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20 March 2020



Ref: H202000496

Dear

#### Response to your request for official information

I refer to your request of 23 January 2020 under the Official Information Act 1982 (the Act) for:

"planning documents that provided the foundation for construction of Southland Hospital in Invercargill, which opened in November 2004. These would include but not be limited to population projections, proposed capacity of hospital services such as Medicine, ED, Surgery, etc"

On 13 February 2020, we wrote to inform you that the timeframe to respond to your request is extended pursuant to section 15A(1)(b) of the Act, as the request necessitates a search of archived information.

Documents identified within scope of your request are outlined in Appendix One and copies of these are attached to this letter. The table in Appendix One also lists the specific grounds under which information has been withheld.

You have the right, under section 28 of the Act, to ask the Ombudsman to review any decisions made under this request.

Yours sincerely

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Michelle Arrowsmith Deputy Director-General DHB Performance, Support and Infrastructure

## Appendix One: Documents for release

No	Date	Document	Decision
1	26 October	Technical Description of Bed	Released in full.
	2000	Hospital	
2	8 October 2002	HR20022974 Size of New Southland Hospital	Released with some information withheld under section 9(2)(a) of the Act, to protect the privacy of natural persons.
3	1 November 2000	Memo to Mary Bonner	Released in full.



Technical Description of Bed Model Analysis for Southland Hospital

Released under the

26 October 2000

## EXECUTIVE SUMMARY

This report describes the bed model developed by the Ministry of Health to determine future public inpatient, secondary care bed requirements for the Southland region, for services that will be provided by Southland Hospital. Projected bed numbers are provided for each of 2005/06, 2010/11, and 2015/16.

Bed numbers for Medical, Surgical and Pregnancy/Neonatal services have been projected based upon the model developed for the Wellington area to determine both secondary and tertiary inpatient bed requirements in 2005/06 and 2015/16. The Ministry model assumes changes in required bed numbers due to: efficiency adjustments; demographic change; changes in service volumes independent of demographic growth; and changes in day case treatment and average length of stay (ALOS). Bed requirements for AT&R (Long-stay Geriatric and Mental Health) cases are projected on a separate basis.

The table below provides final bed numbers across all services to be provided by Southland Hospital. In summary:

- At present, there are 198 available beds at Southland Hospital for Medical, Surgical, Pregnancy/Neonatal and AT & R services, though only 174 of those beds are resourced on average at Southland Hospital.
- Based on Ministry projections, Southland Hospital needs:
  - 1 156 beds for 2005/06;
  - 2 145 beds for 2010/11; and,
  - 3 131 beds for 2015/16.
- Excluding AT & R additional beds, Southland Hospital needs:
  - 1. 118 beds for 2005/06;
  - 2. 107 beds for 2010/11; and
  - 3. 93 beds for 2015/16.

Number	of	Medica	al	Sur	gical	and	Preg	nanc	:y/Ne	eona	tal	and	ΑΤ	&	R	beds	estimated	by
Ministry	of	Health	bec	l mo	odel i	n 200	<b>)5/06</b> ,	201	0/11	and	20	15/16	6 for	So	outh	nland l	Hospital	

	В	ase	Projected Beds in				
sed	Current Available*	Current at Average Occupancy**	2005/06	2010/11	2015/16		
Medical, Surgical, and Pregnancy/Neonatal	158	138	118	107	93		
AT & R*	40	36	38	38	38		
GRAND TOTAL	198	174	156	145	131		

\* Projections for 2005/06 to 2015/16 could vary by +/- 5 beds depending on what proportion of Mental Health

AT & R beds are deemed to be Mental Health inpatient beds.

## Introduction

This report describes the bed model developed by the Ministry of Health (Ministry) to determine future public inpatient, secondary care bed requirements for the Southland region, for services, which will be provided by Southland Hospital. Projected bed numbers are provided for each of 2005/06, 2010/11, and 2015/16.

The Ministry bed model analysis for Southland Hospital is based upon the model developed for the Wellington area to determine both secondary and tertiary inpatient bed requirements in 2005/06 and 2015/16.

A sensitivity analysis will also be performed to assess the impact of risk and uncertainty on decision situations. This will be provided in the next version of the report.

## Method

## Bed Types Modelled

The bed model developed in this report for Southland region residents, covers only the following services:

- Acute and elective Medicine (includes Paediatric Medicine);
- Acute and elective Surgery;
- Pregnancy/Birth and Neonatal (excludes delivery beds);
- AT & R (Long-stay geriatric and Mental Health) services.

The model excludes any information on Mental Health inpatient beds, and all outpatient services.

## **Model Assumptions**

Bed numbers for those services, which are purchased on a case-weight basis, namely Medical, Surgical and Pregnancy/Neonatal services<sup>1</sup> have been projected based upon a model developed for the Wellington area. AT&R cases are projected on a separate basis.

Projected secondary inpatient bed numbers required for Medical, Surgical and Pregnancy/Neonatal services have been modelled using a stepwise additive factor approach.

- 1. Bed number projections are made for a number of services (aggregations of hospital specialities or discharge departments) in 2005/06, 2010/11, and 2015/16.<sup>2</sup>
- 2. Bed requirements for each service are aggregated to estimate the total number of secondary inpatient beds required at Southland Hospital.

<sup>1</sup> Pregnancy/Birth and Neonatal ICU services are not purchased on a case-weight basis, but are included here.

<sup>&</sup>lt;sup>2</sup> Coding at a health specialty level was considered too variable at Southland Hospital across recent years' discharge data to consider doing analysis at that level of detail.

The services modelled are (with corresponding health specialties) are:

Medical:	Cardiology, Dermatology, Endocrinology, Gastroenterology,
	Haematology, Intensive Care/A&E, Internal Medicine,
	Nephrology, Neurology, Oncology/Radiotherapy, Paediatric
	Medical, Respiratory, Rheumatology
Surgical - Long Stay:	General Surgery, Orthopaedic, Paediatric Surgery, Plastic, and Urology.
Surgical - Short Stay:	Dental, ENT, Gynaecology, and Ophthalmology.
Pregnancy/Birth.	
Neonatal ICU	
Other	

## Model Specification

The numbers of hospital beds required for each hospital speciality is modelled using a stepwise additive factor approach. The key stages in this process are outlined below

#### Stage 0: Base Model

The starting point for all projections is 1998/99 actual public hospital discharges for Southland Hospital.

Inpatient bed days used for each inpatient are determined by the total length of stay (i.e. number of nights) that each patient spends in hospital, excluding all leave days.<sup>3</sup> Each day case was assigned one bed day.

#### Stage 0: Efficiency Adjustments

The base was further refined by an occupancy adjustment, and benchmarking both average length of stay (ALOS) and the percentage of treatment carried out on a day case basis.

#### A. 85% occupancy

The model assumes a benchmark-based standard occupancy rate of 85%.

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<sup>&</sup>lt;sup>3</sup> Maximum length of stay set to 365 days.

### B. Benchmarking

Inpatient ALOS for Southland Health patients are benchmarked against the national average ALOS for the six services listed previously to assess where efficiency gains might lead to reductions in ALOS. Benchmarking is carried out using case-mix adjusted ALOS. This allows a fair comparison of ALOS between providers. ALOS is casemix adjusted using a number of different factors, including:

- the principal diagnosis;
- the presence of any complications and/or co-morbidities;
- age;
- socio-economic and demographic factors.<sup>4</sup>

The case-mix adjusted ALOS for Southland Health patients for each service is compared with the national average of 1.0 If the ALOS is found to be significantly longer than the national average (using 99% confidence intervals), then ALOS is reduced by the percentage that the current ALOS is longer than the national average. Where the ALOS was found to be either no different from, or shorter than the national average, no change is made to the current ALOS.

The same basic approach outlined above for ALOS was also used to project changes in the percentage of day-case treatments. For each service, the day-case percentage is reduced by the percentage that the current day-case rate is below the national average after case-mix adjustment. Where the day-case percentage is found to be either no different from, or above the national average, no change is made to the current percentage of day cases.

## Stage 2: Demographic Change

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Expected Number of Total Discharges in year x = sum of the age/gender specific rates by service and territorial local authority (TLA)<sup>5</sup> in 1998/99 multiplied by the projected TLA age/gender populations in year x.<sup>6</sup>

<sup>4</sup> To make a valid comparison between regions the above four factors are controlled by an adjustment for a patient's status on admission.

<sup>&</sup>lt;sup>5</sup> Invercargill, Southland, Gore, and Queenstown Lakes (parts in Southland DHB region only).

<sup>6</sup> Assuming medium birth and mortality rates, and medium migration flows.

## **Stage 3:** Changes in Service Volumes Independent of Demographic Change (based on trend analysis)

This stage involves a trend-based projection for changes in service volumes (either positive or negative). This trend is independent of that related to demographic changes. Projected numbers of cases in year x are found by carrying out a regression analysis of the number of discharges for Southland Hospital between 1992/93 and 1998/99 - if such analysis is deemed appropriate, and the *R squared* from the model is at least 50%). If a regression analysis is deemed inappropriate, or the *R squared* from the model is less than 50%, no change in service volumes (independent of demographic change) is assumed.

#### **Stage 4**: Changes in ALOS and % Day Case (based on trend analysis)

#### A. ALOS

Having benchmarked ALOS, the projected ALOS for inpatients in year x is found by carrying out a regression analysis of ALOS from 1991/92 to 1999/00. The analyses are calculated using data for all New Zealand (only for secondary cases). Subsequently, these national trends are applied to the Southland data - if such analysis is deemed appropriate, and the *R*-squared from the model is at least 50%. Using the regression equation, a projection is made for ALOS in year x. For example, in the case of Medical cases, if regression analysis projects a 26.9% reduction in ALOS nationally between 1998/99 and 2005/2006, then the benchmarked ALOS for Medical cases in Southland would be reduced by 26.9%. If a regression analysis is deemed inappropriate (or the *R*-squared from the model is less than 50%) then the ALOS in year x is set to the ALOS for 1998/99

### B. % Day Case

Having benchmarked percent day case, the projected percentage of day cases in year x is found by carrying out a logistic analysis of the percentage of day cases (using nationwide data) from 1991/92 to 1999/00. This analysis only looks at secondary cases. These trends are applied to the Southland data, given the analysis is deemed appropriate (i.e. the logistic estimate for time is significant at the 5% level of significance), thereby projecting the percentage of day cases in year x. If a logistic analysis is deemed inappropriate (i.e. the logistic estimate for time is not significant) then the percentage of day cases in year x is set to the 1998/99 percentage of day cases.

## The Final Equation

Final inpatient numbers and bed days for each service, along with final day-case numbers and bed days (after making the occupancy adjustments detailed above) are aggregated to determine the final total numbers and bed days for Southland Hospital.

The number of hospital beds required is calculated as the total number of predicted bed days for year *x*, as above, divided by the product of the number of days in a year and the occupancy adjustment.

The projected number of beds required for each hospital/service, and health service, are aggregated to calculate the total number of hospital beds required by Southland Hospital.

#### Number of beds required = Number of bed days/(365.25\*0.85)

## Uncertainty of the Estimates

The estimates presented above are subject to a number of uncertainties. Firstly, there are uncertainties due to errors around the assumptions used (forecasting errors) Secondly, there are a number of unforeseen or unknown factors, which cause uncertainty around the estimates.

### 1. Forecasting Errors

Forecast changes in demographics, service volumes, ALOS and day case percentages may not occur. As with any forecast, estimates of such parameters are subject to a degree of uncertainty. Inaccuracies in the forecasts of individual parameters, which 'drive' the bed model, will result in inaccuracies in the final bed number estimates.

#### 2. Unforeseen Factors

No explicit allowance has been made in the model for unforeseen 'external' factors, which might influence the need for beds in the Southland area. Such factors may act either to increase or to decrease bed requirements relative to the levels forecast. The development of new technologies that allow current hospital-based procedures to be performed outside a hospital, and the emergence of new pharmaceutical products that could reduce overall levels of ill-health and thus demand for hospital services are factors that might be expected to reduce future bed requirements. Conversely, the introduction of new, hospital-based treatments for currently 'incurable' conditions, and the emergence of new diseases and increased incidence of existing diseases that require admission to hospital are examples of unforeseen factors that might increase future bed requirements.

The uncertainties discussed above cannot, by their very nature, be built into the bed model. In an attempt to recognise their possible impacts, however, sensitivity analysis is run for the projected bed numbers for Southland Hospital using current and recent years' trend utilisation data

Sensitivity Analysis is a method used to assess the impacts of risk and uncertainty on decision situations. The principal objective of sensitivity analysis is to aid the decision-maker in selecting a course of action, based on the knowledge of the possible outcomes that could occur resulting from those decisions.

Sensitivity analysis will be carried out by examining the impact of random variations in each of the four key parameters that 'drive' the model (i.e. demographics, service volumes, ALOS, day case percentages). The cumulative effect of such variations is to generate confidence intervals around the bed number projections for 2005/06, 2010/11 and 2015/16.

## What the Final Model Does Not Include

The following factors are <u>not</u> included explicitly in the final bed models above:

- benchmarking against any international ALOS and percentage day case rates;
- any shifts to the private sector;
- any changes in admission practices, such as integrated care and possible moves towards more treatment being provided in a primary care setting.

Using international data for comparisons is problematic for several reasons, including: coding differences, different admission/discharge practises, different funding pressures, different public/private mix etc.

There may be potential for reductions in hospital activity due to factors, such as integrated care and an emphasis on primary care, greater than that reflected in the trend over the last seven years. However, these factors would be most likely to affect only short-stay cases.

## AT&R Services

Bed Numbers for AT&R cases are assumed to be based simply on current contracted bed numbers between Southland Health and the HFA.

## Summary of Results

## Medical, Surgical and Pregnancy/Neonatal Services

*Table 1* (below) provides a summary of the results for 2005/06 (with an 85% occupancy rate) showing bed numbers after each stage of the process.

*Table 2* (below) provides the corresponding summary for 2010/11 and 2015/2016.

(1) Efficiency Adjustment 2005/06 Base (3) - (2) Current at Current Final - (3) plus plus Average Utilised at Current Occupancy 85% After Bench-(2) - (1) plus Service ALOS & % marking Service Available' Occupancy Demographic Volumes **Day Case** Medical 74 58 61 57 58 72 50 Surgical 48 57 53 54 54 54 54 Pregnancy/Birth 15 14 15 16 16 14 11 Neonatal ICU 5 7 5 7 6 6 6 Other 7 7 5 5 5 5 TOTAL 158 138 143 140 138 152 118

**Table 1:** Number of Medical, Surgical and Pregnancy/Neonatal beds estimated by Ministry of

 Health bed model in 2005/06 for Southland Hospital

\* Total number of beds available to meet demand of increased admissions.

\*\* Number of beds normally staffed to meet average daily requirements.

Therefore, in 2005/2006 (with 85% occupancy):

- <u>Base</u>. At present, there are 158 available beds at Southland Hospital for Medical, Surgical and Pregnancy/Neonatal services, though only 138 of those beds are resourced on average. Assuming no demographic change from 1998/99, and ALOS, service volumes, and percent day case at 1998/99 levels, and applying 85% occupancy, estimates bed numbers at 143.
  - 1. Benchmarking reduces bed numbers by three to 140 (starting point).
  - 2. Assuming demographic change only, it is predicted that 138 beds would be needed (1.4% decrease from the starting point);
  - 3. (2) plus projecting changes in service volumes increases bed numbers by **10.1%** (14) to 152;
  - 4. (3) plus projecting changes in ALOS and percent day case reduces bed numbers by **22.4%** (34) to 118 (final model).

#### 118 beds is the final result of the model.

**Table 2:** Number of Medical, Surgical and Pregnancy/Neonatal beds estimated by Ministry of

 Health bed model in 2010/11 and 2015/16 for Southland Hospital

		2010/11		2015/16			
		(3) - (2)	Final - (3)			Final - (3)	
		plus	plus ALOS		(3) - (2) plus	plus ALOS	
	(2) - (1) plus	Service	& % Day	(2) - (1) plus	Service	& % Day	
Service	Demographic	Volumes	Case	Demographic	Volumes	Case	
Medical	58	79	46	58	83	41	
Surgical	54	54	43	54	54	37	
Pregnancy/Birth	13	13	9	12	12	7	
Neonatal ICU	6	6	6	6	6	6	
Other	5	5	3	5	5	2	
TOTAL	136	158	107	135	159	93	

\* All bed numbers assume 85% occupancy.

In 2010/11, (assuming 85% occupancy) it is projected that 107 acute Medical, Surgical and Pregnancy/Neonatal services inpatient beds will be required by Southland Hospital. In 2015/16, the projected number of beds is 93.

Projected bed numbers by service are provided in Appendix A.

## Sensitivity Analysis

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The effects of including uncertainty are illustrated below in *Table 3* for inpatient, daypatient, and total bed numbers, by service. In each case, the figures for "Lower Limit" and "Upper Limit" represent, respectively, the lower and upper bounds of the 90% statistical confidence intervals for future bed requirements. Thus, based on the assumptions included in the model, there is a 90% probability that bed requirements will lie between the figures shown for lower limit and upper limit.

The key findings from the sensitivity analysis, with 85% occupancy, are:

- For 2005/06, with 90% confidence, the model predicts that the required number of hospital beds will fall between 112 and 124, a range of 12 beds.
- In 2010/11, it is predicted with 90% confidence that total bed requirements will fall between 101 and 113 beds. For 2015/16, the predicted range of beds is 87 to 99.

#### Table 3: Number of beds estimated by Ministry of Health bed model in 2005/06, 2010/11, and 2015/16, for Southland Hospital with 90% confidence limits (85% occupancy)

#### (a) 2005/06

	Inpatient Daypatient		atient	t Total		
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Medical	39	49	5	7	45	55
Surgical - Long Stay	32	36	5	5	37	41
Surgical - Short Stay	3	5	4	6	8	10
Pregnancy/Birth	10	12	-	-	10	12
Neonatal ICU	5	7	-	-	5	7
Other	2	4	-	-	2	4
TOTAL	97	107	15	17	112	124

#### (b) 2010/11

	Inpa	tient	Dayp	atient 🔣	Total		
				ςΟ,			
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	
Medical	34	44	6	8	40	52	
Surgical - Long Stay	27	31	5	5	32	36	
Surgical - Short Stay	3	5	4	6	7	11	
Pregnancy/Birth	8	10		-	8	10	
Neonatal ICU	6	6_(		-	6	6	
Other	2	4	-	-	2	4	
TOTAL	84	96	16	18	101	113	

#### (c) 2015/16

	Inpa	tient	Dayp	atient	Total		
	5						
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	
Medical	28	38	7	9	35	47	
Surgical - Long Stay	23	27	5	5	28	32	
Surgical - Short Stay	3	3	3	5	6	8	
Pregnancy/Bi th	6	8	-	-	6	8	
Neonatal ICU	5	7	-	-	5	7	
Other	1	3	-	-	1	3	
TOTAL	71	81	16	18	87	99	

Note: Due to the statistical estimation technique used to derive these estimates, the upper and lower limits for total beds cannot be derived by adding either inpatient and daypatient, or service specific upper and lower limits.

*Figure 1* depicts the estimated number of hospital beds for each year, from the Ministry of Health bed model, together with 90% confidence limits.

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Figure 1: Number of beds estimated by Ministry of Health bed model over time, with 90% confidence limits for Southland Hospital

## AT & R Services

*Table 4* shows that presently, there are 40 resourced beds available at Southland Hospital for DSS AT & R services, though only 36 of those beds are occupied on average. Based on the HFA benchmark of 2.1 beds per 1,000 population 65 and over for aged care AT & R beds, the Ministry estimates that 28 beds are currently required for these services.<sup>7</sup>

However, Southern Health also provides DSS AT & R services for those under 65 years which most other HHS's do not provide, thus the HFA benchmark would be inappropriate in this case. Examination of 1998/99 inpatient AT & R information for Southland Hospital, shows that there were 11,750 total bed days. This implies that 38 beds would currently be required at 85% occupancy. With the joint effects of reductions in length of stay over time, but an increasing population 65 and over<sup>8</sup>, the number of required DSS AT & R beds has been set at 33 for each of 2005/06, 2010/11 and 2015/16.

<sup>&</sup>lt;sup>7</sup> Assuming medium birth and mortality rates, and medium migration flows. Projections based on low and high projections are also shown.

<sup>&</sup>lt;sup>8</sup> Projected increases from 1998/99 are: 7.5% to 2005/06; 14.1% o 2010/11; 30.1% to 2015/16.

Southland Hospital currently provides 10 Mental Health AT & R (Psychogeriatric) beds. However, there is ongoing discussion with the HFA whether some of those beds are in fact Mental Health inpatient beds. For this reason, projected Mental Health AT & R beds for each of 2005/06, 2010/11 and 2015/16, have been set at 5, though bed numbers could vary by +/- 5 beds depending on what proportion of AT & R beds are deemed to be inpatient beds.

In total, for each of 2005/06, 2010/11 and 2015/16, there are projected to be 38 AT & R beds at Southland Hospital.

	Ba	se		Projections for:			
Projection	Current Resourced	Current at Average Occupancy	Current at 85% Occupancy	2005/06	2010/11	2015/16	
DSS	40	36	38	33	33	33	
Mental Health*	10	10	10	5	5	5	
Total	50	46	48	38	38	38	

 Projections for 2005/06 to 2015/16 could vary by +/- 5 beds depending on what proportion of Mental Health AT & R beds are deemed to be Mental Health inpatient beds.

## Final Bed Numbers

Table 5 provides final bed numbers across all services to be provided by Southland Hospital.

In summary

- At present, there are 198 available beds at Southland Hospital for Medical, Surgical, Pregnancy/Neonatal and AT & R services, though only 174 of those beds are resourced on average at Southland Hospital.
- Based on Ministry projections, Southland Hospital needs:
  - 4 156 beds for 2005/06;
  - 5 145 beds for 2010/11; and,
  - 6 131 beds for 2015/16.
- Excluding AT & R additional beds, Southland Hospital needs:
  - 4. 118 beds for 2005/06;
  - 5. 107 beds for 2010/11; and,
  - 6. 93 beds for 2015/16.

Table 5: I	Number of Medical,	Surgical and I	Pregnancy	/Neonata	l and AT & R	beds estimated
	by Ministry of Health	n bed model in	2005/06,	2010/11	and 2015/16 i	for Southland
	Hospital					

	В	ase	Р	rojected Beds	in
		Current at			
	Current	Average			
	Available*	Occupancy**	2005/06	2010/11	2015/16
Medical, Surgical, and					
Pregnancy/Neonatal	158	138	118	107	93
AT&R*	40	36	38	38	38
GRAND TOTAL	198	174	156	145	131

\* Projections for 2005/06 to 2015/16 could vary by +/- 5 beds depending on what proportion of Mental Health

AT & R beds are deemed to be Mental Health inpatient beds.

## **APPENDICES**

- Appendix A: Medical, Surgical, Pregnancy/Neonatal, and AT & R Bed Projections by service
- Appendix B: Current and Historical Utilisation Trends at Southland Hospital
- Appendix C: Sensitivity analysis
- Appendix D: Average length of stay, percent day case, and discharge number trends and projections
- Appendix E: Urgent/non-urgent admissions

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Appendix F: Analysis of average length of stay (ALOS) by age

#### Medical, Surgical, Pregnancy/Neonatal, and AT & R Bed projections by Appendix A: Service

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	Ba	ise (1	I) Efficiency	Adjustme	2	2005/06			2010/11			2015/16	
		Current at	Current			(3) - (2)	Final - (3)		(3) - (2)	Final - (3)		(3) - (2)	Final - (3)
		Average	Utilised at	After		plus	plus		plus	plus		plus	plus
	Current	Occupancy	85%	Bench-	(2)	Service	ALOS & %	(2)	Service	ALOS & %	(2)	Service	ALOS & %
Service	Available*	**	Occupancy	marking	Demographic	Volumes	Day Case	Demographic	Volumes	Day Case	Demographic	Volumes	Day Case
Medical	74	58	61	57	58	72	50	58	79	46	58	83	41
Surgical - Long Stay	47	44	45	45	45	45	39	45	45	34	45	45	30
Surgical - Short Stay	10	9	9	9	9	9	9	8	8	9	8	8	7
Pregnancy/Birth	15	15	16	16	14	14	11	13	13	9	12	12	. 0
Neonatal ICU	5	5	7	7	6	6	6	6	6	6	6	6	6
Other	7	7	5	5	5	5	3	5	5	3	5	5	2
Total Medical, Surgical, and													
Pregnancy/Neonatal	158	138	143	140	138	152	118	136	158	107	135	159	93
AT & R***	40	36		48			38			38			38
GRAND TOTAL	198	174		188			156			145			131

\* Total number of beds available to meet demand of increased admissions.

Number of beds normally staffed to meet average daily requirements.

\*\*\* Projections for 2005/06 to 2015/16 could A47vary by +/- 5 beds depending on what proportion of Mental Hea th AT & R beds are deemed to be Mental Health inpatient beds.

-Jusi Technical Description of Bed Model Analysis for Southland Hospital - 26/10/2000

## Appendix B: Current and Historical Utilisation Trends at Southland Hospital

		Numbers of Discharges							
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change	
Medical	3,640	4,208	4,577	4,657	4,846	4,686	4,868	4.8%	
Surgical - Long Stay	3,879	4,001	3,972	4,343	4,449	3,954	4,195	1.2%	
Surgical - Short Stay	1,986	2,127	2,313	2,241	2,214	1,927	2,047	-0.6%	
Pregnancy/Birth	2,600	2,460	2,214	2,003	2,088	2,308	1,899	-3.5%	
Neonatal ICU	104	103	130	92	107	115	152	5.0%	
Other	61	65	29	21	41	52	52	-2.5%	
Total	12,270	12,964	13,235	13,357	13,745	13,042	13,213	1.0%	

 Table B1:
 Total numbers of discharges by service at Southland Hospital: 1992/93 to 1998/99

## Table B2: Inpatient average length of stay (ALOS) by service at Southland Hospital: 1992/93 to 1998/99

	ALOS									
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change		
Medical	6.2	<mark>5.3</mark>	5.6	5.5	5.5	4.7	4.3	-4.0%		
Surgical - Long Stay	6.2	5.7	5.9	5.3	5.4	4.8	4.2	-4.9%		
Surgical - Short Stay	3.0	2.9	2.9	2.5	2.4	2.0	2.0	-6.2%		
Pregnancy/Birth	5.5	5.1	4.1	3.8	3.3	2.8	2.8	-8.8%		
Neonatal ICU	13.6	11.8	10.1	12.4	11.8	9.0	9.5	-4.2%		
Other	33.8	37.2	23.3	26.4	18.7	20.3	28.5	-5.7%		
Total	6.2	5.7	5.3	5.0	5.0	4.4	4.3	-4.8%		

## Table B3: Percent day case by service at Southland Hospital: 1992/93 to 1998/99

S	Percent Day Case									
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change		
Medical	6.7%	6.7%	7.2%	9.1%	10.2%	12.7%	13.7%	1.3%		
Surgical - Long Stay	17.2%	15.8%	19.6%	21.5%	22.0%	25.2%	27.8%	1.9%		
Surgical - Short Stay	36.9%	36.9%	47.5%	50.3%	57.8%	60.2%	64.2%	<mark>5.0%</mark>		
Pregnancy/Birth	6.8%	6.3%	7.6%	7.4%	8.2%	10.2%	9.6%	0.6%		
Neonatal ICU	1.0%	3.9%	3.8%	1.1%	0.9%	2.6%	3.9%	0.1%		
Other	24.8%	31.8%	14.9%	15.3%	16.0%	24.6%	15.5%	-1.5%		
Total	15.1%	14.8%	18.0%	19.8%	21.3%	23.1%	25.2%	1.8%		

Technical Description of Bed Model Analysis for Southland Hospital – 26/10/2000

		Total Bed Days						
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change
Medical	21,283	20,939	24,116	23,578	24,416	19,793	18,721	-1.6%
Surgical - Long Stay	20,538	19,987	19,734	18,921	19,576	15,195	13,758	-5.2%
Surgical - Short Stay	4,497	4,671	4,620	3,899	3,555	2,706	2,792	-8.0%
Pregnancy/Birth	13,575	11,987	8,475	7,108	6,516	6,093	4,920	-10.4%
Neonatal ICU	1,403	1,172	1,271	1,125	1,253	1,014	1,396	-0.9%
Other	1,555	1,676	569	478	647	806	1,247	-5.9%
Total	62,851	60,432	58,785	55,109	55,963	45,607	42 834	-5.3%

Table B4: Total bed days by service at Southland Hospital: 1992/93 to 1998/99

Table B5: Estimated bed usage by service at Southland Hospital: 1992/93 to 1998/99

				Estimate	d Bed Nur	nbers*	$\mathcal{O}$		Average Annual
	Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change
	Medical	69	67	78	76	79	64	60	-1.6%
	Surgical - Long Stay	66	64	64	61	63	49	44	- <mark>5</mark> .2%
	Surgical - Short Stay	14	15	15	13	11	9	9	-8.0%
	Pregnancy/Birth	44	39	27	23	21	20	16	-10.4%
	Neonatal ICU	5	4	4	4	4	3	4	-0.9%
	Other	5	5	2	2	2	3	4	-5.9%
	Total	202	195	189	178	180	147	138	-5.3%
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	Assuming 85% occupar	icy							
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## **Appendix C: Sensitivity analysis**

## Summary

This analysis provides some sensitivity analysis around the future number of acute public hospital beds required by Southland Hospital in 2005/06, 2010/11 and 2015/16. Sensitivity analysis is run for the projected bed numbers for Southland Hospital using current and recent years' trend utilisation data for these hospitals.

@RISK for Windows, Version 3.5.2<sup>9</sup>, has been used to determine the levels of uncertainty over time around the future number of beds required by Southland Hospital, and is run through EXCEL.

In summary, assuming 85% occupancy rate,

- For 2005/06, with 90% confidence, the model predicts that the required number of hospital beds will fall between 112 and 124, a range of 12 beds.
- In 2010/11, it is predicted with 90% confidence that total bed requirements will fall between 101 and 113 beds. For 2015/16, the predicted range of beds is 87 to 99.

*Figure C1* depicts the estimated number of hospital beds from the Ministry of Health bed model, together with 90% confidence limits.

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<sup>&</sup>lt;sup>9</sup> Copyright 1990-1997, Palisade Corporation.



Figure C1: Number of beds estimated by Ministry of Health bed model over time, with 90% confidence limits for Southland Hospital

## Introduction

This analysis provides some sensitivity analysis around the future number of acute public hospital beds required by Southland Hospital in 2005/06, 2010/11 and 2015/16. Sensitivity analysis is run for the projected bed numbers for Southland Hospital using current and recent years' trend utilisation data for these hospitals.

## Method

Sensitivity Analysis is a method used to assess the impacts of risk and uncertainty on decision situations. The principal objective of sensitivity analysis is to aid the decision-maker select a course of action, based on the knowledge of the possible outcomes that could occur resulting from those decisions.

Current values for critical variables in the model are known, but what about values for these same variables in the future? Time often has a very important impact on estimates - they become less and less certain the further out in time your projections extend. As a consequence, results based on your single "best estimates" become more and more risky the further out in time they are projected.

@*RISK for Windows, Version*  $3.5.2^{10}$ , has been used to determine the levels of uncertainty over time around the future number of beds required by Southland Hospital and is run through EXCEL. The approach employed by @*RISK* works in two steps, namely:

- 1. Identifying uncertainty over time in the variables in the model and specifying their possible values with probability distributions, and identifying the uncertain results to be analysed.
- 2. Analysing the model through simulation to determine the range and probabilities of all possible outcomes for the results of the model.

The results that @*RISK* generates can then be used by the decision-maker to help choose a course of action.

Uncertainty in the bed model for Southland Hospital is built up sequentially in four stages, namely:

- Stage 1: Growth Due to Population Change
- Stage 2: Changes in Service Volumes
- Stage 3: Day Case Changes Using Trend Analysis
- Stage 4 (Final model): Inpatient Average Length of Stay (ALOS) Changes Using Trend Analysis.

As with the derivation of the bed model projections, uncertainty around the estimates is modelled for each of the services to be provided by Southland Hospital. Subsequently, the uncertainty around the projections is aggregated to provide sensitivity analysis around the future number of acute public hospital beds required by Southland Hospital.

## 1. Measures of Uncertainty Around the Estimates

## Stage 1: Growth Due to Population Change

Uncertainty around the expected number of discharges in year x is determined by assuming that the projected populations in year x are uniformly distributed. That is, projected populations in 2005/06, 2010/11 and 2015/16 could vary uniformly from a minimum of the Statistics New Zealand low projections (low fertility, high mortality, and high net migration), to a maximum of the Statistics New Zealand high projections (high fertility, low mortality, and low net migration).

Stage 2:

## Changes in Service Volumes Independent of Demographic Change

Uncertainty around changes in service volumes (either positive or negative) independent of changes predicted through demographics is also considered to be normally distributed, with mean and standard errors calculated from the regression equations, as for the ALOS analyses.

<sup>&</sup>lt;sup>10</sup> Copyright 1990-1997, Palisade Corporation.

## Stage 3 Day Case Changes Using Trend Analysis

Variation in the projected changes to the projected percentage of day cases in year *x* is also assumed to be normally distributed, with a mean equivalent to the projected change in the percentage of day cases, and a standard deviation based around the standard errors of the predicted percentage of day cases from the calculated logistic regression equations.

## Stage 4: (Final model): Inpatient Average Length of Stay (ALOS) Changes Using Trend Analysis

Variation in the projected changes to ALOS for inpatients in year x is assumed to be normally distributed with a mean equivalent to the projected change, and a standard deviation based around the standard errors of the predicted ALOS from the calculated regression equations. Where a regression analysis was deemed inappropriate (or the *R*squared from the model was less than 50%) then the standard error was assumed to be the average across all specialties.

## 2. Simulation Analyses to Measure the Uncertainty

A simulation in *@RISK* involves repetitive recalculations of the model, based on the distribution functions measuring variability at each stage of the model. Each recalculation is called an "iteration". For each iteration:

- all distribution functions are sampled;
- sampled values are returned and the model is recalculated; and,
- output values (ie. inpatient, daypatient, and total bed numbers) are returned and saved for that iteration.

The above process is repeated for each of *n* iterations. The simulation process for this analysis used n = 10,000 iterations. On the basis of the 10,000 iterations, a distribution of final bed numbers is derived, with mean equal to the projected estimate, and standard deviation calculated directly from the distribution of simulated bed numbers. This enables a  $(1 - \alpha)\%$  confidence interval to be placed around the estimates for the projected number of hospital beds, and hence provide a  $(1 - \alpha)\%$  degree of confidence around the bed model estimates. The results that follow use 90% confidence intervals.<sup>11</sup>

<sup>&</sup>lt;sup>11</sup> 90% confidence interval = estimate +/- 1.645\*standard deviation.

## 3. What Sensitivity Analysis Can (Cannot) Do<sup>12</sup>

It cannot be assumed that the techniques used by @*Risk* are magic "black boxes" that unequivocally arrive at the correct answer or decision. No technique can make that claim. Rather, these techniques are tools that can be used to help make decisions and arrive at solutions. Like any tools, they can be used to good advantage by skilled practitioners, or they can be used to create havoc in the hands of the unskilled. In the context of sensitivity analysis, quantitative tools should never be used as a replacement for personal judgement.

Therefore, sensitivity analysis cannot guarantee that the projected number of hospital beds by Southland hospital is the most appropriate viewed from the perspective of hindsight. Hindsight implies perfect information, and in this case, the ability to see into the future, which is impossible at the time the decision is made. However, the sensitivity analysis provided here, provides a means for selecting the number of beds required by Southland Hospital, based on the available information.

## Results

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*Table C1* below provides a summary of the sensitivity analysis results for 2005/06, with an 85% occupancy rate, showing 90% upper and lower confidence limits for projected bed numbers for Southland Hospital. Analysis is provided for inpatient, daypatient, and total bed numbers.

The key findings from the sensitivity analysis, with 85% occupancy, are:

- For 2005/06, with 90% confidence, the model predicts that the required number of hospital beds will fall between 112 and 124, a range of 12 beds.
- In 2010/11, it is predicted with 90% confidence that total bed requirements will fall between 101 and 113 beds. For 2015/16, the predicted range of beds is 87 to 99.
- Variability in projected inpatient bed numbers is greater than that for projected daypatient bed numbers.
- Most of the variability in projected bed numbers is accounted for by Medical beds, with relatively little variability in projected Surgical Long Stay, and Pregnancy/Birth bed numbers.

<sup>&</sup>lt;sup>12</sup> As noted by the developers of @*Risk*.

#### Table C1: Number of beds estimated by Ministry of Health bed model in 2005/06, 2010/11, and 2015/16, for Southland Hospital with 90% confidence limits (85% occupancy)

### (a) 2005/06

	Inpa	tient	Daypa	atient	То	tal
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Medical	39	49	5	7	45	55
Surgical - Long Stay	32	36	5	5	37	41
Surgical - Short Stay	3	5	4	6	8	10
Pregnancy/Birth	10	12	-	-	10	12
Neonatal ICU	5	7	-	-	5	7
Other	2	4	-	-	2	4
TOTAL	97	107	15	17	112	124

#### (b) 2010/11

	Inpa	Inpatient		atient 🔍	То	tal
				ν SO		
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Medical	34	44	6	8	40	52
Surgical - Long Stay	27	31	5	5	32	36
Surgical - Short Stay	3	5	4	6	7	11
Pregnancy/Birth	8	10		-	8	10
Neonatal ICU	6	6_(		-	6	6
Other	2	4	-	-	2	4
TOTAL	84	96	16	18	101	113

### (c) 2015/16

	Inpat	tient	Dayp	atient	То	tal
	<u>v</u>					
Service	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Medical	28	38	7	9	35	47
Surgical - Long Stay	23	27	5	5	28	32
Surgical - Short Stay	3	3	3	5	6	8
Pregnancy/Bi th	6	8	-	-	6	8
Neonatal ICU	5	7	-	-	5	7
Other	1	3	-	-	1	3
TOTAL	71	81	16	18	87	99

Note: Due to the statistical estimation technique used to derive these estimates, the upper and lower limits for total beds cannot be derived by adding either inpatient and daypatient, or service specific upper and lower limits.

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*Figure C1* depicts the estimated number of hospital beds from the Ministry of Health bed model, together with 90% confidence limits.



*Figure C1:* Number of beds estimated by Ministry of Health bed model over time, with 90% confidence limits for Southland Hospital

# Appendix D: Average length of stay, percent day case, and discharge number trends and projections



Figure D1: Discharge numbers: trends and projections

Figure D2: Average length of stay: trends and projections





Figure D3: Percent day case: trends and projections

*Figure D1* shows discharge number trends and projections for total, Medical, Surgical and Pregnancy/birth services for Southland Hospital. For Southland Hospital as whole, discharge numbers are predicted to grow by 10.0% between 1998/99 and 2015/2016 (approximately 1,300 cases).

It is clear by service, that growth is projected to occur only for Medical services from 1998/99 to 2015/16 (44.3% and over 2 100 cases). In contrast, a 3.7% decrease is projected for Surgical services from 1998/99 to 2015/16, with a 30.2% reduction in Pregnancy/birth services over the corresponding period.

To determine if the projected overall discharge number increase is occurring nation-wide, and not just in Southland Hospital, *Figure D4* and *Table D1* compare standardised discharge rates (SDRs)<sup>13</sup> per 10,000 population from 1988/89 to 1998/99. Both raw and case-mix adjusted<sup>14</sup> discharges are compared.

It is clear that there has been a considerable growth in the volume of services delivered over the last ten years (25.2%), independent of demographic change. This growth is fairly constant through the years, apart from a period of relatively minor increase from 1990/91 to 1992/93. *Figure D4* and *Table D1* also show that the average cost per case has increased over the ten-year period.

<sup>&</sup>lt;sup>13</sup> SDR's make adjustments for a population's age and gender characteristics

<sup>&</sup>lt;sup>14</sup> 'Case-mix adjusted' as defined here implies that the cost of each discharge is taken into account (expressed in terms of 1996/97 average RHA prices) as well as the number of discharges. The implication is that the higher the number of case-mix adjusted discharges are, the more complicated or complex the average discharge is.



*Figure D4:* Standardised discharge rates (SDRs) per 10,000 population: 1988/89 to 1997/98 for all New Zealand

 Table D1:
 Standardised discharge rates (SDRs) per 10,000 population: 1988/89 to 1997/98 for all New Zealand

	SDR p	er 10,000 🛛 🔪	Cumulativ	e % Change
Year	Age and gender	Age/gender and case mix	Age and gender	Age/gender and case-mix
1988/89	1,205	1,187		
1989/90	1,233	1,206	2.4%	1.6%
1990/91	1,276	1,258	5.9%	6.0%
1991/92	1,268	1,254	5.3%	5.6%
1992/93	1,311	1,296	8.9%	9.2%
1993/94 🔪	1,380	1,359	14.6%	14.5%
1994/95	1,389	1,393	15.3%	17.3%
1995/96	1,419	1,406	17.8%	18.5%
1996/97	1,430	1,452	18.7%	22.3%
1997/98	1,490	1,522	23.7%	28.2%
1998/99	1,508	1,543	25.2%	30.0%

\* From 1988/89 to the current year.

## Appendix E: Urgent/non-urgent admissions

- *Table E1* shows national discharge rates per 100,000 population from 1991/92 to 1998/99, by service, for urgent secondary services. *Table 2* showing the corresponding information for non-urgent cases. Urgent is defined as all cases with an acute admission type, and 20% of all arranged admissions. Otherwise the case was classified as non-urgent
- *Tables E3* and *E4* contain discharge rates per 100,000 population from 1991/92 to 1998/99, by service for Southland Hospital patients, for urgent and non-urgent services respectively.
- For all services, at the national level, the per capita growth in urgent cases has been approximately 5.9% for secondary services. By contrast, there has been only a 2.1% increase in the number of non-urgent cases per capita.
- For Southland Hospital, the average per capita growth per annum for urgent and nonurgent cases has been the same at 1.0%.
- *Tables E5* and *E6* show ALOS for urgent and non-urgent cases respectively, by service for secondary services.
- For all cases, there has been a reduction of 0.28 days per year in ALOS for urgent cases. This compares with 0.14 days for non-urgent cases. This same pattern is repeated across all services.

				Ye	ar				Average Annual
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change
Medical	118,080	122,723	134,166	144,347	157,378	158,221	168,244	179,555	7.5%
Surgical - Long Stay	74,057	76,341	82,295	90,275	91,644	90,567	93,199	93,806	4.0%
Surgical - Short Stay	21,292	21,806	22,709	25,232	25,969	26,661	26,433	27,474	4.4%
Pregnancy/Birth	20,673	20,241	20,377	26,604	35,348	33,729	32,860	29,512	10.0%
Neonatal ICU	7,806	6,190	3,727	3,550	3,348	3,147	3,433	3,238	-7.3%
Other	711	747	811	1,035	748	1,010	1,176	1,098	8.6%
Total	242,618	248,048	264,084	291,044	314,434	313,334	325,344	334,684	5.9%

Table E1: Secondary urgent discharges by service: 1991/92 to 1998/99 for New Zealand

\* Urgent is defined as all cases with an acute admission type, and 20% of all arranged admissions.
 Otherwise the case was classified as non-urgent

Table E2: Secondary non-urgent discharges b	by service: 1991/92 to 1998/99 for N	ew
Zealand	νO,	

	Year									
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change	
Medical	19,133	21,955	24,619	21,311	23,879	24,649	28,162	26,504	5.3%	
Surgical - Long Stay	67,093	70,358	75,398	69,617	68,495	72,968	78,720	79,954	2.2%	
Surgical - Short Stay	48,460	51,260	53,594	50,869	51,992	53,929	58,193	61,652	3.2%	
Pregnancy/Birth	55,726	57,922	58,432	54,149	54,996	56,060	55,972	55 <mark>,</mark> 673	-0.4%	
Neonatal ICU	806	2 624	4,860	5,271	2,199	2,323	2,326	2,823	2.9%	
Other	681	659	797	758	708	1,247	1,851	1,566	23.5%	
Total	191,899	204,777	217,701	201,974	202,269	211,176	225,225	228,172	2.1%	

\* Non-urgent is defined as all cases with an waiting list admission type, and 80% of all arranged admissions. Otherwise the case was classified as urgent

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				Year				Average Annual	
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change	0
Medical	3,192	3,779	4,105	4,191	4,252	4,073	4,266	4.4%	O'
Surgical - Long Stay	1,949	2,116	2,019	2,113	2,075	2,033	1,778	-1.1%	O.O.
Surgical - Short Stay	366	453	430	454	474	497	457	4.0%	N S
Pregnancy/Birth	2,153	2,128	1,909	1,668	1,845	2,074	1,656	-2.8%	X
Neonatal ICU	78	93	102	70	98	105	122	7.0%	C C
Other	36	35	17	9	25	24	23	-5.4%	
Total	7,774	8,604	8,582	8,505	8,769	8,806	8,303	1.0%	X

#### Table E3: Urgent discharges by service: 1992/93 to 1998/99 for Southland Hospital

\* Urgent is defined as all cases with an acute admission type, and 20% of all arranged admissions. Otherwise the case was classified as non-urgent

				Year				Average Annual
Service	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	% Change
Medical	448	429	472	466	594	613	602	7.6%
Surgical - Long Stay	1,930	1,885	1,953	2,230	2,374	1,921	2,417	3.6%
Surgical - Short Stay	1,620	1,674	1 883	1,787	1,740	1,430	1,590	-1.6%
Pregnancy/Birth	447	332	305	335	243	234	243	-7.0%
Neonatal ICU	26	10	28	22	9	10	30	-1.0%
Other	24	30	0 11	13	16	28	29	2.0%
Total	4,495	4,360	4,652	4,853	4,976	4,235	4,909	1.0%

\* Non-urgent is defined as all cases with an waiting list admission type, and 80% of all arranged admissions. Otherwise the case was classified as urgent

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					Year					Average Annual
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change (Days)
Medical	6.2	5.7	5.4	5.2	4.8	4.6	4.3	4.0	4.1	-0 27
Surgical - Long Stay	6.2	5.8	5.5	5.3	4.8	4.5	4.4	4.4	4.4	-0 24
Surgical - Short Stay	2.8	2.7	2.6	2.6	2.3	2.2	2.2	2.1	2.1	-0.10
Pregnancy/Birth	4.6	4.6	4.4	3.9	2.2	2.1	2.0	1.8	1.5	-0.46
Neonatal ICU	8.3	9.0	11.6	11.1	9.7	7.6	7.2	6.8	6.6	-0.42
Other	25.9	26.9	24.2	25.2	22.0	15.3	14.8	14.4	15.1	-1.83
Total	5.9	5.6	5.3	5.1	4.4	4.2	4.0	3.9	3.9	-0.28

## Table E5: Secondary urgent average length of stay (ALOS) by service: 1991/92 to 1999/00 for New Zealand

\* Urgent is defined as all cases with an acute admission type, and 20% of all arranged admissions.

Otherwise the case was classified as non-urgent

3/0%

## Table E6: Secondary non-urgent average length of stay (ALOS) by service: 1991/92 to 1999/00 for New Zealand

					Year					Average Annual
Service	1991/92	1992/93	19 <mark>9</mark> 3/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change (Days)
Medical	7.3	7.0	7.1	7.2	6.7	6.0	5.7	5.2	4.7	-0.33
Surgical - Long Stay	5.5	5.4	5.4	5.3	5.2	4.9	4.6	4.4	4.3	-0.16
Surgical - Short Stay	2.8	2.7	2.5	2.4	2.5	2.4	2.3	2.3	2.2	-0.06
Pregnancy/Birth	4.6	4.4	4.2	4.0	3.7	3.3	3.2	3.1	3.0	-0.22
Neonatal ICU	11 0	9.4	7.0	6.9	10.2	8.8	8.8	8.1	7.6	-0.20
Other	26.5	31.4	27.9	21.4	26.3	24.3	32.5	21.4	18.5	-0.83
Total	4.9	4.8	4.8	4.6	4.6	4.3	4.3	4.0	3.7	-0.14

\* Non-urgent is defined as all cases with an waiting list admission type, and 80% of all arranged admissions. Otherwise the case was classified as urgent

# Appendix F: Analysis of average length of stay (ALOS) by age

- *Table F1* contains age-adjusted national ALOS, by service, for secondary services. The corresponding numbers of inpatients by service are provided in *Table F2*. Age adjustment, in this case, implies that differences in the age composition of patients over the years are accounted for.
- Changes in age-adjusted ALOS for all cases is slightly higher than that for unadjusted ALOS, as would be expected given an increasingly elderly patient mix, with an overall decrease for age-adjusted of 0.24 days per year, compared with 0.22 days unadjusted.
- *Table F3* shows national ALOS for those aged 65 and over, by service, for secondary services. The percentage of patients 65 and over is provided in *Table F4*
- Results show that there has been an increase in the proportion of people 65 and over going into hospital, but that they are staying a shorter time in hospital. For all services, the reduction in ALOS for those 65 and over is greater than that for all patients combined, with the exception of Surgical Short Stay cases.

		Year									
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change (Days)	
Medical	6.4	60	5.7	5.5	5.1	4.8	4.5	4.2	4.1	-0.30	
Surgical - Long Stay	6.0	5 7	5.5	5.4	5.0	4.7	4.5	4.4	4.3	-0.23	
Surgical – Short Stay	2.8	2.7	2.6	2.5	2.5	2.3	2.3	2.3	2.2	-0.07	
Pregnancy/Birth	4.6	4.4	4.3	4.0	3.6	3.3	3.2	3.1	3.0	-0.22	
Neonatal ICU	8.6	9.1	9.0	8.6	10.9	9.0	8.7	8.4	8.1	-0.07	
Other 🔨	27.8	30.2	26.5	24.4	24.0	20.8	26.9	18.7	17.1	-1.33	
Total*	5.7	5.4	5.2	5.0	4.7	4.4	4.2	4.0	3.9	-0.24	

## Table F1: Secondary age-adjusted average length of stay (ALOS) by service: 1991/92 to 1999/00 for all New Zealand

Adjusted for differences in case-mix over the period.

		Year								
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change
Medical	123,333	126,390	137,062	144,178	156,786	155,728	161,957	165,735	174,004	6,368
Surgical - Long Stay	114,324	116,044	124,567	124,331	122,506	123,492	127,095	126,812	130,502	1,687
Surgical - Short Stay	41,885	41,004	41,876	41,313	37,321	35,067	34,386	34,609	34,168	-1,188
Pregnancy/Birth	69,762	70,596	71,909	73,173	81,314	79,191	78,278	74,794	79,715	1,186
Neonatal ICU	8,196	8,516	8,309	8,474	5,446	5,394	5,569	5,861	6 543	-386
Other	1,054	1,057	1,201	1,393	1,223	1,885	2,699	2,286	2,155	193
Total*	358,554	363,607	384,924	392,862	404,596	400,757	409,984	410,097	427,087	7,860

**Table F2**: Secondary number of inpatients by service: 1991/92 to 1999/00 for all New Zealand

Table F3: Secondary average length of stay	(ALOS) by service for	r those a	ged 65+: 1991/92
to 1999/00 for all New Zealand			

					Year	<u>(</u> 0.				Average Annual
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change (Days)
Medical	8.7	8.1	7.6	•7.3	6.8	6.5	6.0	5.5	5.4	-0.41
Surgical - Long Stay	9.0	8.6	8.0	78	7.3	6.8	6.5	6.3	6.2	-0.37
Surgical - Short Stay	3.4	3.3	3 0	2.8	3.0	2.9	3.0	3.4	2.9	-0.03
Other	34.0	36.4	31.7	28.5	26.8	22.6	31.1	20.2	18.2	-1.97
Total*	8.7	8.2	7.7	7.5	7.0	6.6	6.3	5.8	5.6	-0.39

\* Adjusted for differences in case-mix over the period.

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## Table F4: Secondary percentage of inpatients by service for those aged 65+: 1991/92 to 1999/00 for all New Zealand

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					Year					Average Annual
Service	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Change
Medical	36.7%	37.7%	37.4%	38.4%	39.0%	40.6%	40.8%	41.1%	42.8%	0.7%
Surgical - Long Stay	28.5%	29.1%	29.4%	29.5%	30.7%	31.4%	31.0%	32.0%	32.9%	0.5%
Surgical - Short Stay	17.5%	18.5%	18.5%	18.4%	16.0%	15.3%	14.4%	13.8%	13.6%	-0.7%
Other	55.0%	56.5%	60.7%	65.0%	72.1%	69.4%	74.0%	72.7%	73.6%	2.6%
Total	30.6%	31.5%	31.6%	32.3%	33.2%	34.3%	34.5%	34.9%	36.3%	0.7%

Ref. No.: 20022974

MINISTRY OF HEALTH - 8 OCT 2002 DISPATCHED



## HEALTH REPORT

Subject: SIZE OF NEW SOUTHLAND HOSPITAL

 Date:
 8 October 2002
 File Ref: HC06-23-6, 2 ~

Attention: Hon Annette King (Minister of Health)

Priority:	Routine	Semi-Urgent	Urgent	24 Hour
			M	

## EXECUTIVE SUMMARY

- 1. There have been recent reports in the media suggesting that the new Southland Hospital is too small. The initial report, based on a Hospital Advisory Committee meeting, suggested current bed numbers over a fourteen month test period were inadequate about a third of the time. There are concerns Southland District Health Board (SDHB) will manage this by "farming patients out to the private sector". This briefing outlines the basis for the size of the new facility.
- 2. In July 2002 Ministers approved a new hospital for Southland, at SDHB's Kew campus, at a total cost of \$69.7 million. The construction of this facility began in August 2002.

## Bed Model Analysis

3. The Ministry of Health completed bed model analysis for Southland's projected bed needs in the future in 2000. Bed numbers for medical, surgical, pregnancy/birth (ante/postnatal and delivery), neonatal ICU, and assessment, treatment and rehabilitation (AT&R) services have been projected based upon the model developed for the Wellington area to determine secondary care inpatient bed requirements in 2005/06 and 2015/16. Models have also been developed for new hospitals at Waitemata, and Christchurch Women's.

## 4. The Ministry model assumes changes in required bed numbers due to:

- efficiency adjustments
- demographic change
- changes in service volumes independent of demographic growth

- changes in day-case treatment and average length of stay (ALOS).
- 5. The following factors are not included explicitly in the final bed model:
  - benchmarking against any international ALOS and percentage day case rates
  - any shifts to the private sector
  - any changes in admission practices, such as integrated care and possible moves towards more treatment being provided in a primary care setting.
- 6. An important point to note from the bed model analysis is that the total number of beds needed is projected to fall by 25 from 2005/06 to 2015/16. This suggests the new hospital will meet a relative peak in demand soon after completion and demand will reduce over time.

## Process for Finalising Bed Numbers

- 7. Based on its projections and analysis, the Ministry of Health believes there will be sufficient space in the new Southland Hospital to allow SDHB deliver the services its population needs. The total area for the new hospital is more than 27,000 square metres, including more than 20,000 square metres in the new Clinical Services Block.
- 8. SDHB tested the Ministry's model and agreed the proposed bed numbers will meet its need. In late 2000, the proposed bed configuration for the new hospital was fully endorsed by the senior nursing team and nursing management at Southland Hospital. The total inpatient bed numbers in the Ministry's bed model analysis was also adopted by the hospital's senior medical staff in late 2000, although they did express reservations at the time about the hospital's ability to manage seasonal peaks associated with tourist numbers.
- 9. The total number of beds available will reduce from the current level of 199 to 185 in the new hospital. This is broken down in more detail in Appendix 1. The number of beds in the Southland Region is also noted.

## Managing Winter Peaks

10. The winter peak occupancy rate at Southland Hospital lasts between eight to ten weeks every year. In June this year, three Southland Hospital patients were sent to a private facility for one night. The DHB is considering how best to use all the available beds in the region during the peak season, because it does not believe building an infrastructure that is only fully utilised for eight to ten weeks of the year is a good investment.

## Effect of Primary Care Strategy

- 1. The Primary Health Care Strategy is aimed at keeping New Zealanders well in their communities. This is expected to result in a reduction in the number of people being admitted to hospitals.
- 12. An estimated 30 percent of hospital admissions for those under 75 could be avoided around the country, largely through early access to primary health care. When the Strategy is implemented there should be an estimated 60,000 fewer hospital admissions per year.

13. A Primary Health Organisation, the key delivery mechanism for the Primary Health Care Strategy, is expected to be up and running in rural Southland early next year.

## Comparisons with Hawkes Bay

- 14. A recent media query inferred that the bed numbers in Hawkes Bay (as a result of the closure of Napier Hospital) were also too few and a repeat of this would occur in Southland.
- 15. Southland Hospital differs from Napier. In Hawke's Bay there were two buildings consolidating on one main site, whereas Southland is a redevelopment and investment of \$69.7 million.
- 16. Plans for the reconfiguration of hospital services in Hawke's Bay began in 1993, under a previous government. Shareholding Ministers gave their public support to the regional hospital strategy in Hawke's Bay in June 1995.

## RECOMMENDATIONS

- 17. The recommendations are that you:
  - (a) note the contents of this briefing.

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Gordon Davies Deputy Director-General DHB Funding and Performance

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**MINISTER'S SIGNATURE:** 

DATE:

2/6/02

Name	Position	Te	elephone	Suggested
Shirley Smith	Account	496-2562	After Hours s 9(2)(a)	First Contac 1st
Gordon	Manager Deputy	496-2257	Pager	2nd
Davies	Director-		s 9(2)(a)	2110
Keith Fraser	Account	496-2282	973-3221	3rd )
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osed u	nderthe	officia		
	nderthe	officia		

### Contact for telephone discussion (if required)

## SOUTHLAND HOSPITAL BED NUMBERS

	Current	New Hospital
AT&R	36	30
Children's Ward	14 + 4 acute assessment	13 + 4 acute assessment
Critical Care	7	6
Maternity	15 + 5 delivery rooms	14 + 4 delivery rooms
Neonatal	5	5
Mental Health	23	23
Surgical	42 + 4 flexibeds	42
Medical	42 + 2 flexibeds	38
Emergency Department (short stay observation)	0	6
	184 + 9 + 6	177 + 8 - 14

Note: Approval was given for a 156 bed facility (excluding Mental Health beds). The total beds here (excl the 4 + 4 - acute assessment and delivery rooms) are 154. It was not possible to reduce the Capital Cost and Grid Size unless 8 beds were removed. This leaves a total of 154 beds.

+9+6	177 + 8
	20
	22
	227



Corporate Office Southland Hospital, Kew, Invercargill, New Zealand Telephone 03-218 1949 Fax 03-214 2496

Correspondence to be addressed to the Corporate Office

-3, 98

00 11 06 09 09

MINISTRY DE DEALTH

1 November 2000

Dr Colin Feek Chief Medical Adviser Ministry of Health P O Box 5013 WELLINGTON

Dear Dr Feek

#### RE: BED NUMBERS FOR SOUTHLAND'S NEW HOSPITAL

Thank you for your letter dated 17 October 2000.

I am now able to advise that the number of 156 beds, excluding Mental Health, as projected by Robert Lynn's analysis for 2005/06 has been adopted by both the senior nursing and medical team.

Please find attached a copy of their respective letters for your information.

Yours sincerely

Helen McKenzie Facilities Project Manager



Andrew Duncan, HMD, Ministry of Health Paula Bearsley, Treasury DO:CM



## Memorandum

File No:

TO:	Mary Bonner, Chief Executive Officer
FROM:	Dale Oliff Director of Nursing & Midwifery
DATE:	1 November 2000
SUBJECT:	Proposed Bed Configuration

As Southern Health staff prepare for the future service provision and delivery of health care the proposed configuration and bed numbers have been explored, options and issues discussed with Nurse Unit Managers and senior nursing personnel.

The proposed number of beds of one hundred and fifty six (156) is adequate for the provision of service delivery. The proposal is therefore fully endorsed by the senior nursing team and nursing management at Southland Hospital.

PP Dale Qliff

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## Memorandum

TO:	Mary Bonner Chief Executive	N
FROM:	Murray Fosbender, Medical Advisor Peter Christmas, Medical Advisor Ian Shaw, Medical Advisor	
DATE:	1 November 2000	
SUBJECT:	PROPOSED INPATIENT BED NUMBERS FOR A NEW HOSPITA	٩L

The total inpatient bed numbers as provided in the Ministry of Health Bed Model Analysis dated 20 October have been adopted by the Senior Medical Staff.

However we take this opportunity to express our reservations about our ability to manage seasonal peaks (in particular the high level of tourist numbers in the Lakes District and Te Anau areas) with the projected bed number of 156.

There are also concerns regarding the rise in practice of defensive medicine and the effect this will have on the length of stay related to the bed numbers

P Christmas For Medical Advisors

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