Venture Southland
Enterprise, Tourism & Community Development

Assessment of the Economic and Social Impacts of Tiwai Point Aluminium Smelter on the Southland Economy

prepared for Venture Southland by
Infometrics &
Business and Training Services,
Southern Institute of Technology

January 2005

INFOMETRICS

Business & Training Services

cd/05/4/2751

1.0 Executive Summary

Infometrics (Wellington), and Business and Training Services (Invercargill), were commissioned by Venture Southland to undertake an assessment of the economic and social impacts of Tiwai Point Aluminium Smelter on the Southland economy.

The objective of this report is to estimate the economic and social impacts of New Zealand Aluminium Smelters' operation at Tiwai Point on the Southland regional economy. Information in this report encompasses the historical contribution of the plant and highlights the impact on the Southland economy should NZAS close the Tiwai Point smelter. Data was compiled from a number of sources including NZAS, Statistics New Zealand, and interviews with Southland businesses.

The contribution of NZAS to the Southland region is estimated as follows:

- $500m or 18% of the region's gross domestic product (GDP),
- 2,600 full time equivalent jobs,
- $1,600m in sales.

These effects take into account all of the output of goods and services from industries that supply NZAS (the production induced effects) and the output from industries that supply goods and services to households that spend income earned at NZAS and supplying industries (consumption induced effects).

If in addition, we consider demand-driven expenditure by central government on health and education:

- the GDP effect rises to $540m, and
- the employment effect to around 3,300 full time equivalent jobs.

It would be incorrect, however, to interpret these numbers as measuring the effect on the regional economy if NZAS were to cease operation. Certainly in the short term, before other industries expanded or new industries established themselves, there would be a marked increase in unemployment and a substantial reduction in the region's gross domestic product.

It is important to note, however, the following points when considering the closure of such a large scale industry:

- similar large scale industries would be confronted with extensive resource consent requirements which may potentially delay industry establishment opportunities, and
- the challenge any region must overcome when facing potential industry closure is in fact the ability to retain the skills and workforce potential within the region.

In the medium term the economic impacts would be less severe, depending largely on how many people would emigrate from Southland and on what the eventual employment status would be of those who remain. Of course one cannot be precise, but considering:

- the education and skill mix of NZAS employees,
- average annual rates of economic growth in Southland,
- average rates of emigration from Southland,

We estimate that closure of NZAS would lead to approximately:

- 2.5% of Southland's population moving out of the region.

This would bring about a permanent loss in Southland's GDP of:

- 6-7% or $165-195m,

On the assumptions that over the medium term other industries in Southland will expand or that new ones will develop to utilise the resources that would be made available by the closure of NZAS. There is some anecdotal evidence that a population outflow cascading effect may be induced, caused by the perceived loss of opportunity associated with a closure, but the quantum of this is difficult to assess.

The decline in the value of the housing stock would be similar:

- about $250m in dollar terms.

Even if reallocation of resources between declining and expanding industries does occur, local purchasing power may not be restored as the average salary at NZAS is well above the regional mean. Coupled with the relatively higher purchasing power of those who leave Southland, this suggests that the 6-7% may be an understatement.

Part of the loss in GDP consists of a decline in government funding for health and education. Based on a population loss of 2.5%, the decline in such funding would be $7-8m.

It is possible that with a secure and competitive power supply NZAS would expand its production at Tiwai Point. This would involve not only hiring more people, but also expanding their apprenticeship and training programmes, as part of the existing workforce is nearing retirement. This illustrates one of the key difficulties in determining what would happen if an existing industry closes; what is the appropriate counterfactual? We have endeavoured to estimate what resources would be re-allocated if NZAS closed. Part of this involves estimating how many people are at risk and part of this involves estimating what they (and others) would do if closure does occur. If, over the next few years NZAS grows more than Southland as a whole, the effects of its subsequent closure would be that much greater.

NZAS provides funding and employee time for a number of environmental and community services such as the Kakapo Recovery Programme. While the amounts involved are small in the context of a regional economy with a GDP of $2.8 billion, the projects generate benefits over many years. Sponsorships of this kind are not easy to replace.

General observations indicated in the Brown Copeland and Co Report 2004 show that Transmission grid limitations would also limit the ability to transport potential surplus power from Southland (in the event of the closure of Tiwai smelter) to northern demand areas and would require a significant upgrade of the South Island power grid estimated at $200m. This investment would also need to be implemented prior to the scheduled 2012 Transpower capital investment plan. (Refer to Appendix One)

Brian Leyland Consulting Engineer indicated in May 2004 that any additional power provided by the closure of Tiwai Smelter would soon be absorbed by load growth and at best would defer major generation investment by one year.

CONTENTS

2.0 Introduction

Infometrics (Wellington) and Business and Training Services (Invercargill) were commissioned by Venture Southland to undertake an assessment of the economic and social impacts of Tiwai Point Aluminium Smelter on the Southland economy.

The objective of this report is to estimate the economic and social impacts of New Zealand Aluminium Smelters' operation at Tiwai Point on the Southland regional economy. Information in this report encompasses the historical contribution of the plant and highlights the impact on the Southland economy should NZAS close the Tiwai Point smelter.

Methodology

The following tasks were undertaken by Infometics and Business and Training Services in order to provide this final report:

1. Collection of data from NZAS and existing studies.

2. Analysis of NZAS data to determine upstream and downstream economic effects.

3. Interview with NZAS to identify community sponsorships and the key suppliers of inputs, including specialist labour skills (such as engineering).

4. Identification of main locations of suppliers (to ascertain local geographic effects) and interviews with suppliers to determine dependence on NZAS and additional business opportunities created in areas such as processing and manufacturing.

5. Identification of main locations of residences of NZAS employees and supplier personnel.

6. Estimation of the degree to which NZAS personnel and their families use local educational and health services, and the extent of their participation in local clubs and societies.

7. Extrapolation of the results of (6) to allow for analogous upstream and downstream effects.

3.0 Background Information – Tiwai Point

It is important to provide some background information on the Tiwai Point Aluminium Smelter in order to realise the impact that a closure would have on Southland's economy.

Tiwai Point Smelter is operated by New Zealand Aluminium Smelters Limited (NZAS) which is a joint venture operation owned by Comalco New Zealand Limited (79.36%) and Sumitomo Chemical Co Ltd (20.64%).

Commissioned in 1971 and expanded three times since that date, the smelter produces 334,000 tonnes per annum (2003) of the highest purity aluminium (99.98% pure) produced anywhere in the world. It provides 960 full time jobs and an estimated net economic contribution of in excess of $100 million per annum to the New Zealand economy.

NZAS is one of the largest single employers in the Southland region and also generates a significant volume of activity for a wide range of Southland companies. Gauging the impact of such a large direct and indirect employer on the regional economy is vital for the formulation of future regional employment, energy and industrial strategies.

NZAS maintains a competitive advantage by consistently producing high quality products that demand a premium in the market place.[1] Health and safety and up-skilling of employees contribute to the production of these high quality products. NZAS have adopted a 'zero tolerance' approach to health and safety whereby the organisation believes that all injuries and illnesses can be eliminated, and has set a target of 50% reduction in the number of lost time injuries each year. Appropriate systems to aid them in achieving this goal have been implemented. Two media releases from NZAS regarding health and safety at Tiwai Point Smelter are attached as Appendix Two.

As well as the 'zero tolerance' approach to health and safety, Tiwai Point Smelter also contributes to their highly efficient workforce by providing opportunities for employees to up-skill in their current roles. NZAS, Tiwai Point also offers employees the opportunity for further career development, therefore contributing to the skilled work force of Southland.

There have been other studies into the economic effects of the Tiwai Point smelter, most notably:

- Brown Copeland and Co Ltd. (1993). *The Southland and Regional Economic Benefits of the Tiwai Aluminium Smelter*, and *The National Economic Benefits of the Tiwai Aluminium Smelter*, both reports to NZAS.
- Brown Copeland and Co Ltd. (2004). *The Continued Contribution of the Tiwai Point Aluminium Smelter, 2004-2012*, report prepared for Comalco NZ Ltd and Sumitomo Chemical Company.

The 1993 Southland report is conceptually similar to the approach used here. The other two studies take a rather different perspective by considering the opportunity cost of resources, especially electricity and transmission lines used by Tiwai Point. The results are not directly comparable with this study.

[1] Source: www.comalco.com

The Brown Copland and Co Ltd report 2004 also identified the following key Transmission effects.

- In the event of Tiwai Smelter being disconnected from the Transmission grid. It would be currently impossible (because of grid constraints) for the surplus power from Manapouri to be transmitted from Southland to service demand in locations further north, leaving Meridian Energy with a stranded generation asset.
- In order to transport residual electricity north Transpower would be required to invest up to $200 million in Transmission upgrades prior to the currently schedules 2012 investment timetable (investment schedule confirmed by Transpower April 2005).

Brian Leyland Consulting Engineer indicated in May 2004 that any additional power provided by the closure of Tiwai Smelter would soon be absorbed by load growth and at best would defer major generation investment by one year.

4.0 Economic Effects

The economic effects of a project or event are typically measured by three variables:

1. Gross output - approximately equivalent to sales or turnover, valued at producer prices.

2. Employment - in terms of equivalent full time positions.

3. Value Added - equivalent to contribution to Gross Domestic Product. It is defined as sales less expenditure on inputs of materials. Thus it covers payments to labour, the return to capital (including depreciation) and some indirect taxes.

Before examining the size of the effects, it is useful to understand the concepts involved.

4.1 Direct and Induced Impacts

Three stages of impact are commonly identified: direct impacts, production induced (upstream) impacts and consumption induced (downstream) impacts.

The direct impact covers the first round of expenditure such as the sale of freight services to NZAS. The companies that supply these services require inputs such as oil and maintenance services from other industries. Thus production induced impacts arise. These flow-on effects result from the network of backward linkages connecting the various industries and sub-industries of the regional economy. Further backward linkages or industrial support effects occur as these suppliers purchase goods and services from their suppliers, and so on "up the line". The total production induced impact comprises the first round impact and the subsequent industrial support effects.

The total economic impact of the expenditure associated with a given industry will also involve consumption induced effects. The given industry pays income to labour and capital (through wages and salaries, dividends, etc) both indirectly associated industries and also in linked industries. Part of this income will be spent by the income earners on consumer goods and services and part of this spending will be re-spent again. This process may be repeated many times. These economy-wide flow-

on effects, created by the increased demand for goods and services by households that have received increased income as a result of the initial and subsequent rounds of increased production, constitute the consumption induced impact.

4.2 Multipliers

Conceptually a multiplier is a qualitative tool for providing information about the nature of the impact of an expenditure injection on an economy. The direct impact of the establishment of a new industry or an event in a particular region is enhanced or "multiplied" to the extent that an increase in production in one industry requires or is associated with increased production in other industries, and to the extent that industries supplying consumer goods and services increase their production in response to increased consumer demand.

Multipliers are also quantitative tools that can be used to estimate, in numerical terms, the potential flow-on economic impacts of an industry or event on a particular region. In general, a multiplier is that coefficient which, when applied to an injection of expenditure will produce the total effect on a region's output, employment, value added etc. Multipliers can be classified in a variety of ways.

- Type I multipliers provide an estimate of the potential direct plus production induced impact. Type I multipliers are sometimes split into two components (A and B) to separate the direct input requirements of a particular industry from the production induced requirements. In Table 4.1, page 9, we deal with the Type IB definition.

- Type II multipliers evaluate the direct, plus production induced, plus consumption induced impacts on a regional economy.

- Type I and Type II multipliers can be further categorised as output, employment or value added multipliers.

Multipliers are calculated with respect to a particular region. The choice between the use of a national or a regional multiplier depends upon the particular issue that is to be addressed. In general, national multipliers are larger than regional multipliers as regional economies are typically less self-sufficient than the nation as a whole.

4.3 Trade Creation and Trade Diversion

Superficially, every dollar spent on a good or service can be expected to have flow-on effects throughout the economy. However, if that dollar is merely redirected expenditure, any economic impact analysis should also consider the flow-on effects of the foregone expenditure. For example, the establishment of a new restaurant can be expected to draw some trade away from other restaurants and/or from other areas of discretionary expenditure such as movie visits, sports betting, certain grocery items and so on. The new restaurant may create very little trade, but divert very much trade.

In fact from the perspective of a national economy, the only true sources of trade creation are sales to foreigners (exports) and the displacement of spending overseas by residents (import substitution). Note that the latter may be part of the induced effects. For example, a switch in consumer spending from winter clothing to heating would have a net trade creation effect if heating has a lower import content than winter clothing.

For any given project or event, deciding which expenditure constitutes trade creation and which is merely trade diversion essentially amounts to deciding what would occur in the absence of that industry or event. In other words, what is the appropriate counterfactual?

4.4 Counterfactual

Because of the possibility of trade diversion, the careful specification of the counterfactual is central to any economic impact analysis. If the counterfactual is not realistic there is a high probability that the economic impact of a given event or industry will be incorrectly assessed - usually overstated. How much of NZAS is truly additional to the Southland - trade creation in the above terminology.

Most of the output of NZAS is exported, with only a small amount used domestically. The latter represents import substitution as there is no other aluminium production facility in New Zealand. Hence 100% of NZAS output is defined as trade creation.

Clearly, however, if NZAS did not exist some other industry might evolve to use the released resources. We look at this question in Section 4.6.

4.5 Application and Results

From the above discussion, the correct procedure for calculating the economic impact of an industry or event is as follows:

1. Ascertain the starting values - the total gross value of sales
2. Apply the multipliers to determine gross trade creation
3. Specify the direct expenditure associated with the counterfactual
4. Apply the multipliers to determine total trade diversion
5. Subtract the results under 4 from those under 2 to determine net trade creation

As there is no trade diversion in this case, steps 3 and 4 are redundant.

The results are presented in Table 4.1, page9.

The multipliers have been calculated from a regional input-output table for Southland[2], with the coefficients for the Base Metals industry updated to reflect the cost structure of NZAS in 2004. In broad terms,

- sales were $956m,
- of which value-added constituted $271m
- with direct employment of 792 people,
- corresponding to 789 full time equivalent (FTE) jobs.

The employment multipliers are relatively high because of a low direct labour requirement per unit of output at NZAS[3] and a relatively high income per person.
Column A in the table below presents the standard multiplier results. The results show the economic effects that are attributable to NZAS, given the regional economy's current configuration. In particular:

- NZAS generates total gross output (sales) in the Southland of over $1600m (1.6b).

[2] The Southland input-output table was estimated by Butcher Partners.
[3] 0.83 FTE per $1m of output at NZAS compared to a Southland average of 5.47.

- NZAS generates total employment in Southland of nearly 2600 FTE jobs.
- NZAS contributes $499m to regional GDP. This constitutes about 18.1% of total Southland GDP.[4] (GDP covers payments to labour, the return to capital including depreciation and some indirect taxes.)

Table 4.1
Economic Effects of NZAS

			A	B	C
	Base Economic Values				
	Sales	($m)	956	956	956
1	Gross Output	($m)	956	956	956
2	Employment	(FTE)	789	789	789
3	Value Added	($m)	271	271	271
	Multipliers - Production Effect (Type IB)				
7	Gross Output		1.521	1.521	1.504
8	Employment		2.739	2.739	2.607
9	Value Added		1.681	1.681	1.652
	Multipliers - Consumption Effect (Type II)				
10	Gross Output		1.703	1.824	1.681
11	Employment		3.285	4.214	3.140
12	Value Added		1.846	2.005	1.813
	Total Activity by Type IB Multipliers				
13	Gross Output	($m)	1454	1454	1438
14	Employment	(FTE)	2161	2161	2057
15	Value Added	($m)	455	455	447
	Total Activity by Type II Multipliers				
16	Gross Output	($m)	1628	1744	1607
17	Employment	(FTE)	2592	3325	2477
18	Value Added	($m)	499	542	490

Notes
Column A is the standard multiplier approach.
Column B adjusts for government spending on health and education.
Column C adjusts for unemployment benefits.

The Type II multipliers used to calculate these effects allow for leakages from the regional economy in the form of tax payments (and savings) by households. There are two reasons for this:

1. From a theoretical perspective, although taxes fund government services, there is no guarantee that taxes paid in one region will be recycled to that region in the form of government services.

[4] Infometrics' estimate Southland regional GDP at $2763m for 2002/03.

2. From a practical perspective, input-output tables are not well suited to analysing such a feed-back loop. This is because they represent the flow of goods and services, not flows of money.

A considerable proportion of government services are demand driven. That is, if a child shows up at a school, the government provides a subsidy. If urgent medical attention is required, the government pays for it. Hence, part of government spending in a region exists because people live there, and one of the reasons they live there is because they, or a family member work there. This effect is not captured in traditional multiplier analysis, which therefore understates the economic contribution of an industry.

Adjustment for government expenditure

With regard to recycled government expenditure we model only that on health and education because of its direct link to demand. While there are undoubtedly other types government expenditure that ultimately depend on the size of the regional population, their link is much more tenuous and almost certainly not linear.

To derive the multipliers for health and education spending we have closed a portion of the tax loop by linking a share of income tax payments by households to government consumption. This does not change the Type I multipliers as these pertain only to the impacts on suppliers to NZAS. As expected though, the Type II multipliers are higher as they encompass a wider range of feedback effects.

The results are given in column B of Table 4.1, page 9. The contribution of NZAS to gross output increases by $116m or about 7% and the contribution to GDP is up by a further $43m, or about 9% more than in column A. In Section 5.0 the value of the health and education effects are estimated at about $27m. Thus over 60% of the change in GDP is in the form of government consumption with the rest in the form of private consumption.

Employment effects, however, are much larger, with the contribution to regional employment rising by 28% – over 700 more FTE jobs. This is a direct result of the high labour intensity of education and health services. As at June 2004 employment in Southland was estimated at 50,500[5] or about 45,000 on an FTE basis, so the impact of NZAS on employment is as much as 7.4%.

Further details on the health and education effects are given in Section 5.0.

4.6 Closure of NZAS

The contribution of NZAS to the Southland regional economy is clearly significant. A large number of people owe their employment either directly or indirectly to the presence of NZAS. And a sizable share of the region's GDP is attributable to NZAS.

It would be incorrect, however, to interpret these results as measuring the effect on the regional economy if NZAS were to cease operation. Certainly in the short term, before other industries expand or new industries establish themselves, there would be a marked increase in unemployment and a substantial reduction in the region's gross domestic product. On an annualised basis these effects may well be of the size given in column A of Table 4.1, page 9; that is a rise in unemployment of almost 2600 FTE and a decline in regional GDP of $500m.

[5] APR Consultants (20040), *EDANZ Economic Monitoring Report, June 2004* Quarter, prepared for Venture Southland, September.

In the medium term the economic impacts would depend largely on how many people would leave Southland and on what the eventual employment status would be of those who remain. One extreme scenario is that nobody emigrates and all those who previously had employment move on to the unemployment benefit.

This scenario is assessed in column C of Table 4.1, page 9. It is modelled as a rise in private (household) consumption financed by an increase in income from outside the Southland region. We assume that the average rate of benefit (allowing for marital status, number of children etc), is the same as the national average.

In relation to column A the differences are quite small; only $20m in gross output, $9m in GDP and 115 FTE jobs. This is because the value of unemployment benefits that would be paid to NZAS employees and those made redundant through the flow-on effects is less than $26m, compared to a wage bill for NZAS alone of close to $70m. Even if all of this was spent on consumer goods and services, 40% is directly leaked from the Southland economy in form of consumer imports. Also, while the payment of unemployment benefits reduces the impact on industries that supply goods and services to households, this provides no direct relief to the industries that supply inputs to NZAS.

We infer therefore that the payment of unemployment benefits in the event of NZAS closure would have only a minor compensatory effect.

In Sections 5.5 and 5.6 we estimate that about 2.5% of Southland's population would leave the region if NZAS closed. There is some anecdotal evidence that a population outflow cascading effect may be induced, caused by the perceived loss of opportunity associated with a closure, the quantum of which is difficult to assess.

Applying the ratio of the GDP impact to the employment impact given in Table 4.1 (column B), leads to an estimated fall in regional GDP of 6-7% or $170m - $190m. This assumes that over the medium term other industries in Southland will expand or that new ones will develop to utilise the resources that would be made available by the closure NZAS. Labour is clearly the major resource, but electricity, land and distributional infrastructure are other examples.

It is important to note, however, the following points when considering the closure of such a large scale industry:

- similar large scale industries would be confronted with extensive consenting requirements which may potentially delay industry establishment opportunities, and

- the challenge any region must overcome when facing potential industry closure is in fact the ability to retain the skills and workforce potential within the region.

Even if reallocation of resources does eventually occur, local purchasing power may not be restored as the average salary at NZAS is well above the regional mean. Coupled with the relatively higher purchasing power of those who leave Southland, this suggests that the 6-7% loss in regional GDP is probably an understatement.

4.7 Property Values

Based on 2004 sales data and the residential location of NZAS employees at the time of the 2001 census, the mean value of houses owned by NZAS employees is approximately 16% above the Southland regional mean of about $118,000.[6] While we do not know the house values of all people in Southland whose employment depends either directly or indirectly on NZAS, it seems reasonable to infer that this wider group is representative of the region as a whole.

We estimate the total number of occupied permanent private dwellings in Southland to be about 34,000 (33,540 at the 2001 census), giving a total capital value for such properties of $4 billion. Based on the estimates in Section 4.6, around 6-7% of this is at risk if NZAS were to close.

4.8 Interviews with Suppliers

The multiplier results for employment have been verified by ascertaining the direct labour requirements of some key suppliers to NZAS. Twelve interviews were conducted, covering fourteen of the larger Invercargill based businesses that supply NZAS at Tiwai Point. These businesses account for $23.7m, or 46% of the $51.3m spent by NZAS with Southland businesses each year.

- The businesses surveyed employ a combined total of 410 full time equivalent employees.
- They estimate that sales to NZAS are responsible for 156 (±8) of their FTE employees. As a proportion of their total workforce this represents 39%.
- Three of the fourteen businesses interviewed said that they would close down if they were to lose their custom with NZAS. In all cases this is because NZAS custom underlies most of their sales, rather than NZAS being a small but essential customer to maintain critical mass.
- The long term security of at least one third of all apprenticeships in Invercargill (about 35 per annum) would be threatened if NZAS were to withdraw from Tiwai Point.

The 156 FTE jobs directly attributable to NZAS exist in three broad industry groups as shown in Table 4.2

Table 4.2
Interview Statistics

	Interview results		IO data
	$m	FTE	FTE
Manufacturing and Engineering	17.3	104	244
Transport	5.1	42	70
Business Services	1.3	10	132
Total	23.7	156	446
Implied employment from sample (156/0.46)			339

[6] Sources: Quotable Value Ltd, *Residential Property Sales Summary*, Quarter Ending June 2004. www.stats.govt.nz Census 2001 Table Builder.

On the basis of the share of NZAS input expenditure, employment directly attributable to NZAS would be 339 FTE jobs. This compares to 446 FTE jobs estimated from input-output data. Because of size considerations, however, the interviews were weighted heavily in favour of manufacturing and transport, industries that have a lower labour-output ratio than services. Thus the 339 FTE jobs is likely to be an under-estimate, although it is possible that labour productivity improvements since 2000/01 (the year to which the input-table relates) could be overstating the 446 FTE jobs to a small degree.

Overall we can be reasonably confident that the multiplier analysis has produced reliable results.

A newspaper article regarding four engineering suppliers to NZAS, Tiwai Point is located in Appendix Three of this report. The article outlines the impact that NZAS, Tiwai Point has had on these firms.

Port facilities

The closure of NZAS would lead to a 55% reduction of cargo by volume through Southport and significantly undermine the viability of the Regional Port. The major shipping lines that also service Tiwai would cease their respective operations into Bluff, implying a significant reduction in the back loading of bulk freight, which would impact on the competitiveness of the high performing Southland export sector.

5.0 Social Effects

5.1 Demographics of NZAS Employees

Table 5.1 presents the age and gender distribution of NZAS employees in 2004, with a comparison for the main working age groups given in Table 5.2. Note that the latter table relates to 2001.

Employees at NZAS are more heavily weighted in the 35-54 age group than all employed people in Southland. As expected the mirror image of this is a lower proportion of workers in the 25-34 age group, but the 55-64 age group is also under-represented at NZAS. In fact the average age of NZAS employees as about the same as that of the wider Southland workforce. Although this tells us nothing about the absolute probability of NZAS employees finding other work if NZAS closed, at least there is no reason to assume that NZAS employees would have any greater difficulty than Southlanders in general.

Table 5.1
Age and Gender of NZAS Employees

	Male		Female		Total
Age	Count	Percent	Count	Percent	Count
15-24	11	1.39%	3	0.38%	14
25-34	101	12.75%	13	1.64%	114
35-44	242	30.56%	11	1.39%	253
45-54	288	36.36%	11	1.39%	299
55-64	107	13.51%	4	0.51%	111
65-74	1	0.13%	0	0.00%	1
TOTAL	750	94.70%	42	5.30%	792

Table 5.2
Age Composition of NZAS Employees v Southland Employed as at Census 2001

	NZAS		All Southland Employed	
Age	Count	Percent	Count	Percent
25-34	126	17.2	8757	23.7
35-44	300	41.0	12195	33.0
45-54	240	32.8	10416	28.2
55-64	66	9.0	5574	15.1
TOTAL	732		36942	

A range of other demographic data on NZAS employees drawn from the 2001 Census is available. Information includes residential location (used in Section 4.7), nature of tenure, hours worked per week, household composition, age of youngest dependent child and family type. Some parts of this information are used below.

5.2 Health

For 2003/04, government funding to the Southland DHB was $185.2m (excl GST)[7], for a relevant population of 106,000, implying approximately $1700 per capita.

From Table 4.1, the total employments effects of NZAS are 3325 FTE. Allowing for marital status and dependents suggests another 1.50 people per person employed at NZAS. Assuming this factor applies all employment, the number of people affected by NZAS is about 8300.

Hence if all those who would be directly and indirectly affected by the closure of NZAS were to leave Southland, the total value of government financed health care that could potentially be lost from Southland if NZAS closed is $14.1m. Note, however, that even apart from the likelihood that not everyone would emigrate, this figure is probably overstated because, with the exception of obstetric and neonatal care, health care costs rise with age and DHB funding includes an age related component.[8]

5.3 Education

Effective government funding per student in 2004 (excluding GST) and the approximate number of students (not EFTs) are shown in the following table.

Table 5.3
Central Government Expenditure on Education in Southland

Category	$/pupil	Approx No
Early Childhood Education	$2,000	3,600
Primary	$3,500	11,300
Secondary	$6,100	6,100
Tertiary (2002)	$4,700	5,700
		26,600

The overall value of demand-driven government funding for education in Southland is approximately $111m. It should be noted, however, that the funding of educational institutions in any given year is not entirely based on student numbers. Nevertheless, we assume that over the longer term all funding is driven by student numbers.

Employees at NZAS are estimated to have 698 dependent children aged 17 or less. Again assuming a similar ratio for all of Southland implies that approximately 2500 children would leave Southland schools if all of their families were to emigrate from

[7] Comprising $167.3m (including GST) directly to the Southland DHB, plus a pro-rata share of other non-departmental output class appropriations such as funding for disability support services.
[8] We have not been able to discuss these results with the Southland DHB.

Southland in the event of NZAS closing. On the basis of a pro-rata age distribution, the value of lost government funding would be $10.1m.

Discussions with the Ministry of Education revealed that primary schools in Southland have an average roll of 250, and secondary schools an average of 700. About 90% of families with children under 4 years of age are estimated to use a pre-school facility.

Of the 2500 children who could potentially leave Southland about 2100 attend primary and secondary schools. It is thought that this would lead to the closure of one primary school and one secondary school, with other schools incurring lower rolls.

The number of students attending the Southland Institute of Technology (SIT) who live in families that are affected by NZAS is estimated to be about 680,[9] although with SIT enrolments in 2003 reaching 9495 students (in formal programmes of study), the 680 may be on the low side. On the other hand it is thought that SIT's zero fees scheme has attracted students from outside Southland.

At 680 the loss in government educational funding to SIT is about $3.2m. This is equivalent to about 40% of the community funding that was secured by SIT to instigate the zero fees scheme.

As with health care, however, it should be emphasised that two schools closing, other schools shrinking and 680 students leaving SIT is a worst case scenario. It is most unlikely that everybody affected by NZAS would leave Southland if NZAS ceased operation, particularly as regards SIT students who would not necessarily follow their families. This is discussed further in the following section.

5.4 Occupation and Education (Re-employment Prospects)

In Section 4.5 it was noted that the short term impact effect on regional GDP if NZAS were to close would be a decline of about 18%. At recent rates of economic growth that would take about 4-6 years to claw back, depending on the proportion of people that would leave the region and the rate of expansion of other industries.

Table 5.4 summarises the education levels of NZAS employees, measured as at the 2001 census. Those with vocational and degree qualifications are potentially a more mobile group as they have good prospects for employment elsewhere in New Zealand. For the same reason though, their employment prospects in Southland would also be above average.

Table 5.4
Education of NZAS Employees 2001

Highest Qualification	
No Qualification	26.1%
School Qualification	25.3%
Vocational Qualification	33.1%
Bachelor Degree or Higher	8.9%
Not Elsewhere Included	7.0%
Total number	771

[9] This includes 10 NZAS apprentices.

In contrast, less skilled workers are probably quite likely to remain. Their prospects elsewhere may not be much better than in Southland, in addition to which there is the cost of moving, the higher cost of living in other parts of the country, and the likelihood of lower than expected house sale prices if the number of emigrants is high. Perhaps only 10% of lower skilled people would move, compared to say 30% of skilled people. This would give an overall departure rate of about 28%, with 72% remaining.

Looking at the occupational mix of NZAS employees in Table 5.5 below, categories 12-33 would represent highly skilled and relatively mobile people. Categories 41-72 cover generally semi-skilled people, while the remaining categories cover generally less skilled occupations. If their probabilities of emigrating from Southland in the event of NZAS closure are say 60%, 30% and 10% respectively, the weighted average is 26%.

Table 5.5
Occupations of NZAS Employees (2001)

Occupation	
12 Corporate Managers	3.9%
21 Physical, Mathematical and Engineering Science Professionals	4.3%
22 Life Science and Health Professionals	1.2%
24 Other Professionals	2.3%
31 Physical Science and Engineering Associate Professionals	3.5%
33 Other Associate Professionals	1.9%
41 Office Clerks	6.2%
42 Customer Services Clerks	0.8%
51 Personal and Protective Services Workers	0.4%
71 Building Trades Workers	6.6%
72 Metal and Machinery Trades Workers	23.0%
81 Industrial Plant Operators	18.3%
82 Stationary Machine Operators and Assemblers	6.6%
83 Drivers and Mobile Machinery Operators	6.2%
84 Building and Related Workers	2.3%
91 Labourers and Related Elementary Service Workers	7.8%
Not Elsewhere Included	5.1%
Total number	771

If these estimates are realistic, not just with respect to NZAS employees, but also with respect to people who are caught in the multiplier effects, the long term loss to the Southland regional economy could be about 27% of the 3325 FTE jobs attributable to NZAS. That is about 900 people out of total FTE employment in Southland of 45,000, around 2%. Together with their dependants (a ratio of 2.5) this implies emigration of about 2.5% of Southland's population.

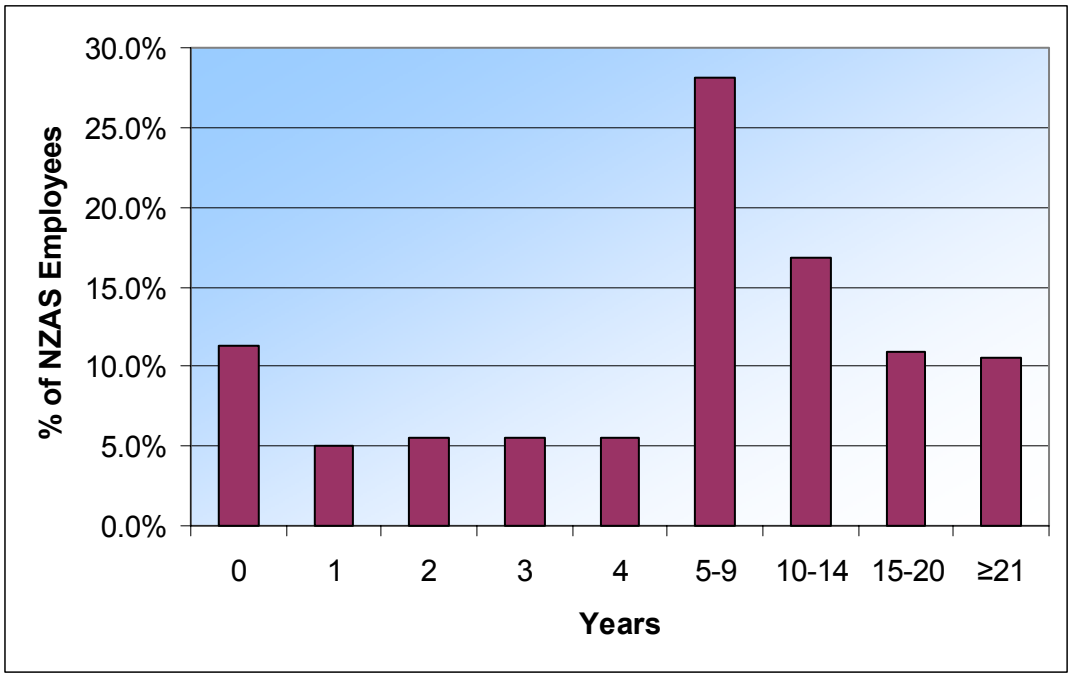
5.5 Mobility

Figure 5.1 shows the distribution of the number of years that NZAS employees had lived at their usual residence, as at the 2001 census. The average duration was approximately 9.1 years with 2/3 of people having been at their (then) current

address for over five years. On this basis we would not expect a large proportion of people to leave Southland if NZAS closed.[10]

Between 1996 and 2001, approximately 12,100 people aged five years and over emigrated from Southland, out of a total regional population aged five years and over of 88,300 in 1996; a rate of 13.7%, or about 2.6% per annum.[11] These rates certainly do not suggest that the loss of another 2.5% or so of the population in the first year or two after closure of NZAS is unrealistically high.

Figure 5.1
Years at Usual Residence



[10] NZAS recruits over 90% of its employees locally. (Source: NZAS Sustainable Development Report 2003, p14.)
[11] This ignores immigration into Southland. Southland's total population in the last three census years of 1991, 1996 and 2001 was 99948, 97047 and 91008 respectively. (Source: SNZ census data.)

6.0 Community and Environment

NZAS provides funding and employee time for a number of environmental and community services. For example:

- In 2004 donations to community services were about $100,000 including university prizes and scholarships, and the Community Assistance Programme.

- NZAS contributed to the sponsorship of the successful Southern Institute of Technology 'Zero Fees Scheme'.

- Over 1100 hundred hours, valued at around $40,000, were allocated to activities such as the Kakapo Recovery Programme, the Southland Science Fair and various STARS programmes.

While these amounts may seem small in the context of a regional economy with a GDP of $2.8 billion, many of the programmes and activities supported by NZAS have benefits that are not recorded in the national accounts. The Kakapo Recovery Programme has contributed immensely to preventing the extinction of a species, while contributions to parenting programmes and further education can generate benefits over many years – benefits that may never be measured. These types of sponsorships are not easy to replace. A media release from NZAS regarding the Kakapo Recovery programme is located in Appendix Two of this report.

7.0 Glossary

Direct impacts – cover the first round of expenditure such as the sale of freight services to NZAS.

Production induced (upstream) impacts – cover the inputs of goods and services that are required by the industries that supply NZAS. These industries in turn require goods ands services from yet other industries, and so on.

Consumption induced (downstream) impacts – capture the spending of wages and salaries earned by those working either for NZAS or for those companies that supply goods and services to NZAS, whether directly or via other companies.

Multiplier – a coefficient which, when applied to an injection of expenditure will produce an estimate of the total (production induced plus consumption induced) effect on a region's output, employment, or value added.

Type I multipliers provide an estimate of the potential direct plus production induced impact.

Type II multipliers evaluate the direct, plus production induced, plus consumption induced impacts.

Type I and Type II multipliers can be further categorised as output, employment or value added multipliers.

Gross output – approximately equivalent to sales or turnover, valued at producer prices.

Employment – in terms of equivalent full time positions.

Value Added – equivalent to contribution to Gross Domestic Product. It is defined as sales less expenditure on inputs of materials. Thus it covers payments to labour, the return to capital (including depreciation) and some indirect taxes.

Trade diversion – the diversion of trade from one seller to another, such as a new restaurant taking customers from an established restaurant.

Trade creation – when a new activity raises local spending and incomes by selling its goods to other regions or by displacing imports from other regions. (The definitions of trade creation and diversion depend on the geographical area under consideration.)

Counterfactual – What would happen or could have happened, if some given event does or did not occur. For example, what might the Southland economy look like now if NZAS Tiwai Point had never existed?

8.0 Appendices

8.1 Appendix One — *Brown, Copleland & Co Ltd Report July 2004*

"The Continued Economic Contribution Of The Tiwai Point Aluminium Smelter, 2004-2012"

8.2 Appendix Two — NZAS Media Releases:

- *NZAS recognised for outstanding safety performance.*
- *NZAS rewarded for commitment to Health, Safety & Environmental Standards.*
- *NZAS employees provide a helping hand to the Kakapo Recovery Team.*

8.3 Appendix Three — The Southland Times Newspaper Article

- *Tiwai project boosts city firms.*

8.1 Appendix One - Brown, Copeland and Co Ltd:

8.2 Appendix Two - NZAS Media Releases:

1. *NZAS recognised for outstanding safety performance.*
2. *NZAS rewarded for commitment to Health, Safety & Environmental Standards.*
3. *NZAS employees provide a helping hand to the Kakapo Recovery Team.*

8.3 Appendix Three – The Southland Times Newspaper Article

1. *Tiwai project boosts city firms.*