and experiences that they have accumulated and align these with existing jobs in the market. The analysis presented in this report shows that, across both NSI and the wider

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<sup>1</sup> The closure date for the Vance mine has stayed unchanged from 2011, therefore does not form the scope of the impact analysis.

Redlands and Brisbane area, employment opportunities for individuals with similar *occupational experiences* concentrated in industries such as: construction; accommodation and food services; transport, postal and warehousing; and manufacturing. Moreover, based on their *non-school qualifications*, the greatest employment opportunities for sand mining employees were in industries including construction; accommodation and food services; manufacturing; health care and social assistance; and retail trade.

# 1 Introduction

The Queensland State Government is reviewing the policy that governs the sand mining activity on North Stradbroke Island (NSI).

As part of the review process, the Department of State Development has engaged Deloitte Access Economics to investigate the economic and employment impact of closing sand mining on North Stradbroke Island ('the project').

As required by the Request for Tender document, this report only seeks to quantify the direct economic and employment impact of closing sand mining operations on NSI. The indirect impact of sand mining closure to NSI and the broader Redland City region are also investigated but only qualitatively discussed.

This report comprises two parts. **Part I** presents the findings on the economic and employment impact of closing sand mining operations on NSI; **Part II** provides a discussion of the alternative economic opportunities on NSI by investigating the broader economic profile of NSI, with particular consideration given to the characteristics of the local labour force. The detailed structure of Part I and Part II is set out below.

## **Part I Economic impact**

- Chapter 2 provides an overview of sand mining activity on NSI and the relevant policy developments.
- Chapter 3 establishes the economic impact to NSI of closing the sand mining operations. The current operation's direct impact on both employment and Gross Value Added (contribution to Gross Regional Product) are quantified. Also discussed are the direct impact of rehabilitation following mine closure and the indirect impact to other sectors of the economy.
- Chapter 4 presents the conclusions from Part I.

## **Part II Alternative economic opportunities:**

- Chapter 5 establishes the broader economic profile of NSI and investigates potential opportunities for alternative economic activity for NSI after the closure of the mines, focusing on the skills and qualifications of the local labour force.
- Chapter 6 presents the conclusions from Part II.

# Part I: Economic impact

*This section of the report presents an overview of current sand mining operations on NSI by:*

- *detailing the history of sand mining on NSI as well as recent policy developments;*
- *providing an overview of the current economic impact of current sand mining operations on the island by establishing;*
  - *the size of the sand mining workforce;*
  - *the place of residence of the sand miners;*
  - *the age distribution of the sand mining workforce;*
  - *the income distribution of the sand mining workforce;*
  - *the occupation of the sand mining workforce;*
  - *the gender of the sand mining workforce;*
  - *the ethnicity of the sand mining workforce; as well as*
  - *the education attainments of the sand mining workforce.*
- *establishing the current direct impact of sand mining to Gross Regional Product;*
- *discussing the direct impact of closing sand mining operations on NSI, including the rehabilitation impact; and*
- *discussing the indirect economic impact of ceasing sand mining operations to the other parts of the NSI economy.*

## 2 Context

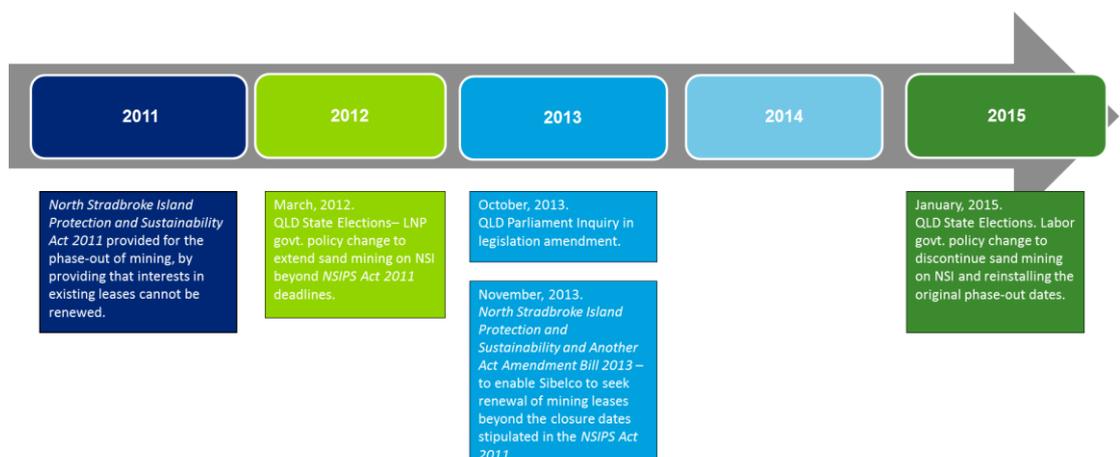
This chapter presents the broader context of sand mining on NSI by providing an overview of:

- sand mining on NSI; and
- policy developments around sand mining operations on NSI.

Sand was first mined on NSI in the 1950s. At the time of writing this report, there are three sand mining sites on the island, including: Enterprise, Vance and Yarraman, which are all operated by Sibelco Australia Limited, a Belgian owned multi-national mining company. About 50Mt of ore is dredged annually from these mines with concentrates transported by barge to a dry mill plant at Pinkenba (also owned by Sibelco). Sibelco’s sand mining operation produces around 70,000 tonnes of rutile, 50,000 tonnes of zircon and 150,000 tonnes of ilmenite each year for export to over 33 countries, including the United Kingdom, the United States and Japan<sup>2</sup>. Most of the ilmenite and rutile is processed into various titanium products, namely titanium metal for aerospace, flux core welding products, and titanium dioxide for paint pigments while the zircon is used in the ceramic industries. The silica produced from the silica sand mines are commonly used in glass applications (such as the I-O glass bottle plant at West End in Brisbane, formerly ACI) and windscreens, plasma TV screens and solar panels<sup>3</sup>.

There have been ongoing policy developments for the sand mining activity on NSI. The policy developments have been outlined in the timeline below.

**Figure 2.1: North Stradbroke Island mining activity policy development**



Source: Department of State Development, 2015; Deloitte Access Economics, 2015

In summary:

- In 2011, the *NSIPS Act 2011* was developed to “provide for the ending of mining in the North Stradbroke Island Region, and to amend particular other Acts to provide for indigenous joint management of particular land in the region”. The objective of the

<sup>2</sup> <http://www.sustainablestradbroke.com.au/about.html>

<sup>3</sup> Department of Natural Resources and Mines, Queensland’s metalliferous and industrial minerals, 2014

*NSIPS Act 2011* was to end mining interests over land across NSI, to protect and restore environmental values of the region and to facilitate the joint management between the State and the traditional owners of the land. The legislation provided for the phase-out of mining, by providing that interests in existing leases could not be renewed, as follows:

- Yarraman mining lease (ML1109) to finish at the end of December 2015;
  - Enterprise mining leases (ML1105, ML1117 and ML1120) to finish at the end of 2019; and
  - Vance mining lease (ML1108, ML1124 and ML7064) to finish at the end of October 2025.
- In 2013, the Parliament of Queensland enacted a bill to amend the *NSIPS Act 2011* - the *North Stradbroke Island Protection and Sustainability and Another Act Amendment Bill 2013* (the *NSIPSAAA Bill 2013*). The key revisions are as follows:
    - Yarraman mining lease (ML1109) to be kept as the end of 2015 (but also allowing for rehabilitation of land in the region to happen up until the end of 2020);
    - Enterprise mining lease (ML1105, ML1117 and ML112) to be extended to the end of 2035 (but also allowing for rehabilitation of land in the region to happen up until the end of 2040).
  - In 2015, the Queensland Government announced an amendment to its policy position, by maintaining its stance on discontinuing sand mining on NSI and reinstalling the original phase out dates, which is 2019 for the Enterprise mine and 2025 for the Vance mine.

### 3 Economic impact of closing sand mining operations

*This chapter provides an overview of the economic impact of the sand mining operations on NSI by presenting:*

- *the approach used to calculate the direct economic impact of the current sand mining operations on NSI;*
- *an analysis of the direct economic impact of current sand mining operations (including a detailed profile of the sand mining workforce);*
- *the direct quantified economic impact of NSI's sand mining on GRP (value added);*
- *the direct economic impact of ceasing sand mining operations (including employment impact from rehabilitation obligations); and*
- *a discussion of the potential flow-on impact of closing NSI's sand mining operations on NSI.*

### 3.1 Approach to estimating the direct economic impact

The most accurate measure of the number of workers on NSI and their respective incomes would be through Sibelco’s internal headcount payroll. However, such information is not publicly available as Sibelco is a private company. As such, the best alternative dataset available is the Australian Bureau of Statistics’ (ABS) 2011 Census of Population and Housing.

There are a number of limitations to using this dataset that should be noted. These include:

- At the time of compiling the report, the Census was circa four years old;
- In this time, there have been a number of developments for the sand mining industry on NSI. The major event being the decommissioning of the Yarraman mine in August 2015 and the cessation of full time production of the Vance mine in June 2013.

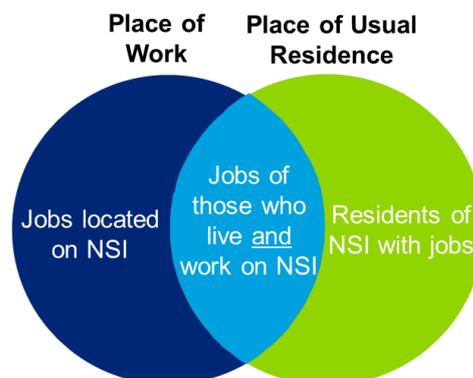
The following section details the methodology by which data was collected from the ABS 2011 Census of Population and Housing.

Two main databases were used to profile the economic and social characteristics for the study area. These were the:

- **Place of Work (POWP) database**, which provides information on where a person recorded their location of work; and
- **Place of Usual Residence (PURP) database**, which collects data based on a person’s place of usual residence.

By combining these data sources (via the journey to work dataset), it is possible to identify individuals who live in certain areas and their work destinations. For the purposes of this study, the demographics of interest were segmented according to whether a person’s place of usual residence was on NSI or not, and/or if a person’s place of work was on NSI or not. This methodology is outlined graphically in Figure 3.1.

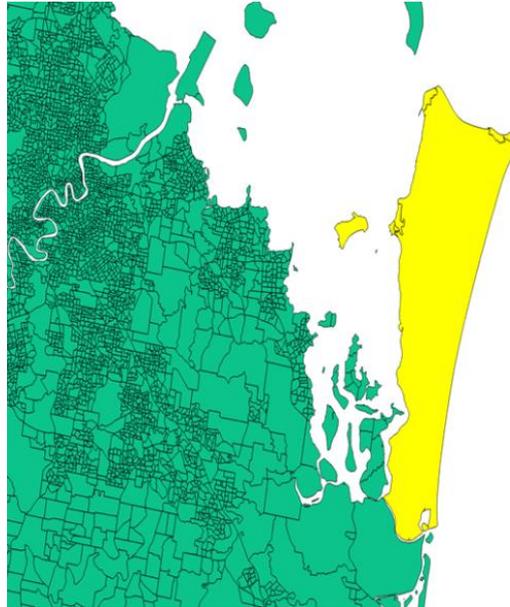
**Figure 3.1: Data collection methodology**



Source: Deloitte Access Economics

The smallest areas that POWP data is collected by the ABS is called a Destination Zone (DZ<sup>4</sup>). For NSI, the DZ of interest is #310101887 and its digital boundary is represented in Figure 3.2.

**Figure 3.2: Destination Zone (310101887)**



Source: ABS category 8000.0

Note: This DZ captures POWP data of those individuals working on Peel Island, in addition to NSI study area.

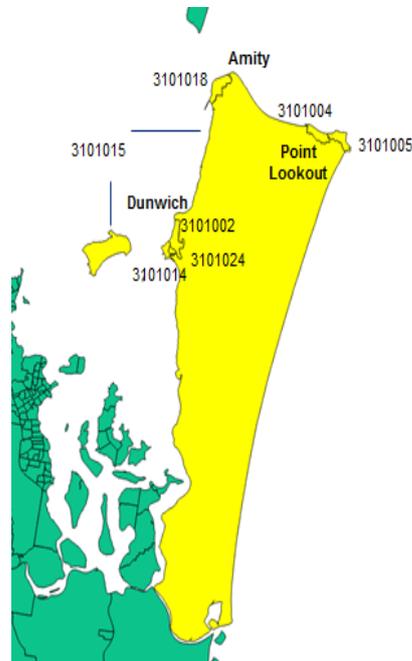
The smallest area that PURP data are collected is a Statistical Area 1 (SA1<sup>5</sup>). There are six different SA1s that, when combined, make up the geographic area for NSI, as outlined in Figure 3.3.

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<sup>4</sup> DZs – or Destination Zones - are the spatial unit developed by the ABS used to code Place of Work (POWP).

<sup>5</sup> SA1 – or Statistical Area 1 – is an ABS geographical construct designed to be either urban or rural in character, with a population in the range of 200 to 800 persons.

**Figure 3.3: Map of SA1s on North Stradbroke Island**



Source: ABS category 8000.0

This approach allows for the targeting of selected demographics by segmenting the data by location and other social and economic tags of interest within the ABS Census, including industry of employment, income, or age, etc.

## 3.2 Direct employment impact of North Stradbroke Island’s sand mining operations

### 3.2.1 Profile of North Stradbroke Island’s sand mining workforce

#### Size of sand mining workforce on North Stradbroke Island

On NSI there were 141 individuals recorded in 2011 as working in the mining industry. Table 3.1 shows the breakdown of mining jobs at the ABS data’s most granular level (4 Digit ANZSIC) within the industry on NSI.

**Table 3.1: Composition of mining jobs, North Stradbroke Island**

<b>INDB Industry of employment (4 digit level)</b>	<b>Number of jobs</b>
Mineral Sand Mining	131
Mining, nfd (not further defined)	7
Other Non-Metallic Mineral	3
<b>Total mining jobs</b>	<b>141</b>

Source: 2011 ABS Census of Population and Housing

Research shows that Sibelco’s sand mining operations was the only mining work taking place on NSI at the time of the 2011 Census. Hence, the 10 jobs from both *Mining, nfd* and

*Other Non-Metallic Mineral* in Table 3.1 have been assumed to belong to Sibelco’s sand mining on the island as well.

The 141 mining jobs identified in the 2011 Census are also assumed to be the number of direct sand mining jobs on NSI in 2019<sup>6</sup>, as it is the best available proxy. It is noted that the Census captured the employment associated with all three mines, including the Yarraman Mine, which, once closed, will reduce the volume of mineral sands mined on the island by 34%<sup>7</sup>. Hence, Deloitte Access Economics acknowledges that identifying these 141 positions as sand mining jobs in 2019, based on 2011 Census data (at which time all three mines were operating), represents an upper limit of the direct employment impact of the closure of the Enterprise mines that comprise the scope of this study.

### Sand miners’ place of residence

Understanding the place of residence of the sand mining workforce is important. This is because whether the workforce live locally or not provides an indication of the degree to which locally earned income are retained within NSI and the extent to which local residents will be affected by the mine closures. Table 3.2 shows that 95 of the sand miners (or 67% of total mining workforce on NSI) lived locally as of 2011.

**Table 3.2: Location status, North Stradbroke Island’s sand mining workforce**

Sand miners’ location status	Number of sand miners
NSI residents	95
Non-NSI residents	46
<b>Total mining jobs</b>	<b>141</b>

Source: 2011 ABS Census of Population and Housing

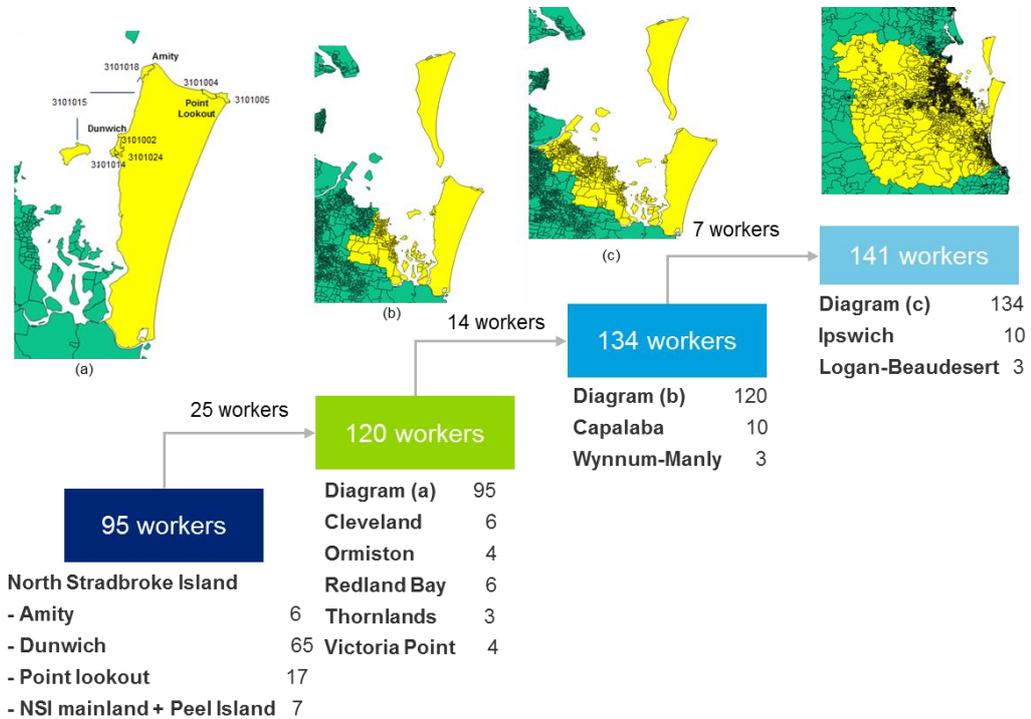
The geographic area that distinguishes whether an individual’s place of usual residence is on NSI is shown in Figure 3.3. All other sand miners who do not live within this boundary are classified as being a *Non-NSI resident* for the purposes of this study. Approximately two-thirds of the sand mining workforce live on the island, within close proximity to their place of work. The places of usual residence for the remainder of the sand mining workforce, highlighted in Figure 3.4, shows that there are:

- an additional 25 sand miners who usually live in Cleveland, Ormiston, Redland Bay, Thornlands, and Victoria Point;
- 14 workers who usually live at Capalaba and Wynnum-Manly; and
- a further 7 workers that travel from Ipswich and Logan-Beaudesert.

<sup>6</sup> Deloitte Access Economics notes that Sibelco also have a mineral processing plant at Pinkenba in Brisbane, however the jobs at this plant are outside the scope of this study as they are not local jobs on North Stradbroke Island.

<sup>7</sup> Economists at Large, 2011. A review of the report ‘Impact on North Stradbroke Island from Ceasing Sand Mining’. Redlands City Council, 2010. Tourism Strategy for the Redlands 2010 – 2014. Retrieved from <http://www.redland.qld.gov.au/AboutCouncil/Policies/Strategy/TourismStrategy.pdf>

**Figure 3.4: Place of residence, North Stradbroke Island's sand mining workforce**



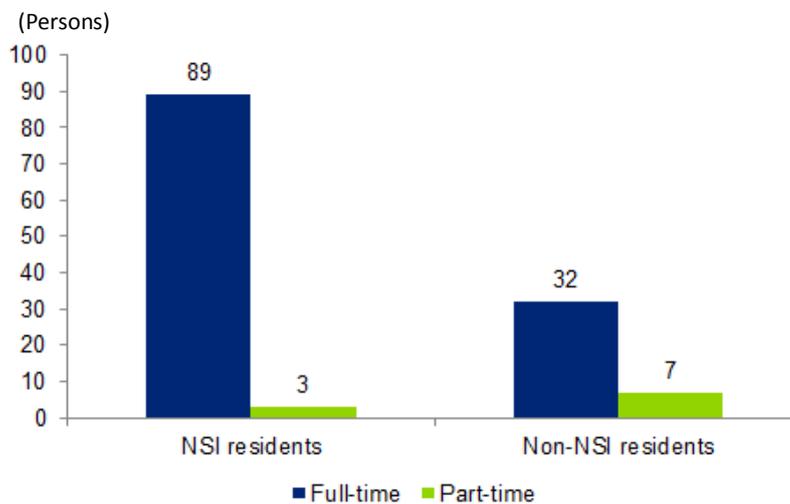
Source: 2011 ABS Census of Population and Housing; ABS category 8000.0

Note: Due to ABS Census data guidelines, some data may not reconcile.

### Employment status

The majority of mining workers are engaged in full-time work (92%). However, of those mining workers who do not live locally there is a higher proportion working part-time, although full-time workers still comprise the majority (82%) of these workers.

**Chart 3.1: Employment status, North Stradbroke Island's sand mining workforce**

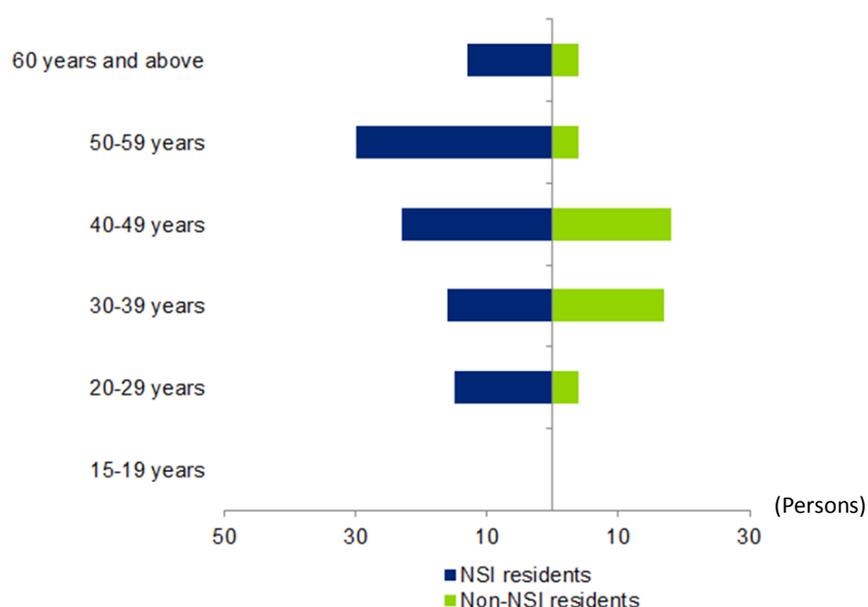


Source: 2011 ABS Census of Population and Housing

## Age

Understanding the age distribution of existing sand mining workers on NSI is an important factor when considering the island’s economic transition strategies. Older workers may face more difficulty obtaining new employment due to a lack of desire or ability to relocate; being over-qualified for other roles; or being perceived as less appealing for potential employers who need to train new hirers. The summary data in Chart 3.2 and Table 3.3 highlight that the sand miners who are NSI residents tend to be slightly older than non-NSI residents.

**Chart 3.2: Age distribution, North Stradbroke Island’s sand mining workforce**



Source: 2011 ABS Census of Population and Housing

Note: All individuals recorded in the ‘60 years and above’ category were between 60-69 years old, except for three NSI residents who were recorded to be aged between 90 and 99 years old. Deloitte Access Economics believes this to be an anomaly, and potential error, in the ABS Census data

**Table 3.3: Average age, North Stradbroke Island’s sand mining workforce<sup>8</sup>**

Location of sand mining worker	Average age
NSI residents	47.0
Non-NSI residents	42.2

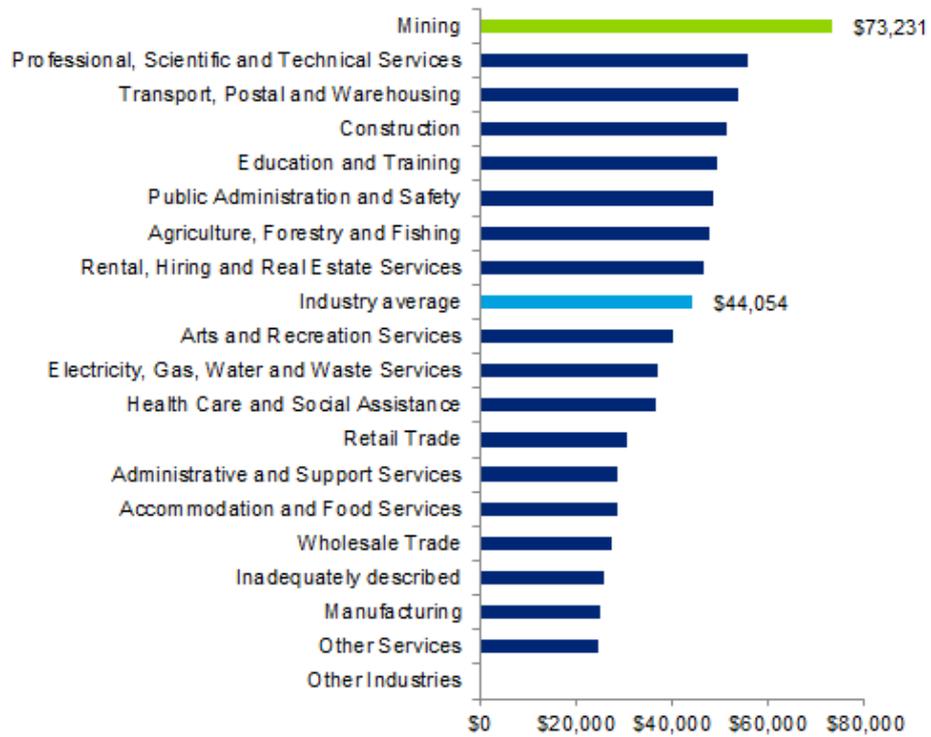
Source: 2011 ABS Census of Population and Housing

## Income

By personal income metrics alone, sand mining is the most important industry for NSI’s economy. Compared to other industries on the island, sand mining jobs offered the highest average personal income (\$73,231). This was significantly higher than the average income of all those work on NSI (\$44,054), as shown in Chart 3.3.

<sup>8</sup> These figures were calculated by taking a weighted average of the midpoints of the various age brackets.

**Chart 3.3: Average personal income, North Stradbroke Island's sand mining workforce**

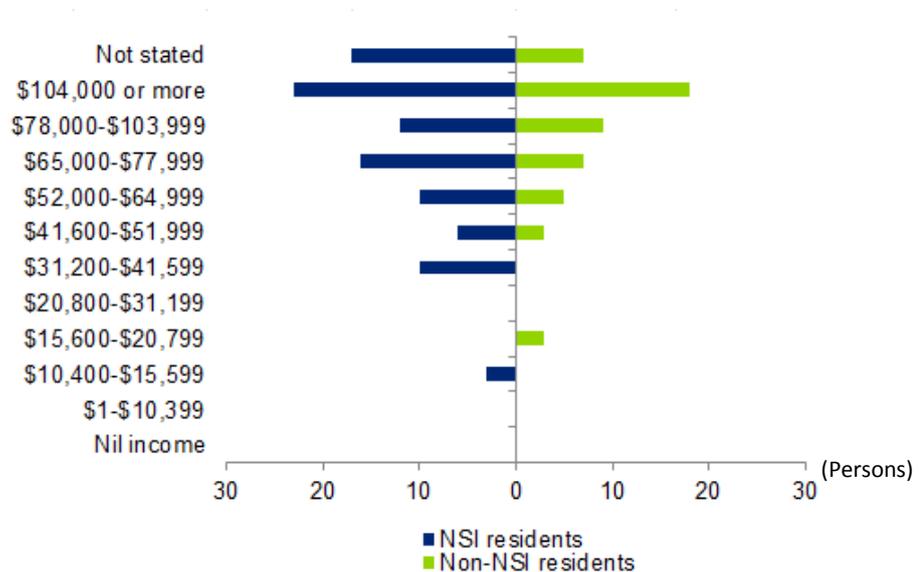


Source: 2011 ABS Census of Population and Housing

Note: The Other Industries category includes: Information Media and Telecommunications, Financial and Insurance Services, Not stated, and Not applicable.

Of those individuals working in sand mining, non-NSI residents (\$81,000) tend to be receiving higher average personal income levels than NSI residents (\$73,800). The income distribution of sand miners is outlined in Chart 3.4 and Table 3.4.

**Chart 3.4: Income distribution, North Stradbroke Island's sand mining workforce**



Source: 2011 ABS Census of Population and Housing

**Table 3.4: Average personal income, North Stradbroke Island sand mining workforce<sup>9</sup>**

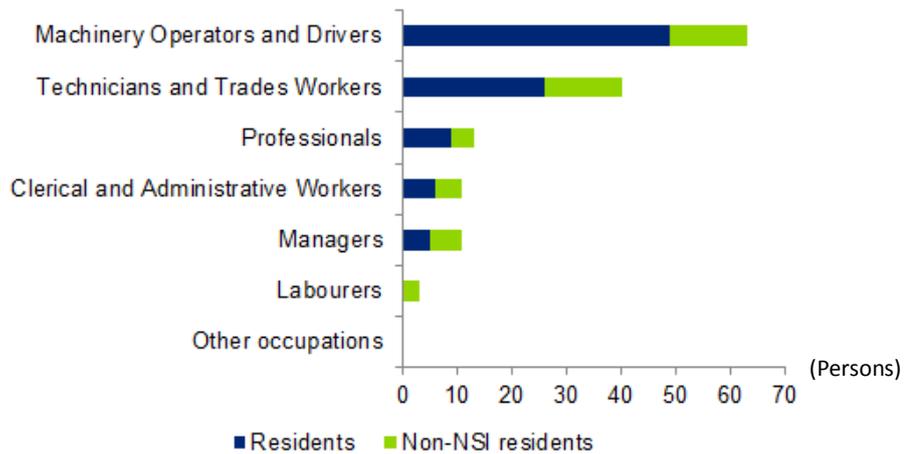
Location of sand mining worker	Average personal income
NSI residents	\$73,800
Non-NSI residents	\$81,800

Source: 2011 ABS Census of Population and Housing

### Occupation

As is the nature of mining, the majority of the workforce within the industry is involved in ‘hands on’ work. As such, Chart 3.5 highlights that Machinery Operators and Drivers, and Technicians and Trades Workers comprise of 45% and 28% of sand miners, respectively.

**Chart 3.5: Occupation, North Stradbroke Island’s sand mining workforce**



Source: 2011 ABS Census of Population and Housing

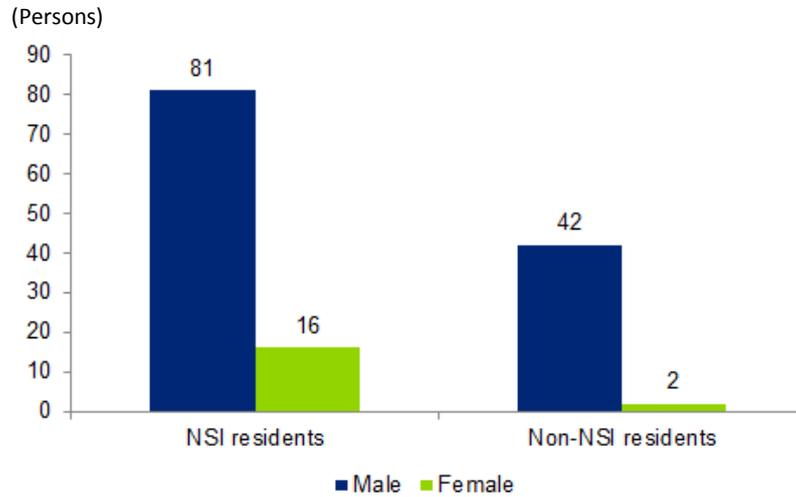
Note: The Other Occupations category includes Sales Workers, Inadequately described, Not stated, Not applicable, and Community and Personal Service Workers.

### Gender

Across the entire sand mining workforce on NSI, the majority of the workers are male (85%). However, there are a significantly higher proportion of females living locally as compared to those who do not, as shown in Chart 3.6.

<sup>9</sup> These figures were calculated by taking a weighted average of the midpoints of the various income brackets, except for the highest income class “\$104,000 or more” whereby \$104,000 was applied.

**Chart 3.6: Gender distribution, North Stradbroke Island's sand mining workforce**

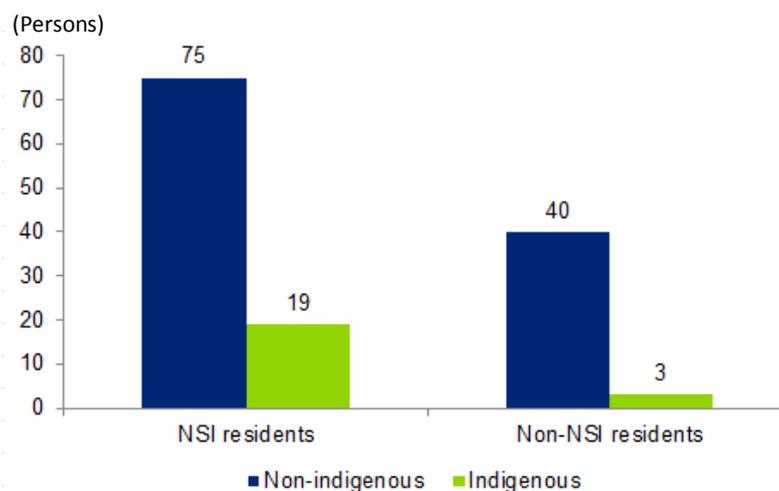


Source: 2011 ABS Census of Population and Housing

### **Ethnic and cultural diversity**

NSI was first inhabited at least 40,000 years ago and is now home to the Noonuccal, Nughie and Goenpul Aboriginal people, who call it Minjerrabah. Approximately 17% of the residents of NSI have indigenous backgrounds. This is consistent with the profile of the sand mining workforce whereby 16% have identified with this background. Chart 3.7 illustrates that indigenous workers comprises a higher proportion of the mining workforce among NSI residents than non-NSI residents.

**Chart 3.7: Indigenous status, North Stradbroke Island's sand mining workforce**



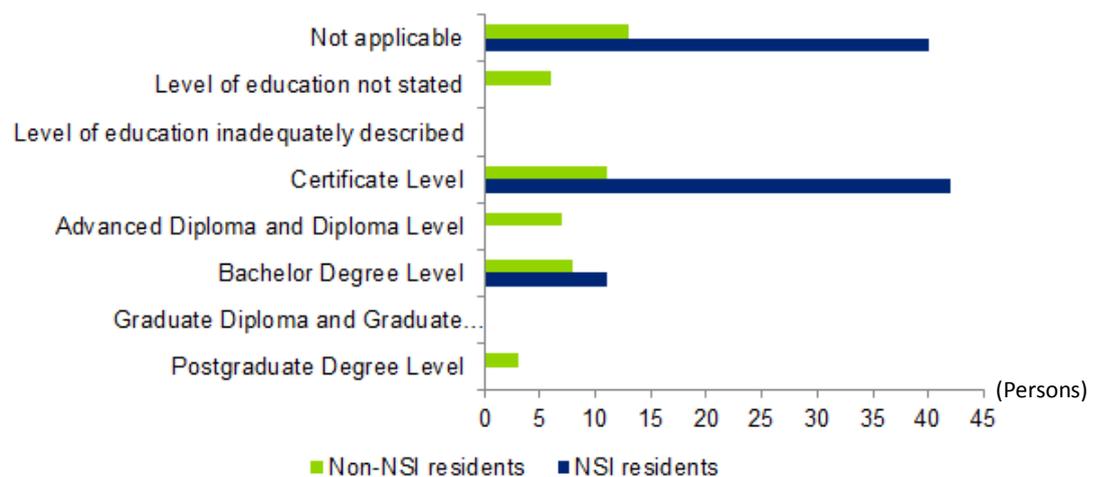
Source: 2011 ABS Census of Population and Housing

### **Education**

Communities that are characterised by high educational attainments are more likely to retain and attract new economic activities. These communities are also more likely to have the skills to adapt to potential changes, understand the nature of their vulnerability, identify community characteristics likely to mitigate vulnerability, plan effective action and motivate others to cope with a future without the sand mining activity.

Furthermore, people who are gaining skills are improving not only their individual human capital but also that of their community (Anderson, O’Loughlin, and Salt, 2001). When such people migrate out of the region and are not replaced, there will be a decline in the overall stock of human capital. Chart 3.8 presents the attainment of non-school qualifications for sand miners across NSI.

**Chart 3.8: Non-school qualification: level of education, North Stradbroke Island’s sand mining workforce**



Source: 2011 ABS Census of Population and Housing

Overall the non-NSI resident workforce holds a more diverse portfolio of non-school qualifications. Conversely, the sand miners have a significant proportion of their qualifications concentrated in the *Certificate Level*.

### 3.3 Direct Gross Regional Product contributed by sand mining operations

Gross Regional Product (GRP) is the primary indicator of economic activity for a region.

Consistent with the method used by the ABS to develop National Accounts, there are three approaches from which the GRP contributed by sand mining on NSI can be estimated:

- **The production approach:** GRP estimated using the production approach is derived as the sum of gross value added (GVA) for the relevant industry, at basic prices, plus tax less subsidies on products. The GVA for each industry is calculated as:

$$\text{Value of goods of services produced (gross output)} - \text{value of inputs used in the production (intermediate inputs)}$$

- **The income approach:** GRP estimated using the income approach is derived as the sum of payment to all of the factors of production as follows:

$$\text{Compensation of employees} + \text{gross operating surplus} + \text{gross mixed income} + \text{taxes less subsidies on production and imports}$$

- **The expenditure approach:** GRP estimated using the expenditure approach is derived as the sum of all final expenditures, changes in inventories and exports of goods and services less imports of goods and services, calculated as follows:

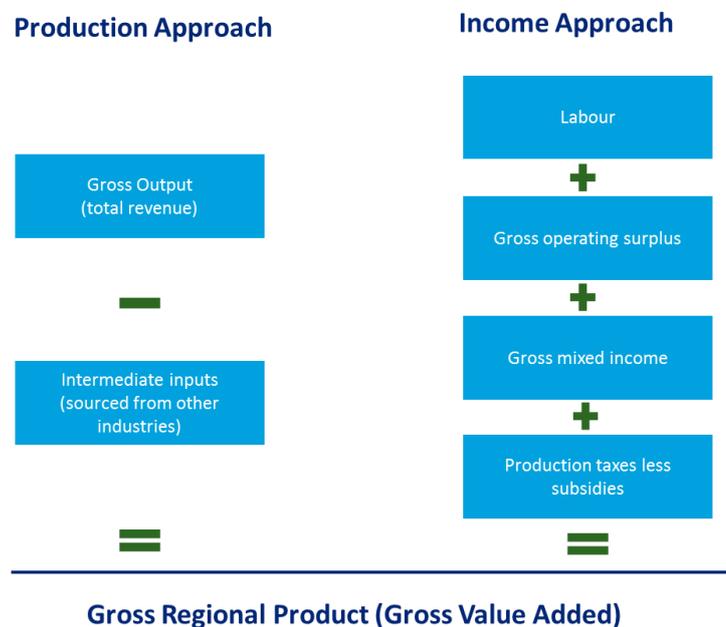
$$\text{Consumption goods and services (C)} + \text{Gross Investments (I)} + \text{Government purchases (G)} + \text{Exports (X)} - \text{Imports (M)}$$

The expenditure approach is difficult to be implemented on a small regional level, as the ABS data in relation to consumption, investment, and especially exports and imports do not go beyond state level. This study focuses on estimating GRP contributed by NSI sand mining operations using the production and income approach.

Both the production approach and income approach use the concept of GVA to capture the *additional* economic activity to the region created by the sand mining operations. GVA refers to the addition of value to the raw materials and intermediate goods by a firm by virtue of its productive activities; alternatively, it can be viewed as contribution of a firm to the current flow of goods and services. Therefore, the production approach measures the difference between value of gross output and value of intermediate inputs.

In comparison, the income approach comprises return to all of the production inputs such as labour, capital, etc. Figure 3.5 below summarises the accounting framework using these two approaches.

**Figure 3.5: Gross Regional Product accounting framework**



Source: Deloitte Access Economics

### 3.3.2 Estimation of the contribution to GRP using the income approach

The ABS State Accounts provides detail of GRP on a state level, but is unable to break down the detail into smaller regions.

The Deloitte Access Economics Regional Economic Value Model (DAE-REV-M) allows these economic activities to be broken down further into Local Government Areas (LGAs).

As illustrated above, the income approach to estimating GRP captures the income generated by employees, firms and government. Using the Income Approach, the DAE-REV-M takes the state GRP provided in the National Accounts and apportions the following four key economic contributors to the Redland Local Government Area (LGA):

- compensations of employees;
- gross operating surplus and gross mixed income;
- taxes less subsidies; and
- ownerships of dwellings.

The model uses regional employment and wage data to allocate these to the Redland LGA within Queensland. The summation of compensation of employees, gross operating surplus and gross mixed income represents the *total factor income*.

The full list of inputs used by the DAE-REV-M is below:

- ABS 5220.0 Australian National Accounts: State Accounts.
- ABS 2011 Census: Local Government Areas (2011 Boundaries) (POWP) by Industry of Employment (INDP) and Total Personal Income (weekly) (INCP).
- ABS 2011 Census: Local Government Areas (2011 Boundaries) (POWP) by Industry of Employment (INDP) and Hours Worked (ranges) (HRWRP).

According to the modelling results from the DAE-REV-M, the GRP contributed by mining activity within the boundary of Redland LGA is estimated to be \$101 million. The ABS 2011 Census reported that there were 257 mining jobs in Redland<sup>10</sup>. Research shows that these workers are likely to comprise the workforce from the Mount Cotton hard rock quarry and NSI sand mining operations; it has been established earlier that NSI sand mining operations employed 141 workers.

Using the same ratio of 141 to 257 (share of NSI mining workers in Redland), it can be estimated that the **share of NSI's mining contribution to Redland GRP is approximately \$55 million**.

There are a few limitations to the estimate derived under this approach however, especially in a NSI regional context; they are explained below.

There are inherent limitations of GRP estimates in a regional context; the GRP only captures the economic activity **produced** in a region; it is unable to further estimate the proportion of economic activity that is **retained** within this region. As a result, although GRP captures the amount of economic activity that is happening in a region, it does not necessarily reflect the wealth or welfare of the local community in the region. For example, there may be a large amount of economic activity in a remote area, but this may be due to foreign companies conducting resource extraction activities making use of the local resources but then repatriating the profits back to parent companies overseas. The standard GRP

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<sup>10</sup> ABS 2011 Census of Population and Housing, Local Government Areas (2011 Boundaries) (POW) by IND - 1 Digit Level, Redland (C)

estimate for the region does not take into account this loss of profit (gross operating surplus) from the region.

For NSI's sand mining operations, there are a couple of components of income that are produced in this region but are not retained locally:

- **Compensation of employees for the non-resident workers:** non-resident workers make up approximately 33% (46 workers) of total mining work force on NSI;
- **Gross operating surplus and gross mixed income:** this represents return to Sibelco in the form of profit. They are 100% repatriated overseas, as Sibelco is 100% foreign owned company; and
- **Production taxes less subsidies:** although there will be some rates and license fees paid to the local government (and as a result retained broadly in the Redland LGA), the majority of these production taxes are repatriated to the state and federal government in the form of royalties and company tax.

The implication of these GRP limitations is that the actual economic activity created by sand mining operations that really affects the island local community's welfare is likely to be less than \$55 million, as some proportions of that are repatriated out of NSI.

Furthermore, the \$55 million estimate represents the current total contribution of sand mining operations on NSI; however, this does not imply that the cessation of sand mining operations on NSI will take \$55 million worth of economic activity out of NSI. This is because while some economic activity will leave the NSI region as a result of the mines closure, it is expected that there will also be some local labour that will find alternative employment on the island, which in turn creates alternative economic activity. The magnitude of GRP generated by such alternative economic activity is not within the scope of this study; however the potential opportunities for the local workforce to transfer to other positions and the ability of local industry to take on additional labour are assessed in Part II.

### 3.3.3 Estimation of the contribution to GRP using the production approach

The GRP contributed by the sand mining operation on NSI could also be estimated through the production approach, using a bottom-up summation of GRP contributed by each sand mining company, via the following equation:

$$GRP/GVA = \text{value of goods of services produced (gross output)} - \text{value of inputs used in the production (intermediate inputs)}$$

#### Gross output

A desktop review highlighted that there is only one sand mining company operating on NSI – Sibelco Asia Pacific Pty Ltd (Sibelco)<sup>11</sup>. Furthermore, as indicated by the Department of Natural Resources and Mines' publication *Queensland's metalliferous and industrial minerals*, Sibelco's NSI mines are the only mines that produce major mineral sand (rutile, zircon and ilmenite) in Queensland.

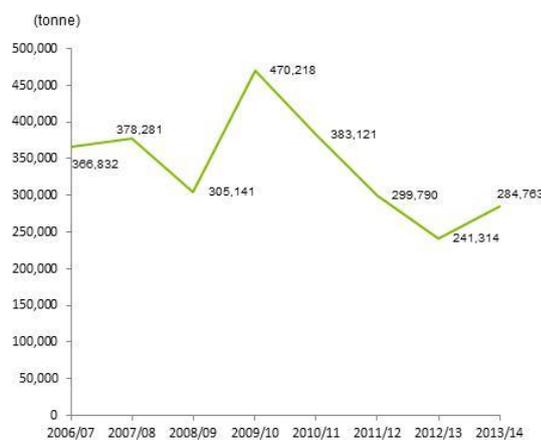
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<sup>11</sup> Sibelco is part of the Belgian company, Sibelco Group and operates in Australia and New Zealand.

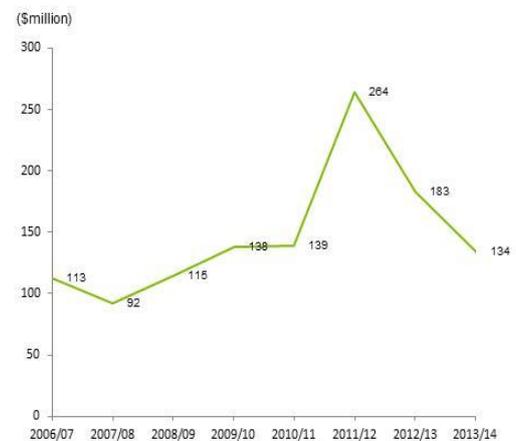
Sibelco does not publish its financial information, including information on its NSI sand mining operations. Therefore Sibelco’s annual revenue (i.e. gross output) is not publicly available. Deloitte Access Economics has estimated the gross output/revenue from NSI sand mining operations based on production data of mineral sand in Queensland, as below.

From ABS and Department of Natural Resources and Mines<sup>12</sup> publications on mining operations in Queensland, it can be established that the quantity and value of production of mineral sand in Queensland during year 2006/07 and 2013/14 are as follows:

**Chart 3.9: Quantity of mineral sand produced in Queensland**



**Chart 3.10: Value of mineral sand produced in Queensland**



Source: ABS, Mining Commodities, Australia, 2001-02 to 2011-12; Department of Natural Resources and Mines, Queensland’s metalliferous and industrial minerals, 2014

Note: The quantity data for rutile is adjusted from the Department of Natural Resources and Mines’ publication based on Deloitte Access Economics’ understanding of potential error in some of the data points.

The production data does not include silica sand, which is solely produced by the Vance mine, which is reported to have ceased full time production in June 2013 and is managed on a campaign basis to suit customer needs.

As established earlier, Queensland commercial production of mineral sand mining activities are limited to NSI, therefore the Queensland production statistics above represent the production statistics on NSI. As the value of production has been volatile historically, Deloitte Access Economics has adopted four estimates as a proxy for the annual value of production (gross output) attributed to sand mining operations on NSI, based on the following criteria<sup>13</sup>:

- The **highest** gross output recorded during 2006/07 to 2013/14, which was \$264 million;
- The **average** gross output between 2006/07 and 2013/14, which was \$147 million;
- The **lowest** gross output during 2006/07 and 2013/14, which was \$92 million;

<sup>12</sup> ABS, Mining Commodities, Australia, 2001-02 to 2011-12; Department of Natural Resources and Mines, Queensland’s metalliferous and industrial minerals, 2014

<sup>13</sup> The IBISWorld *Mineral Sand Mining in Australia* December 2014 publication has predicted that the mineral sand mining industry’s outlook is expected to remain positive during the next five years to 2019-20, as output and prices rise.

- The **latest year** gross output during 2006/07 and 2013/14, which was \$134 million.<sup>14</sup>

### Gross Value Added (GVA)

According to the production approach equation above, the magnitude of intermediate inputs is required to estimate the GVA contributed by Sibelco's NSI sand mining operation. However, this data is difficult to obtain.

The method adopted in this report to measure GVA produced by NSI sand mining operations was to apply a proportion on the total value of gross output for the most representative industry to sand mining, which is the 0805 *Mineral Sand Mining* Industry<sup>15</sup>. The proportion was informed by the ABS publications on mining activities in Australia.

The ABS publication *8415.0 - Mining Operations, Australia, 2013-14* reported **Industry Value Added (IVA)** for the 0805 *Mineral Sand Mining* Industry for year 2012/13 to 2013/14. IVA was defined as "the measure of the contribution by businesses in each industry to gross domestic product".

Also provided was each specific component that comprises IVA, which is gross output (sales of goods and services + government funding for operational costs + capital work done for own use + closing inventories – opening inventories), purchases of goods and materials and other intermediate input expenses.

However, the limited data quality<sup>16</sup> of this particular ABS publication determines that there is insufficient information to calculate gross output for the 0805 *Mineral Sand Mining* Industry with acceptable accuracy. In its absence, "sales and service income" is used as a proxy for gross output, as it comprises the majority of the gross output. The IVA and Sales and service income for the 0805 *Mineral Sand Mining* Industry over the period 2012/13 to 2013/14 period is presented in Table 3.5<sup>17</sup>.

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<sup>14</sup> Production total excludes silica sand which is low value compared to other commodities produced in NSI (average price around \$20 per tonne year). Based on DNRM quantity data at NSI, average production of silica sand around 240,000 tonnes over 2011-12, 12-13 and 13-14 implying silica sands GVP of around \$5 million. Silica sand is produced by the Vance mine.

<sup>15</sup> The Mineral Sand Mining industry is coded 0805 under Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006; it includes the following primary activities: ilmenite sand mining, leucoxene sand mining, mineral sand mining, monazite sand mining, rutile sand mining, synthetic rutile production and zircon sand mining. In Queensland, there are no operations in leucoxene sand mining, monazite sand mining and synthetic rutile production; therefore the 0805 *Mineral Sand Mining industry* accurately captures the NSI sand mining operations and the operations only.

<sup>16</sup> Refer to ABS Quality Declaration for this publication.

<sup>17</sup> This publication also provides industry value added for year 2011-12; however the corresponding sales and services income for that year was not reported. Therefore there is insufficient information to determine the industry value added to gross output ratio for year 2011-12.

**Table 3.5: Mineral Sand Mining Industry, IVA and Sales and service income, 2012-13 to 2013-14**

<b>0805 Mineral Sand Mining Industry</b>	<b>IVA (\$ million)</b>	<b>Sales and services income (proxy for gross output) (\$ million)</b>	<b>Ratio (IVA to gross output)</b>
2012-13	1,318	2,240	<b>58.5%</b>
2013-14	889	2,081	<b>42.7%</b>

Source: ABS, Mining Operations, Australia, 2013-14

The ratio means that for every 1 dollar of production by the sand mining operations on NSI, 42.7 cents or 58.5 cents of value-add is created in the economy, depending on which year's ratio is used.

Both ratios are adopted by Deloitte Access Economics to estimate the GVA. These are comparable to the IVA/revenue ratio reported by IBISWorld for Mineral Sand Mining in Australia<sup>18</sup>, at 50.52%.

Applying the ratios from Table 3.5 to the four gross output/revenue estimates (i.e. \$92 million, \$134 million, \$147 million, \$264 million) established in the Gross Output section above, a range of between **\$62.8 million and \$86.0 million is estimated for GVA generated by the sand mining operations on NSI.**

The formula for this calculation is:

$$\text{GVA} = \text{NSI annual gross output} * \text{Australian IVA} / \text{Australian annual gross output}$$

The results are presented in the table below.

**Table 3.6: GVA by NSI sand mining operations**

	<b>IVA to gross output ratio</b>	<b>2012-13</b>	<b>2013-14</b>
<b>Annual gross output</b>		<b>58.5%</b>	<b>42.7%</b>
<b>Highest</b> between 2006/07 and 2013/14	\$264 million	\$154.4m	\$112.7m
<b>Average</b> between 2006/07 and 2013/14	\$147 million	<b>\$86.0m</b>	<b>\$62.8m</b>
<b>Latest year</b> between 2006/07 and 2013/14	\$134 million	\$78.4m	\$57.2m
<b>Lowest</b> between 2006/07 and 2013/14	\$92 million	\$53.8m	\$39.3m

Source: ABS, Mining Operations, Australia, 2013-14; ABS, Mining Commodities, Australia, 2001-02 to 2011-12; Department of Natural Resources and Mines, Queensland's metalliferous and industrial minerals, 2014; Deloitte Access Economics

Note: Production total excludes silica sand which is low value compared to other commodities produced in NSI (average price around \$20 per tonne year). Based on DNRM quantity data at NSI, average production of silica sand around 240,000 tonnes over 2011-12, 12-13 and 13-14 implying silica sands GVP of around \$5 million

**Limitations to the estimate also exist under this approach, as outlined below.**

<sup>18</sup> IBISWorld Industry Report B0805 (Mineral Sand Mining in Australia), December 2014

- **Using gross output to calculate GVA estimates:** The gross output/revenue for Sibelco is simply calculated as the final production volume of the mineral sand multiplied by the market price for the mineral sand product. Although it captures the level of economic activity created by Sibelco, it does not indicate how much of this economic activity is retained in the NSI local community.
- **The limited accuracy of the gross output/revenue estimate for Sibelco:** Sibelco does not publish its revenue figure earned from NSI sand mining operations; the four sets of estimates of Sibelco's revenue are only based on ABS historic data and might not be reflective of the actual production value in 2019. In addition, the ratio is derived based on whole of Australia data and does not necessarily reflect the production relationship in Queensland accurately.
- **Using the GVA to sales and service income to derive GVA:** there is inaccuracy in using sales and service income as a proxy for gross output, as it is only one component of gross output (albeit the majority component). In addition, the ratio is reliant on the historic data for two years only, and might not be reflective of the actual production relationship in 2019.

## 3.4 Direct economic impact of closing sand mining operations

### 3.4.1 Direct economic impact of closing sand mining operations

The direct employment and economic impact of closing sand mining operations on NSI is indicated by the level of employment and GRP contributed by the current sand mining operations.

As established in Chapter 3.2 and 3.3, 141 sand mining jobs were identified on NSI based on ABS 2011 Census, of which 95 were NSI residents. The sand mining operations generated economic activity on the island to the value of between \$55 million to \$86 million per annum as measured by GRP/GVA/IVA<sup>19</sup>.

These estimates are underpinned by a number of assumptions:

- The employment number (95) is based on ABS 2011 Census and captures the size of the mining workforce which reflects Sibelco's mining production and mining productivity at that point in time. The current employment figure (2015) might have varied from the 2011 figure as a result of many factors, such as Sibelco's business decisions on the production, mining productivity changes and government policy changes on the closure date of certain mines.
- The GRP figure (\$55 million to \$86 million) captures the level of economic activity produced on NSI by the sand mining operations; however it does not necessarily reflect the wealth or welfare of (and therefore the impact on) the local community on NSI as a result of the sand mining operations. Some examples of components of GRP that are produced on NSI but not retained locally include Sibelco's profit, tax paid to the state and federal government, wages for non-NSI resident workers, etc.

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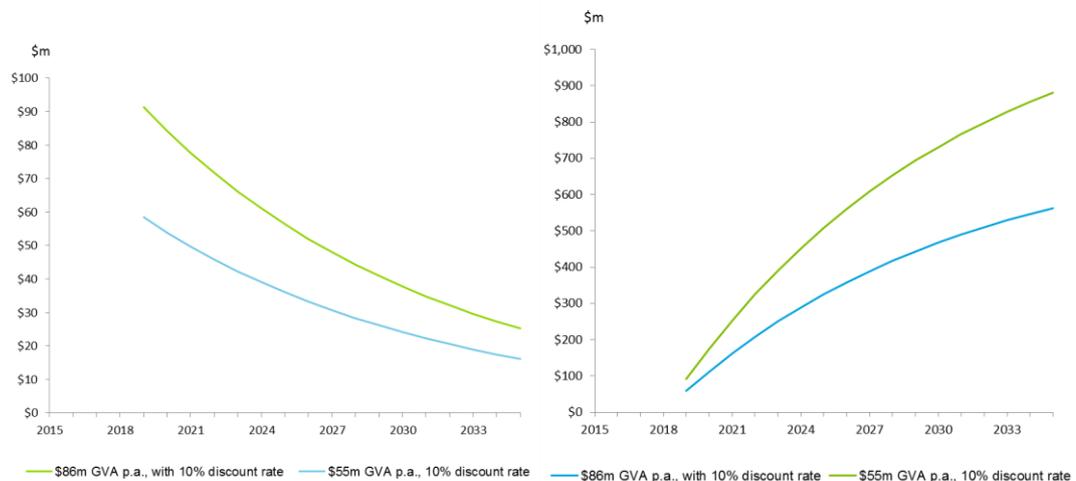
<sup>19</sup> The estimate of \$55 million using the income approach falls within this range

The impact analysis of closing sand mining operations is conducted on the policy proposition of closure of the Enterprise mine by 2019 rather than by 2035 as specified in the previous policy legislated in the *NSIPSAAA Bill 2013*<sup>20</sup>. This represents 16 years of production loss, and based on the current employment and GRP figures, represents a **maximum** loss of the following jobs and GRP produced on NSI:

- Annual direct job loss of 95 for NSI residents. This only captures direct mining jobs and does not include estimates of the loss of any indirect jobs. The indirect jobs associated with the sand mining operations are discussed qualitatively in Chapter 3.5.
- Annual direct GRP/GVA loss of between \$55 million and \$86 million, which amounts to a Net Present Value (NPV) of between \$563 million (constant 2019 prices) and \$880 million (constant 2019 prices) over the 16 year timeframe using a 10% nominal discount rate. If a lower discount rate is adopted (7%), the NPV increases to between \$673 million (constant 2019 prices) and \$1,052 million (constant 2019 prices) over the 16 years. Chart 3.11 and Chart 3.12 below shows the annual and cumulative maximum impact.

**Chart 3.11: Annual impact of closing sand mining operations on Gross Regional Product (NPV, 10% discount rate)**

**Chart 3.12: Cumulative impact of closing sand mining operations on Gross Regional Product (NPV, 10% discount rate)**



Source: Deloitte Access Economics

Caution should be exercised when considering these estimates, as the results are underpinned by several key assumptions and constrained by several limitations of the analysis:

- In the absence of data on the remaining life of the Enterprise mine, it is assumed that the end of production time for the mine coincide with the closure date set by the previous government, which is year 2035;
- The loss of direct job and GRP estimates assumes constant rate of production throughout the mine life until the mine closes, in the absence of real mine production schedule for the Enterprise mines. This estimate therefore does not reflect the possible

<sup>20</sup> The closure date for the Vance mine has stayed unchanged from 2011, therefore does not form the scope of the impact analysis.

reduction in employment and the corresponding GRP towards the end of any mine production;

- This estimate does not take into consideration changes in economic activity that result from resources moving from the sand mining operations into other areas of the economy. This could include the potential redeployment of NSI mining workforce into other industries on the island or mining industries outside of the island and the corresponding economic activity that will create, or the development of alternative industries supported by targeted government initiatives for example.

### 3.4.2 Direct economic impact associated with rehabilitation

Under the *Environmental Protection Act 1994* (EP Act), Sibelco is required to undertake rehabilitation on the mining site as a condition of their Environmental Authority. Part of the operating license for the industry's mineral sands mining activity is to complete the backfill and rehabilitate the sites back to a pre-mining land usage, or an alternative usage provided for in landholder agreements.

According to Sibelco's latest Plan of Operations for the Enterprise and Yarraman Mines (\*confidential) released by the Department of Environment and Heritage Protection, Sibelco's total lease area is 9000 hectares, out of which 3883 hectares are disturbed area. Sibelco has estimated that the rehabilitation and decommissioning costs associated with the 3883 hectares<sup>21</sup> disturbed area is \$54 million.

The rehabilitation activities are expected to last to up to 5 years, as currently the NSI legislation allows mining leases to be renewed for five years in order to undertake rehabilitation activities.

The rehabilitation works could include landform reconstruction, re-instatement of overburden, topsoil return, seeding of pastures and infrastructure replacement such as the building of fences. A range of employment positions are expected to be created as a result, some of which could be filled with redeployment of existing sand mine workers:

- rehabilitation earthmoving operations: performed by mine site machinery operators with experience and skill in the operation of the relevant machinery (scrapers, loaders, excavators etc.) for operations such as final trim, deep rip, drainage construction and revegetation; and
- mine supervisors/managers: their role will be to ensure that the operators (e.g. machinery operators) comply with the closure and rehabilitation criteria.

It is unknown out of the estimated \$54 million total expenditure on rehabilitation estimated by Sibelco, the proportions spent on labour and capital separately. Sibelco does not report the estimated labour requirements associated with the rehabilitation activity either.

In April 2015, a Victorian earthworks company named Mildura' Garraway Group was reported to have been awarded a contract worth more than \$35 million to rehabilitate

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<sup>21</sup> The extent of disturbance varies between areas – some areas are 'cleared and stripped for mining', while some other areas are for services including roads, tracks, power line easements etc.

Iluka Resources' mineral sands mine near Ouyen<sup>22</sup>. The company itself estimated that between this contract and the rehabilitation of another site at Kulwin, about 40 full-time jobs would be created.

Given the broadly similar nature of operations between the Sibelco mines and Iluka Resources' mines in Ouyen and Kulwin, we expect the employment to expenditure ratio for Sibelco's rehabilitation activity to be similar to the two mines for Iluka Resources.

From an income approach point of view, there will be additional GRP (value add) created from the employment of these rehabilitation workers.

### 3.5 Indirect economic impact of closing sand mining operations

#### Indirect industries affected by sand mining closure

The cessation of sand mining operations on NSI will have a number of indirect economic impacts. It is difficult to discern indirect impact at a small regional level, as detailed trade flows need to be mapped to capture that impact which is often difficult to disaggregate and observe for a small region. As such, the ABS Input-Output table are used, as a guide on which other industries maybe impacted by the sand mining operations.

Input-Output tables provide detailed information about the supply and use of products in the Australian economy, and the structure of and inter-relationships between Australian industries.

Table 3.7 provides a summary of the inputs used in the *Non Ferrous Metal Ore Mining* industry, which is the most representative industry of sand mining published within the structure of the ABS Input-Output tables.

**Table 3.7: Inputs used for Non Ferrous Metal Ore Mining Industry**

<b>From industry</b>	<b>Percentage input per unit of production</b>
Exploration and Mining Support Services	27.3%
Non Ferrous Metal Ore Mining	13.0%
<b>Petroleum and Coal Product Manufacturing</b>	<b>5.9%</b>
<b>Construction Services</b>	<b>5.8%</b>
<b>Wholesale Trade</b>	<b>4.9%</b>
Coal mining	4.8%
Professional, Scientific and Technical Services	3.7%
<b>Finance</b>	<b>3.2%</b>
Oil and gas extraction	2.5%
<b>Electricity Generation</b>	<b>2.4%</b>

<sup>22</sup> <http://www.abc.net.au/news/2015-04-02/mildura-firm-wins-35m-contract-to-rehabilitate/6367038>

<b>From industry</b>	<b>Percentage input per unit of production</b>
<b>Electricity Transmission, Distribution, On Selling and Electricity Market Operation</b>	<b>2.2%</b>
Structural Metal Product Manufacturing	1.8%
Basic Chemical Manufacturing	1.8%
<b>Building Cleaning, Pest Control, Administrative and Other Support Services</b>	<b>1.8%</b>
<b>Rental and Hiring Services (except Real Estate)</b>	<b>1.6%</b>
<b>Road Transport</b>	<b>1.3%</b>
<b>Auxiliary Finance and Insurance Services</b>	<b>1.3%</b>
Specialised and other Machinery and Equipment Manufacturing	1.3%
<b>Retail Trade</b>	<b>1.0%</b>
Heavy and Civil Engineering Construction	0.8%
<b>Non-Residential Building Construction</b>	<b>0.8%</b>
<b>Transport Support services and storage</b>	<b>0.7%</b>
<i>*All other inputs</i>	<i>10.3%</i>

Source: Category 5209055001, Australian National Accounts

Note: The Non Ferrous Metal Ore Mining category within the ABS' input-output tables comprising of a number of sub-mining industries including Mineral Sand Mining, as well as Bauxite Mining, Copper Ore Mining, Gold Ore Mining, Nickel Ore Mining, Silver-Lead-Zinc Ore Mining, and Other Metal Ore Mining.

\* There are 89 other remaining inputs used for Non Ferrous Metal Ore Mining, all with input factor percentage magnitudes of less than 0.7% per unit of production.

Values that have been bolded in the table above indicate those input industries that are likely to be impacted once sand mining operations conclude on NSI.

## **Fuel**

As indicated in Table 3.7, Petroleum and Coal Product Manufacturing is the third most intensely used input by value in the production of Non Ferrous Metal Ore Mining (5.9%). Should sand mining no longer continue after 2019, it is likely that demand for diesel fuel on NSI will be lower and its price may experience some upward pressure. However, the extent of this impact would depend on a number of factors, including the price elasticity of diesel fuel supply.

## **Stradbroke Ferry passenger volumes**

Should mining operations cease on NSI from 2019 onwards, there will be approximately 45 non-NSI residents working in mining who would no longer commute to the island for work. This represents approximately 12% of the total number of individuals who commute via the Stradbroke ferry to work; and this does not include those persons using the service for non-work purposes.

In addition to the 45 non-NSI resident mining workers, there are another 95 sand miners who live on NSI. Should the mining operations cease in 2019, a number of these individuals may start to use the ferry service to get off the island for work. This means that, ultimately, there could either be a net increase or a net decrease in the ferry's passenger volumes. A

simple rationale as to why former, local sand miners would consider working off the island would be to earn a higher income, as outlined in section 5.1.4 in Part II.

Finally, it is difficult to make predictions as to what impact the closure of sand mining operations will have on ferry prices. This is because the pricing is influenced by a number of factors, including but not limited to:

- the final net change in ferry passenger volumes as a result of sand mine closure;
- changes over time of the total number of passengers who use the ferry services for non-work purposes;
- changes to transport agency decisions, with respect to either the ferry network or the ground network on NSI and/or neighbouring islands; and
- the input costs of running the ferry services (including fuel, labour, maintenance, etc.).

### **Electricity**

Energex's pricing methodology does not attribute network charge costs solely on the basis of geographical use of network for its domestic and small commercial connections. Rather, network costs are shared according to the class of customer relative to their demand profile and network usage. This means that electricity charges for customers on NSI are influenced by the electricity activity levels of other users in the same tariff class across the entire Australian Energex network, Energex's current network pricing methodology does not support cross subsidies between classes of consumers. Moreover, Energex proactively applies pricing strategies that ensures stability of network prices for all of its customers.

As provided by Energex, Sibelco's mines currently receive electricity as an Individually Calculated Customer (ICC) class customer under Energex's tariff stratum. There are no other ICC class customers on NSI; all other electricity users on the island fall under a different tariff class, either under the domestic or small business tariff classes. This means that their network charges are not directly impacted by customer changes to the major customer class.

Therefore to the extent that the electricity pricing method across tariff classes by Energex remain unchanged in the future, it is unlikely that residents and other businesses of NSI will experience material difference in electricity prices due to the closure of sand mining on the island.

## 4 Part I Conclusion

There are three sand mining sites on the island, Enterprise, Vance and Yarraman. The Yarraman mine is expected to close by August 2015; the Vance mine has reported to have ceased full time production in 2013 and is now managed on a campaign basis to suit customer needs.

Deloitte Access Economics identified 141 sand mining jobs on NSI. Of these 141 workers, 95 also recorded NSI as their place of usual residence, with the remaining 46 recording their place of usual residence in Redland LGA and Greater Brisbane. The sand mining workforce was found to share the following characteristics as set out in Table 4.1 below.

**Table 4.1: Characteristics of North Stradbroke Island’s sand mining workforce (both NSI residents and non-NSI residents)**

<i>Average Income</i>	\$76,682	
<i>Average Age</i>	45.4 years old	
<i>Employment status</i>	92% full-time	8% part-time
<i>Gender</i>	85% male	15% female
<i>Ethnicity</i>	84% non-indigenous	16% indigenous

To establish the direct economic activity (measured by Gross Regional Product/Gross Value Added) generated by the sand mining operations on the island, Deloitte Access Economics used both income approach and production approach and estimated that:

- using the income approach, the share of NSI’s mining contribution to Redland GRP is approximately \$55 million per annum; and
- using the production approach, between \$62.8 million and \$86.0 million of GVA is estimated to be generated by the sand mining operations on NSI each year.

Rehabilitation after mine closure is expected to offset some of the employment and GRP reduction in the region as a result of the new employment opportunities created. It is estimated that a total amount of \$54 million will be spent by Sibelco on decommissioning and rehabilitation of closed mines.

The impact analysis of closing sand mining operations is conducted on the policy proposition of the closure of the Enterprise mine by year 2019 as compared to by 2035 as specified in the previous policy legislated in the *NSIPSAAA Bill 2013*<sup>23</sup>. This represents 16 years of production loss, and based on the current employment and GRP figures, represents a **maximum** loss of the following jobs and GRP produced on NSI:

- Annual direct job loss of 95 for NSI residents. This only captures direct mining jobs and does not include estimates of the loss of any indirect jobs. The indirect jobs associated with the sand mining operations are discussed qualitatively in Chapter 3.5
- Annual direct GVA (contribution to GRP) loss of between \$55 million and \$86 million, which amounts to an Net Present Value (NPV) of between \$563 million and \$880

<sup>23</sup> The closure date for the Vance mine has stayed unchanged from 2011, therefore does not form the scope of the impact analysis.

million over the 16 year timeframe using a 10% nominal discount rate. If a lower discount rate is adopted (7%), the NPV increases to between \$673 million and \$1,052 million over the 16 years.

Deloitte Access Economics notes that these estimates should be read in conjunction with the assumptions and limitations explained in detail in the report.

## Part II: Alternative economic opportunities

*This section explores the alternative economic opportunities that may exist beyond sand mining on NSIS by:*

- *providing a snapshot of the broader NSI economy (outside of sand mining) for the local island and for the wider Redlands and Brisbane region, as well as*
- *identifying viable alternative industries for NSI sand miners on the basis of the sand mining workforce's transferable skill sets.*

# 5 Alternative economic opportunities

This chapter considers how the local and broader regional economy may transition in the future absence of sand mining by:

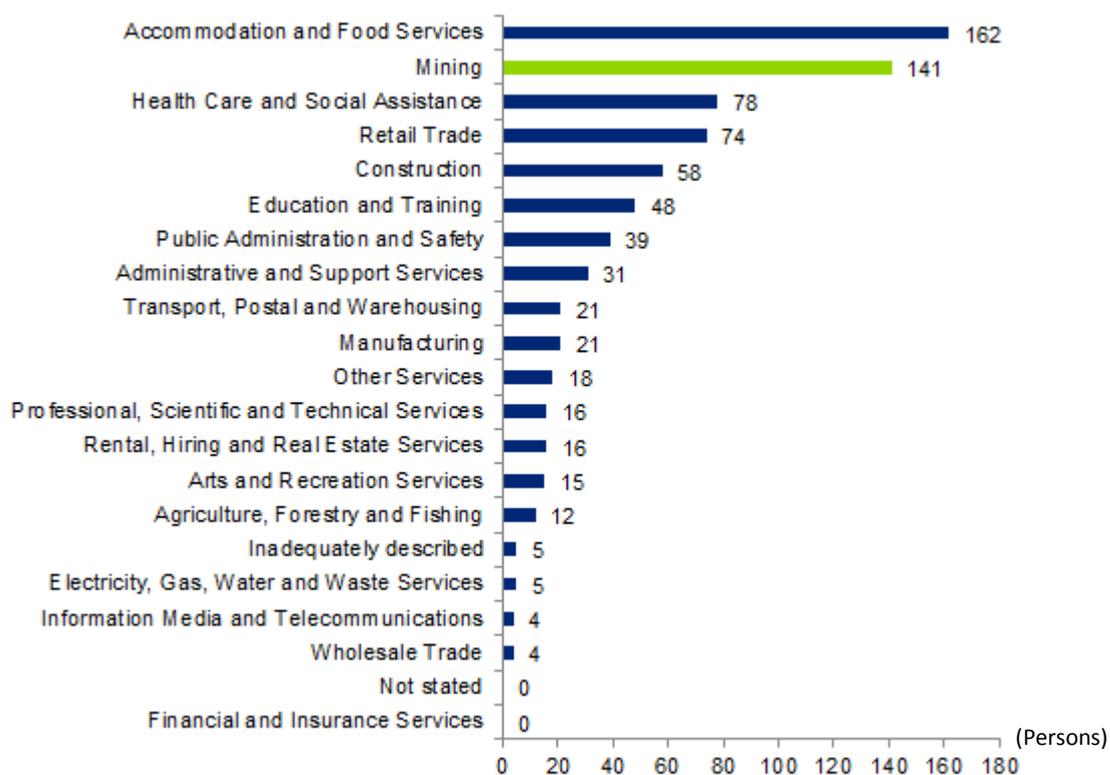
- providing a snapshot of the local economy of NSI as well as the broader Redlands and Brisbane region; and
- identifying viable alternative industries for NSI sand miners.

## 5.1 Regional economic profile of North Stradbroke Island

### 5.1.1 Industry composition and major industries

As of ABS 2011 Census, there were 768 jobs on NSI across a range of industries as illustrated in Chart 5.1. Of note, the Mining industry employed the second highest number of workers on the island, or 18% of the total number of jobs on NSI.

**Chart 5.1: Composition of industry by jobs, North Stradbroke Island**



Source: 2011 ABS Census of Population and Housing

Note: The Other Industries category includes Financial and Insurance Services, and Not stated.

According to the Redlands City Council, the two most prominent industries on NSI are tourism and mining (Redland City Council, 2010).

## Tourism

By ABS statistic standards, tourism is not an industry or product. As a result, tourism is not set out as a separate industry classification in ABS publications; rather, the ABS measures tourism as the sum of a specific proportion of the gross value added of other industries, including *Accommodation and Food Services* (38.5%), *Arts and recreational services* (13.0%), *Transport, Postal and Warehousing* (11.0%), *Retail Trade* (7.9%), *Administrative and support services* (4.7%), and *Education and Training* (6.7%), etc<sup>24</sup>. The **total value of the tourism industry in the Redlands City local government area (LGA) in 2014 was reported to be \$106 million**<sup>25</sup> (ABS, 2014).

NSI offers a wide range of tourism product, including nature-based attractions, recreational activities, cultural experiences and heritage products and places. In 2011, the island reported to receive 350,000 visitors each year (Department of Environment and Resource Management, 2011).

## Government services

Government related services also make up an important part of the island's economy. These services primarily relate to industries such as *Health Care and Social Service* (10% of total employment on NSI), *Education and Training* (6%), *Public Administration and Safety* (5%) and *Electricity, Gas, Water and Waste Services* (0.7%).

### 5.1.2 Personal income by industry

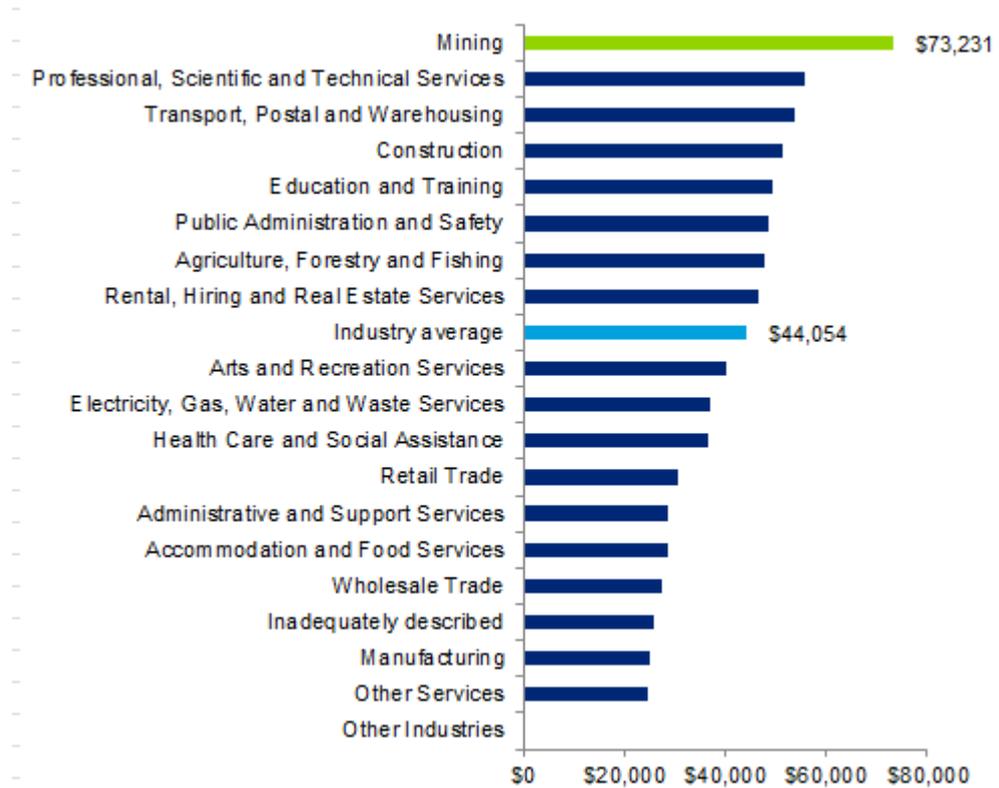
Unless mining workers can find alternative employment outside of NSI, the loss of the 141 mining jobs on NSI will likely translate to a sizeable reduction in personal incomes to those workers, and the wider community. This is because, as shown in Chart 5.2, those who work in mining received the highest personal incomes on the island at \$73,231; whilst the average income of the remainder of those working on NSI was \$44,054 in 2011.

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<sup>24</sup><http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/5249.0Main%20Features22013-14?opendocument&tabname=Summary&prodno=5249.0&issue=2013-14&num=&view>

<sup>25</sup> The smallest geographic areas that show the value of the ABS industries is by LGA. Hence, the value of tourism industry was calculated for the Redlands LGA, rather than for North Stradbroke Island.

**Chart 5.2: Income by industry, North Stradbroke Island**



Source: 2011 ABS Census of Population and Housing

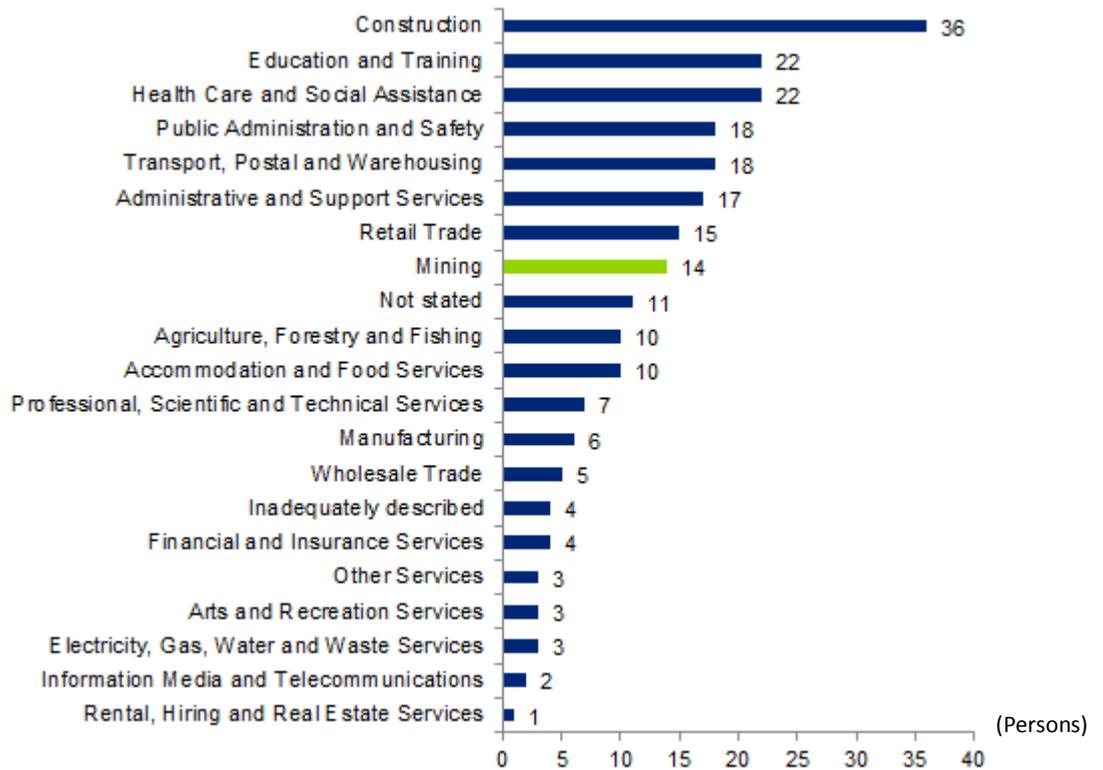
Note: The Other Industries category includes: Information Media and Telecommunications, Financial and Insurance Services, Not stated, and Not applicable.

### 5.1.3 Commuting workers away from NSI

As of ABS 2011 Census, there were 852 residents on NSI who were employed full-time, of which approximately 27% (or 231 workers) commuted off the island for work. Chart 5.3 shows that these commuters were employed across a range of industries; however the construction industry employed the most people (36 individuals). Moreover, 14 individuals who commute off the island were employed in mining<sup>26</sup>.

<sup>26</sup> The Place of Work (by destination zone) of the 14 NSI residents who lived on NSI and worked in mining was not defined in the ABS data.

**Chart 5.3: Industry composition, individuals commuting off NSI for work**



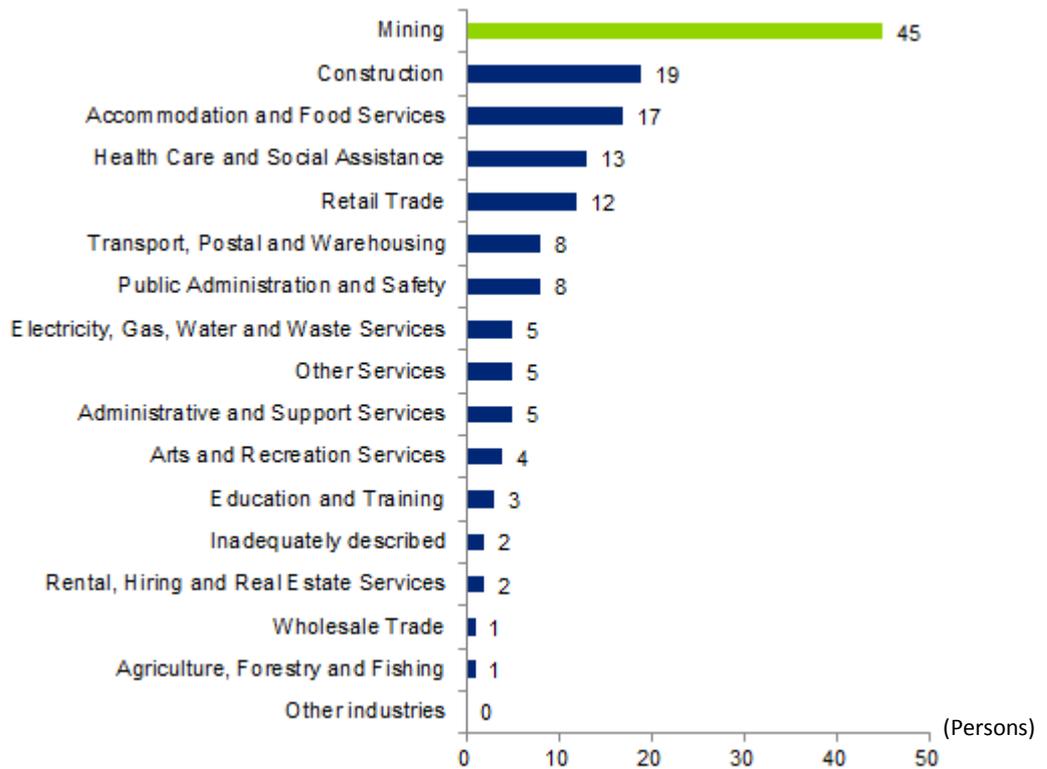
Source: 2011 ABS Census of Population and Housing

The average personal income of these commuters was \$47,058, which is \$5,372 higher than those who live and work on NSI who earned \$41,686.

#### 5.1.4 Commuting workers towards NSI

As compared to the 231 individuals who commuted away from NSI for work, there were 150 people who travelled onto the island for work. The industry with the highest representation was mining, with 45 non-NSI residents working in the industry. The remaining commuters were fairly well balanced across all industries, as shown in Chart 5.4. These workers who commuted onto the island for work recorded average personal income of \$51,282, which was \$9,596 higher than those individuals who live and work on NSI.

**Chart 5.4: Industry composition, individuals commuting to NSI for work**



Source: 2011 ABS Census of Population and Housing

Overall, commuting workers, either travelling to the island or off the island, earned higher personal income than those who do not. A summary of their income is provided in Table 5.1.

**Table 5.1: Income of commuters and non-commuters, North Stradbroke Island**

Residence and employment location	Average personal income	Income premium for commute
NSI residents working on NSI	\$41,686	-
NSI residents working off NSI	\$47,058	\$5,372
Non-NSI residents working on NSI	\$51,282	\$9,596

Source: 2011 ABS Census of Population and Housing

## 5.2 Alternative industries for NSI sand mine employees

The industries that the sand mining workforce will transition into will be influenced by government policies, as well as the skills and knowledge that individual workers have accumulated.

## 5.2.1 Government policies targeting growth industries

Queensland's economy has traditionally been driven by a number of significant industries, being agriculture, resources, construction and tourism. However, the Redland region has its own unique identity within Queensland. The Redland City Plan 2015 – an umbrella strategy that NSI falls under – lists a number of industries, outside of Queensland's traditional industries, that are also contributing to the state's prosperity, including research and development, education and training, as well as manufacturing (Redland City Council, 2015b).

The Redlands City Council has recognised this and, consequently, has recently adopted an Economic Development Framework that seeks to provide a clear plan specific for the city and its future over the next 25 years. The framework identifies a number of key growth industries for the city to focus on for business growth and job creation, including health, education, tourism, manufacturing and construction industries (Redland City Council, 2014).

### Tourism

The *Redland City Council Tourism Strategy and Action Plan 2015 – 2020* foreshadows an overarching strategic plan for NSI's economy to transition from a mining focus to one of tourism (Redland City Council, 2015c). Part of the proposed overall plans is to develop the tourism industry on NSI as well as over the broader Redland City (the 'Redlands') area.

The Redlands has a resident population of 147,000 individuals and currently three per cent of Redland's workforce (or 1,256 people) are employed in jobs related to the tourism industry (Redland City Council, 2015c). In 2009 the area received approximately 166,000 tourist visitors, or 3 per cent of the 5 million visitors to Brisbane (Redland City Council, 2015b; Redland City Council, 2010). These visitors currently contribute \$49 million each year to Redlands' GRP (Redland City Council, 2015b). The majority of visitors are Queenslanders (87%), with 61% from Brisbane.

Redland City Council is in the process of developing two Priority Development Areas; Toondah Harbour in Cleveland and Weinam Creek. The former project involves a \$1.3 billion redevelopment of Toondah Harbour – the staging post for NSI – that will be delivered by Walker Group (Redland City Council, 2015a). Moreover, the Redlands City Council has recognised the need to make improvements to Dunwich Harbour – NSI's entry port. Should these projects go forward, they will provide short-term stimulus for construction activity, as well as longer-term benefits to tourism. (Redland City Council, 2015c).

### Transport

The *Redland City Tourism Strategy and Action Plan 2015 – 2020* notes that there is need to improve NSI's transportation networks. One component of this is expanding services to get to the island, which includes:

1. Investigating the potential to deliver a Brisbane to Amity Point ferry service; and
2. Exploring options to link Southern Moreton Bay Islands with North Stradbroke Island.

The island’s ground transport services was another area that was identified in the council’s document as needing improving, as current services are limited.

Ultimately, proceeding with the aforementioned transport solutions will require additional workers, some of which could transition from sand mining jobs.

## 5.2.2 Potential alternative industries for sand mining workforce

When workers change jobs, through industries, occupations or employment statuses, individuals must rely on the skills and knowledge that they have developed to make the transition. For sand miners, their transition into other industries of employment will also be influenced by their existing occupation status or level of education.

### Skills

As a result of the heavy industry nature of sand mining, the majority of workers held positions as either *Technicians and Trades Workers* or *Machinery Operators and Drivers*, as shown in Table 5.2.

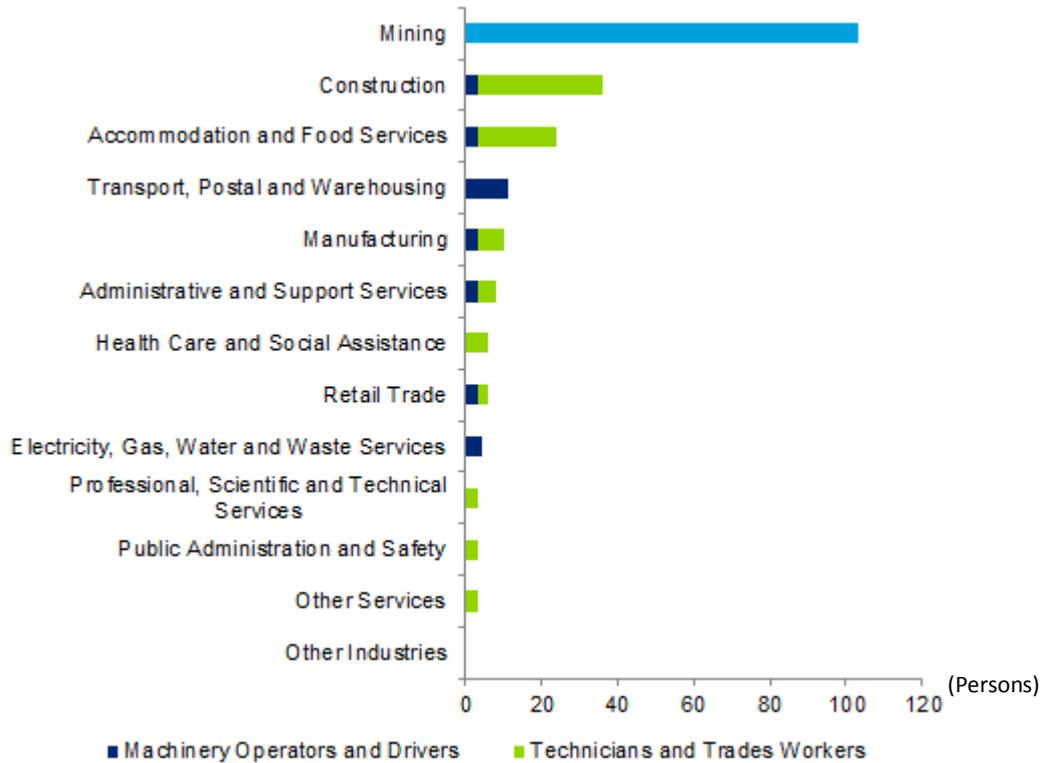
**Table 5.2: Occupation of sand miners, North Stradbroke Island**

Occupation of sand mining worker	Number employed in occupation	Percentage employed in occupation
Professionals	13	9%
Clerical and Administrative Workers	11	8%
Sales Workers	0	0%
<b>Technicians and Trades Workers</b>	<b>40</b>	<b>28%</b>
Community and Personal Service Workers	0	0%
Managers	11	8%
Labourers	3	2%
<b>Machinery Operators and Drivers</b>	<b>63</b>	<b>45%</b>
Inadequately described	0	0%
Not stated	0	0%
Not applicable	0	0%
<b>TOTAL</b>	<b>141</b>	<b>100%</b>

Source: 2011 ABS Census of Population and Housing

With 73% of the sand mining workforce employed across these occupations, it is useful to understand which industries, other than mining, require workers in this capacity on NSI. Hence, Chart 5.5 provides insight into what other industries on the island require *Machinery Operators and Drivers* or *Technicians and Trades Workers*. These industries may provide viable alternatives for those sand miners who hold comparable work experiences and skill sets despite potentially finding themselves unemployed in sand mining.

**Chart 5.5: Industry composition by targeted occupation, North Stradbroke Island**



Source: 2011 ABS Census of Population and Housing

Note: The Other Industries category includes Rental, Hiring and Real Estate Services, Wholesale Trade, Education and Training, Information Media and Telecommunications, Agriculture, Forestry and Fishing, Inadequately described, Arts and Recreation Services, Financial and Insurance Services, Not stated, and Not applicable.

The *Construction* and *Accommodation and Food Services* industries employed the highest number of Technicians and Trades Workers (36 and 24, respectively), while the *Transport, Postal and Warehousing* industry hired the most Machinery Operators and Drivers (11). Considering the broader Brisbane and Redlands region – where approximately 27% of NSIs resident population already commuted for work - Chart 5.6 details those industries that employed individuals in *Machinery Operators and Drivers* and *Technicians and Trades Workers* occupations.

**Chart 5.6: Industry composition by targeted occupation, Brisbane (C) and Redlands (C)**



Source: 2011 ABS Census of Population and Housing

Transport, Postal and Warehousing and Manufacturing combined employed 58% of the total number of Machinery Operators and Drivers. In comparison, the three industries in Brisbane (C) and Redlands (C) that employed that highest amount of Technicians and Trades Workers were Construction, Manufacturing, and Other Services, at 53%.

Mining positions, however, comprises approximately 1% of those *Machinery Operators and Drivers* and *Technicians and Trades Workers* in the Brisbane and Redlands areas, employing 446 and 642 jobs respectively.

**Education qualification**

As outlined in chapter 3.2.1, there was a significant proportion of the sand mining workforce holding either a Certificate Level (38%) or Not Applicable (38%) non-school qualification, and to a lesser extent a Bachelor Degree Level (13%). This is set out in Table 5.3.

**Table 5.3: Non-school qualifications of sand miners, North Stradbroke Island**

Non-school qualification: level of education	Number holding qualification	Percentage holding qualification
Postgraduate Degree Level	3	2%
Graduate Diploma and Graduate Certificate Level	0	0%
Bachelor Degree Level	19	13%
Advanced Diploma and Diploma Level	7	5%
<b>Certificate Level</b>	<b>53</b>	<b>38%</b>
Level of education inadequately described	0	0%
Level of education not stated	6	4%
Not applicable <sup>27</sup>	53	38%

Source: 2011 ABS Census of Population and Housing

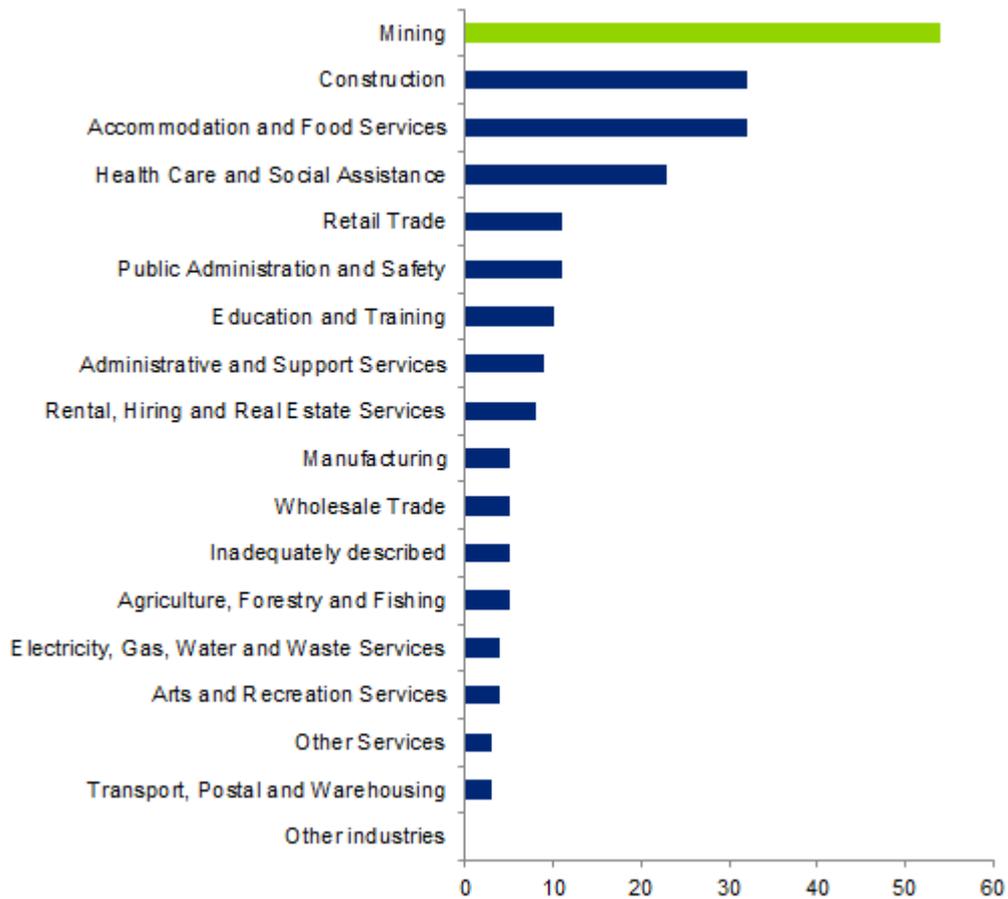
It is important to understand where these individuals can work – outside of sand mining – using their existing levels of education attainment.

For the wider NSI economy, there were 224 individuals holding a Certificate Level non-school qualification<sup>28</sup> – 54 of which were employed in mining. Chart 5.7 shows that the *Construction, Accommodation and Food Services*, and *Health Care and Social Assistance* industries employed a combined 39% of *Certificate Level* holders, whilst there is a moderately even distribution amongst the remaining industries.

<sup>27</sup> Not applicable (@@@) category comprises of: Persons who have a qualification that is out of scope of this classification; Persons with no qualifications; Persons still studying for a first qualification; and Persons aged under 15 years.

<sup>28</sup> This was investigated due to the prominence of the Certificate Level category among the present sand mining workforce.

**Chart 5.7: Industry composition of Certificate Level qualification holders, North Stradbroke Island**

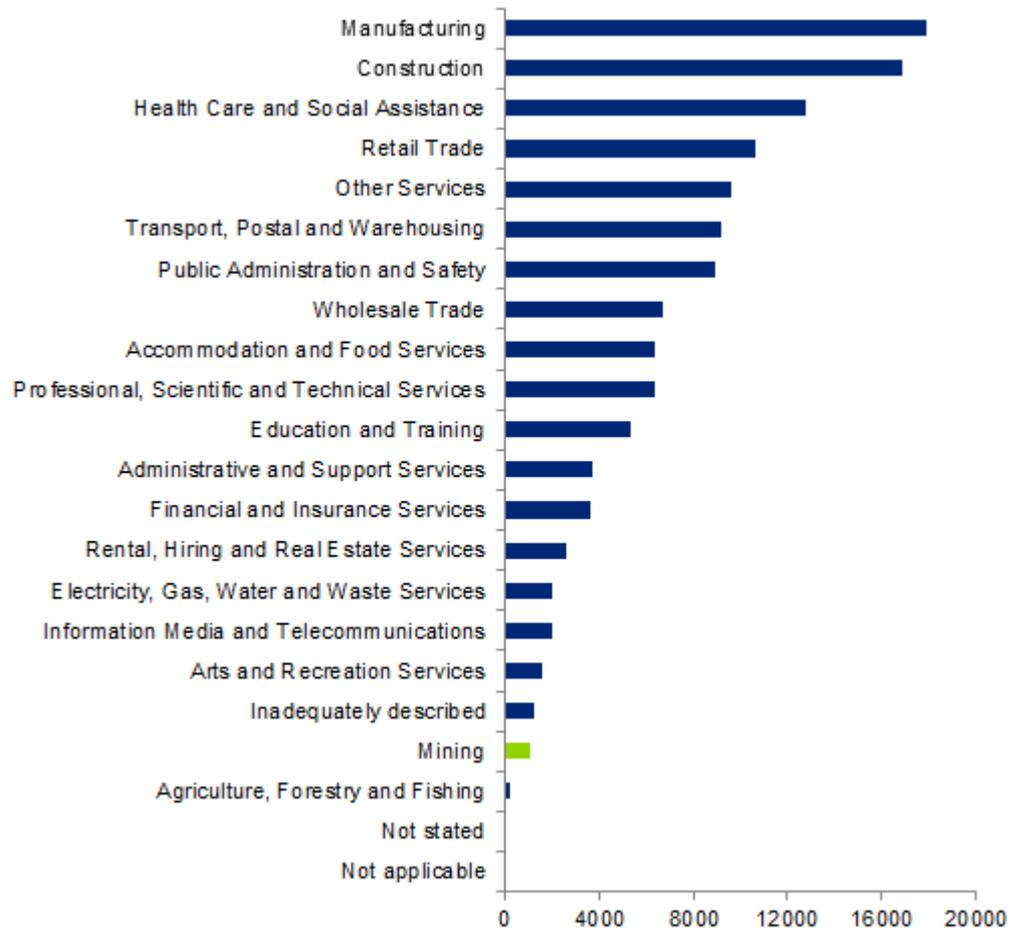


Source: 2011 ABS Census of Population and Housing

Note: Other Industries includes Not applicable, Not stated, Information Media and Telecommunications, Financial and Insurance Services, and Professional, Scientific and Technical Services.

On the mainland in Brisbane and Redlands, those who held comparable qualifications were mostly employed in Manufacturing (14%), Construction (13%) or Health Care and Social Assistance (10%), as shown in Chart 5.8.

**Chart 5.8: Industry composition of Certificate Level qualification holders, Brisbane (C) and Redlands (C)**



Source: 2011 ABS Census of Population and Housing

## 6 Part II Conclusion

As of 2011, there were a total of 768 jobs on NSI.

Mining and tourism industry are NSI's two major industries:

- NSI receives over 350,000 visitors each year; and
- 141 people were employed by the mining industry as of 2011 ABS Census; these jobs received the highest income among all industries on the island (\$73,231).

The labour market on the island is quite mobile. Approximately 27% of the island's residents travelled off the island by ferry to get to work, while around 20% of the workers on NSI arrived from the mainland. These workers earned a \$5,372 and \$9,596 premium on their average annual personal income, respectively, as compared to those individuals who live and work on the island. Hence, receiving an income premium potentially underlies an incentive for individuals to want to travel on or off the island for work, while the Stradbroke ferry service provides individuals with an ability to travel on or off the island. This means that an economic transition strategy does not need to be limited to sourcing jobs that are exclusively on NSI.

With sand mining operations on NSI due to face closure in the near future, state and local governments have recognised the need for an economic transition strategy for the island. The tourism, construction and transportation industries may offer some ability to absorb some labour capacity, with a number of planned projects in the pipeline.

Beyond these industries, workers will seek to align their skills and experiences that they have accumulated with existing jobs in the market. Approximately 73% of sand mining workers held occupations as either Technicians and Trades Workers or Machinery Operators and Drivers. The analysis shows that across both NSI and the wider Redlands and Brisbane area, employment opportunities for individuals working in these occupations tend to concentrate in the Construction, Accommodation and Food Services, Transport, Postal and Warehousing, and Manufacturing industries.

The most prominent non-school qualification for the sand mining workforce was a Certificate Level qualification. Across NSI and the broader Redlands and Brisbane economy, individuals with this qualification tend to be employed in Construction, Accommodation and Food Services, Manufacturing, Health Care and Social Assistance, and Retail Trade.

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## Contact us

Deloitte Access Economics  
ACN: 149 633 116

Level 25  
123 Eagle Street  
Brisbane QLD 4000 Australia

Tel: +61 7 3308 7585

[www.deloitteaccesseconomics.com.au](http://www.deloitteaccesseconomics.com.au)

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