

Rob Greenaway & Associates

**Proposed Manapouri
Tailrace Amended
Discharge:
Recreation and Tourism
Assessment of Effects**

Prepared for Meridian Energy Ltd



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www.greenaway.co.nz

Proposed Manapouri Tailrace Amended Discharge

Recreation and Tourism Assessment of Effects

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1 Summary

This report assesses the effects of Meridian Energy's Manapouri Tailrace Amended Discharge (MTAD) proposal on the recreation and tourism values of Lakes Te Anau and Manapouri, the Lower Waiau River and Doubtful Sound/Patea. The Manapouri Power Station (MPS) currently operates at a set point maximum discharge of 485 m³/s. Meridian is seeking to increase the maximum tailrace discharge limit to 550 m³/s. Of interest to recreation and tourism are the potential effects on:

- Surface water currents and wave formation in Deep Cove and Doubtful Sound,
- Lake levels in Lakes Te Anau and Manapouri, and
- Flows in the Lower Waiau River.

There will be no changes to the hydro management of the Upper Waiau River, and changes to the flow regime in the Waiau Arm will be insufficient to be noticed by any recreational visitor.

1.1 Lakes Te Anau and Manapouri, and the Lower Waiau River

Recreation and tourism effects of the proposal on these three settings will depend on ecological and landscape effects, as there are no direct effects on recreation. That is, the proposed changes will not affect access or any other factor which would prevent existing recreation activities from being undertaken, or alter the nature of the activities. The Lakes will have a greater tendency towards their existing middle lake level ranges, and the consequent reduction in the number of high range events may increase weed growth on some beaches. The proposed Lower Waiau River flow regime may modify flushing effects on didymo, and this may have consequential effects on the angling amenity. The assessment of effects for these parts of the study area is therefore dependent on the MTAD Landscape, River Ecology, Lakeshore Vegetation and Lakeshore Sediments Reports.

1.2 Deep Cove and Doubtful Sound

Three potential effects of the MTAD proposal, without mitigation, on recreation and tourism in Deep Cove and Doubtful Sound are apparent:

- **Sea kayakers:** Periodic increased surface water velocity and consequent changes to the wave characteristics in Deep Cove, and further out into Doubtful Sound. This potentially increases the risk of capsizing and exhaustion on the return leg of an excursion.
- **Deep Cove Outdoor Education Trust (DCOET):** Periodic reduced opportunities for taking boats out of Wanganella Cove to Helena Falls or the north side of the fiord owing to changed wave characteristics, and increased risk as a result of greater surface water velocity in the event of a boating incident. Existing safety management protocols with regard to deciding whether to use boats outside Wanganella Cove, considering weather and water conditions, should retain the 'risk status quo' in terms of whether boats are exposed to dangerous seas. Coincidental existing issues – the loss of the Helena Falls Track and the need of the Trust to review the status of its safety vessel – highlight issues with the status quo, which when addressed will reduce the level of risk exposure for the Trust generally and have beneficial outcomes in relation to the MTAD proposal.
- **Moored vessels:** Although measurements reported in the MTAD Marine Surface Water Report showed no changes to the characteristics of the Wanganella Cove counter current, there were anecdotal reports of an increased offshore 'push' against vessels attempting to berth, or already berthed, in the Cove during the high flow

trials. This effect has been difficult to quantify as it is reported to also exist under quite low discharge patterns (~ 200 m³/s). Anecdotally the effect is stronger further from Brasell Point. Further review of the high flow trial data was requested of the author of the MTAD Marine Surface Water Report to confirm the scale of this effect (Appendix 3, Request 1). The review concluded that there is no evidence in the data measured during the second high flow trial, or in the months following, that the current speeds at Meridian wharf or elsewhere in Wanganella Cove increase substantially when the tailrace discharge exceeds the present operational limit of 485 m³/s. Current speed is expected to increase with tailrace discharge, but only in an approximately proportional manner. For example, an increase in tailrace discharge of 13%, from 485 to 550 m³/s, should lead to an increase of approximately 13% in the current speeds in Wanganella Cove. However, given that the current speed in Wanganella Cove is in the order of 0.1 m³/s, the expected velocity increase is in the order of 0.01 m³/s, which is too small to be detected against background variability. Should the MTAD discharge have a direct recognisable influence on this phenomenon, the potential effect on recreation and tourism would relate to minor increased wear (chafe) on mooring equipment, very minor increased risk of an accident when berthing, and the need for increased surveillance of mooring lines when boarding passengers.

Potential adverse effects on sea kayaking (guided and freedom) and DCOET, without mitigation, are considered to be minor in dry years (1 year in 5.5) and more than minor in wet years (1 year in 6) and in typical years (1 year in 1.5).

Recommendations to mitigate these effects relate to:

- Providing and enabling access to information services,
- Developing a monitoring and review programme in consultation with Fiordland Wilderness Experiences and DCOET in relation to changes to the amenity of the coastal environment as a result of MTAD, and reviewing the scale of necessary mitigation over time.

It is expected that the MTAD proposal will change the background water conditions in the fiord. Prior to the development of the MPS, the current recreational uses of the setting did not exist to anywhere near their current scale – Doubtful Sound would otherwise be the same as any other fiord, bar Milford. That is, it would be infrequently visited for recreation or tourism purposes, and even more rarely by individuals in small boats, such as kayaks. The existing discharge patterns represent a baseline environment to which skippers, crew and recreational boat users have become accustomed – many may have not known anything different. The MTAD proposal represents a shift in that baseline and it will take some time for users of the fiord to adjust.

2 Introduction

Meridian Energy Limited (Meridian) is seeking resource consents to increase the maximum allowable discharge from the tailrace of the existing Manapouri Power Station to Deep Cove in Doubtful Sound. The MPS, New Zealand's largest single hydroelectric power station, harnesses water from Lakes Manapouri and Te Anau, and the Mararoa River, to generate electricity under the Fiordland mountains at West Arm, Lake Manapouri.

The current maximum instantaneous discharge limit from the tailrace of the Manapouri Power Station into Deep Cove is 510 m³/s. In order to avoid breaching this limit, the station currently operates at a set point maximum discharge of 485 m³/s. The theoretical maximum discharge through the tailrace, however, is over 660 m³/s. Meridian is seeking to increase the maximum set point tailrace discharge limit to 550 m³/s.

This proposal, the Manapouri Tailrace Amended Discharge (MTAD) proposal, will require new resource consents in addition to those that already control the station's operation. To achieve this, Meridian will need to vary the manner in which it utilises the water available to it from the natural inflows to the power scheme. The proposal would therefore involve the following components:

- Increasing the maximum rate at which water is discharged through the Manapouri Power Station to Deep Cove;
- Changes to the pattern of lake level fluctuations for Lake Manapouri and Lake Te Anau; and
- Changes to the discharge of water released through the Manapouri Lake Control structure to the Lower Waiau River.

These activities would only be possible when natural conditions permit, in particular during high lake inflows. They would be carried out in a manner that ensures compliance with the Gazetted Guidelines that regulate the controlled fluctuations of Lakes Te Anau and Manapouri and all other existing consent conditions, other than the current 510 m³/s maximum tailrace discharge limit which the MTAD proposal seeks to change.

Developments such as MTAD require an evaluation of effects under the Resource Management Act (RMA). Such evaluations need to be based on a wide range of issues including the potential effects on the physical, biological, social, and cultural environment. This report provides an assessment of the effects of the MTAD proposal on the recreation and tourism values of Doubtful Sound, the Upper and Lower Waiau Rivers, and Lakes Te Anau and Manapouri.

2.1 Study aims

The aims of this study are to:

- Describe and review the recreation and tourism values within the study area,
- Review the effects of the MTAD proposal on these values,
- Identify the potential for avoiding, remedying or mitigating any adverse effects, and
- Detail any monitoring required to assess the scale of effects over time.

2.2 Method

Literature review, Web review, site visits, consultation and stakeholder interviews formed the basis of the description of the study area's values. Base data are presented in Appendices 1, 2 and 3.

Sites visits have included kayaking in Doubtful Sound with Bill Patterson of Fiordland Wilderness Experiences, taking DCOET dinghies into Deep Cove and the tailrace discharge, boat trips in the Sound with Real Journeys and Fiordland Ecology Holidays and jet boating the lower Waiau River to the Monowai power station. Discussions with all operators were associated with those site visits, in addition to consultation meetings and formal interviews. The latter are summarised in Appendix 1 and focus on the effects of the Manapouri tailrace discharge on boating activities, including those of DCOET, Fiordland Wilderness Experiences and skippers of larger vessels.

Site visits to Deep Cove were undertaken with Tom Sawyer, author of the MTAD report *Assessment of Navigation and Marine Safety in Doubtful Sound and Deep Cove* (2009), attached as Appendix 8. Interviews of potentially affected parties were carried out by Mr Sawyer and the author of this report, and appear in both assessments. This and Mr Sawyer's report were prepared in parallel and although each has different foci (this assessment includes a wider study area), conclusions relating to effects on Deep Cove and Doubtful Sound have been reached in collaboration.

The description of the existing and proposed lake, river and fiord flow regimes was drawn from technical assessments completed by NIWA and the Cawthron Institute (MTAD High Flow Trial Report) and URS (MTAD Hydrology Report). Additional modelling of seasonal discharge patterns was provided by Meridian (Appendix 9).

2.3 Study area definitions

The study area, for the purposes of this study, is defined as having three components (Figure 1):

- Deep Cove and Doubtful Sound,
- Lake Manapouri (including the Waiau Arm) and Lake Te Anau, and
- The Lower Waiau River.

These areas have been chosen as separate areas to reflect the different effects of the MTAD proposal. Other key components of the scheme are also shown in Figure 1, including the Te Anau Lake Control Structure (TLC) and Manapouri Lake Control Structure (MLC).

The Upper Waiau River it is not affected by the proposed changes, and therefore the report does not review this waterbody in detail.

2.4 Author's experience

Rob Greenaway is a consultant recreation and tourism planner with twenty years professional experience. He is an experienced sailor, being the son of a boat builder (and cabinetmaker), an experienced coastal and blue water cruiser, and recently the owner of a 10 metre keeler. He is a grade 3 white water kayaker and has had reasonable sea kayaking experience.

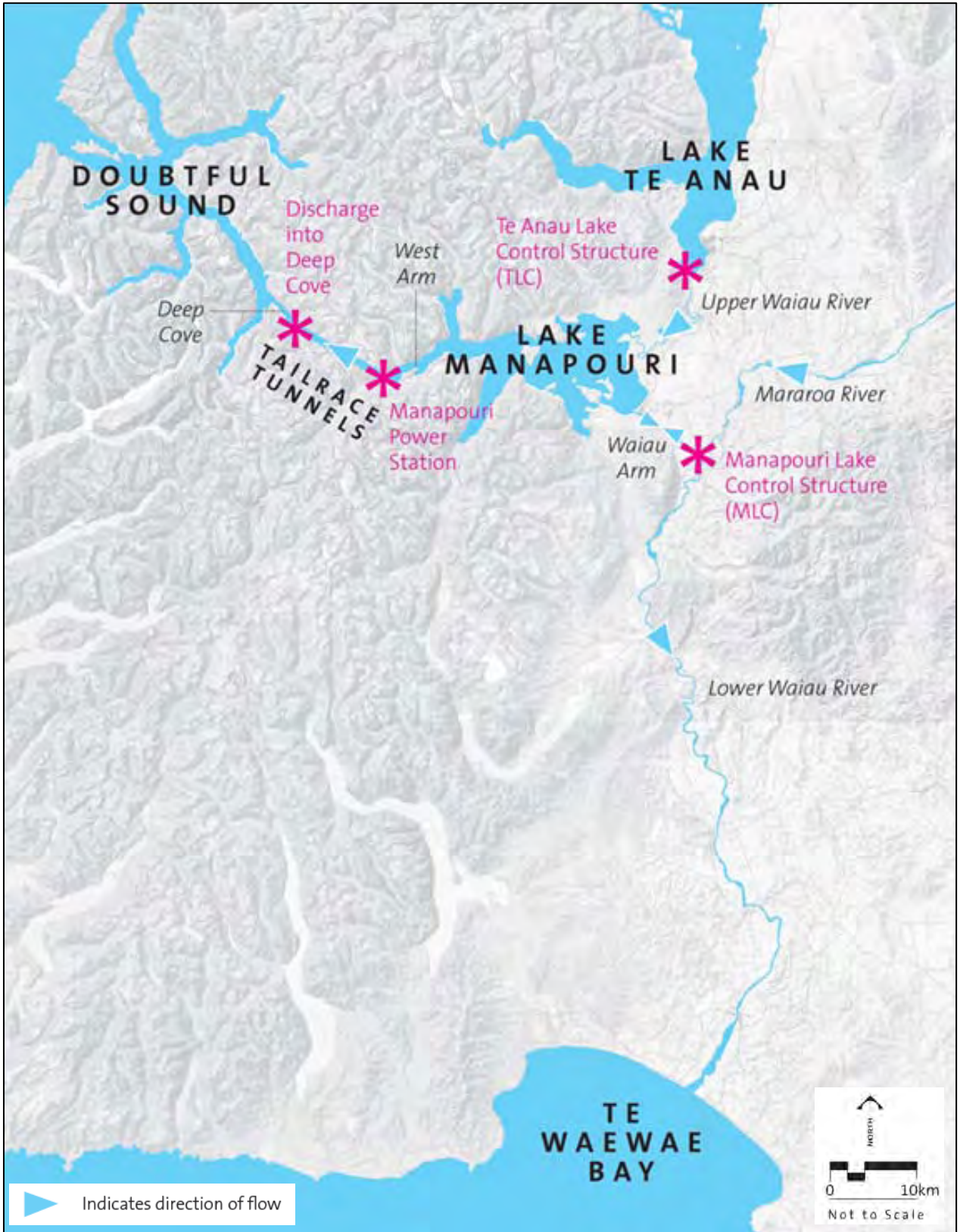


Figure 1: Study area components. Prepared by Boffa Miskell for Meridian

3 Project description

A brief summary of the MTAD proposal is given in Section 2 of this report. A full description of flow regime changes is provided in the MTAD Hydrology Report and a full description of high flow conditions on currents and waves in Deep Cove is in the MTAD High Flow Trial Report. For the purposes of this assessment, a summary of relevant project details is given here.

While there will be slight changes to the flow regime in the Waiau Arm of Lake Manapouri¹, these will have no effect on the recreation amenity in the locale, and a full description of the proposed flow regime is also not given here.

Proposed water level changes are unlikely to have any direct influence² on the recreation amenity of Lakes Manapouri and Te Anau. However, as the lakes are nationally significant recreation and tourism settings, a complete analysis is provided in this assessment. While the Lower Waiau River is not a nationally significant recreation setting – and the MTAD flow regime will not have any direct effects on recreation amenity on the River – its management for recreation and tourism is an important consideration for Meridian, and more detail is therefore provided.³

3.1 Historic and current operating regimes

The Manapouri Power Scheme has been operated under a number of different regimes. Four phases can be identified:

- *Start Up (1969 – 1972)*. The first four generators began operating in September – October 1969, and it was not until September 1971 that all seven were operational. Power output increased throughout this period as the power station turbines and generators were progressively constructed and commissioned.
- *No Minimum Flows (1972 – 1996)*. From 1972 the maximum tailrace discharge was 474 m³/s, allowing a peak electricity generation of 585 MW. A variety of small engineering improvements were carried out, including completion of the two lake control structures, removal of rock from the tailrace channel, and installation of the Mararoa Cut. From late 1977 the station was operated under the lake level Operational Guidelines developed by the Lakes Guardians, verified in practice, and incorporated into the Manapouri-Te Anau Development Act (MTADA) from 1981.

¹ Mean flow in the Waiau Arm towards Lake Manapouri will be 7.0 m³/s, an increase of 0.4 m³/s. There will be ~ 46 flow reversals per year in the arm, which is no change from the existing regime. There will be a slight increase of 0.2 days per year in the average duration of flow events towards Lake Manapouri. The average duration of flow events towards MLC will be 5.7 days per year, a reduction of 0.5 days / year. Long residence time events in Waiau Arm (when flow is between -8 m³/s and + 8 m³/s for 5 days or more) will remain unchanged at 10 per year.

² Direct influence or direct effect refers to some change in recreation amenity which is not consequent on ecological or landscape values. For example, a changes to access and the physical ability to carry out a recreation pursuit in the setting are direct effects. These excludes effects which are defined by ecological parameters, such as the number of crayfish able to be caught – the assessment of which is beyond this technical report. However, should other relevant assessments indicate a relevant ecological or landscape change, then these influences will be referenced in this report.

³ It is worth noting that the Upper and Lower Waiau Rivers are treated as entirely separate recreation settings. They feature different flow regimes and ecologies, and landscape and recreation values. They are essentially different waterbodies. It is an ancillary recommendation of this analysis that any future recreation studies of the Waiau catchment treat the Upper and Lower Waiau Rivers as different locations and segregate all data. For example, the national angler surveys (NAS) carried out periodically by the New Zealand Fish and Game Council have in the past treated the two rivers in different ways. The first study in 1984 (Tierney et al 1984) referred to the 'Waiau River' but presented only angling data for the Lower Waiau River. The 1994/96 study (Unwin and Brown 1998) aggregated all data for the Upper and Lower Rivers into the one river definition. The 2001/02 study (Unwin and Image 2003) considered the Upper and Lower Rivers as reaches of the one river, and while data relating to each are partly segregated in one part of the report, the main data table treats the two rivers as one. If a 10,000 angler day threshold is used as an indicator for potential national importance for recreation of a waterbody (as in MfE 2004a), the Lower and Upper Waiau Rivers fall below this threshold, according to the 2001/02 NAS (Unwin and Image 2003). If the data for the two different rivers are combined, as the NAS does, then the threshold is passed. However, management of the values of the two Rivers is now a completely separate exercise. The Environment Southland Regional Water Plan (2008) refers to the Upper and Lower Waiau Rivers, but uses 'Waiau River' as a collective, which is confusing. Fish and Game Southland note that, "The Waiau is really two rivers."

These guidelines required that any turbid water over 30 NTU⁴ in the Mararoa River had to be discharged to the Lower Waiau River.

- *Minimum Flows (1996 – 2002)*. From November 1996, the MPS was operated under the resource consent conditions granted under the RMA. The effective maximum tailrace discharge was still 474 m³/s, although resource consent conditions permitted a maximum discharge of 510 m³/s. Minimum flows of 12 – 16 m³/s through the Manapouri Lake Control (MLC) structure to the Lower Waiau River were also required by resource consent conditions, and the gazetted lake level Operational Guidelines remained in force.
- *Existing regime (2002 – present)*. From May 2002 the Second Manapouri Tailrace Tunnel (2MTT) became operational, and the tailrace discharge could, for the first time, safely reach a maximum consented level of 510 m³/s, although it has been limited to ~ 485 m³/s in order to avoid breaching the 510 m³/s instantaneous maximum. The resource consent conditions and the gazetted lake level Operational Guidelines remain in force. Small changes have occurred as a result of the half-life refurbishment of the power station generators which commenced in 2002, and has recently been completed. This involved a significant upgrade of the electrical components of all seven of the station's generators, increasing their output to 121.5 MW. In addition, a third transmission circuit from Manapouri to Invercargill was added. As a result of these upgrades, the installed electricity generation and transmission capacity for the power station is now potentially 840 MW, a 16% increase from the previous 730 MW capacity.

The current operating regime is described as the 'existing regime', which is reviewed in the URS report *Manapouri Tailrace Amended Discharge Project (MTAD): Hydrology Assessment*. The data presented here in relation to the MTAD proposal are summarised from that report and relate to effects of the proposed discharge of interest to recreation and tourism.

3.2 Proposed MTAD operating regime

The MTAD proposal is to increase the maximum permitted discharge through the tailrace from an operating maximum of 485 m³/s to an operating maximum of 550 m³/s. Occasional short-term spikes above 550 m³/s would occur due to frequency-keeping requirements that are beyond Meridian's control, and it is proposed that these would be excluded from determining compliance with the 550 m³/s tailrace discharge limit. Normal frequency-keeping will mean that the output from the station will vary around 810 MW by 15 to 20 MW, and the tailrace discharge will vary by 10 to 15 m³/s. The variations are both over, and under, the generation set-point, and these variations would cancel out over time.

Large frequency 'events' (as opposed to frequency-keeping) can lead to large increases in the tailrace discharge, although these increases are of short duration (5 – 10 minutes). Although increases of 50 m³/s could occur six times a year, only one such event occurred in the two years 2005 and 2006. A person on the water in Deep Cove for an hour would have a 0.068% (around 1 in 1500) chance of encountering a 10 minute, 50 m³/s increase in discharge if they occurred six times a year.

Increases greater than 50 m³/s are very rare, occurring no more than once every two or three years. The most extreme events could lead to an increase in station output of 150 MW, or more, and an increase in tailrace discharge exceeding 100 m³/s. Such events are very uncommon. The national grid system operator's guideline is for no more than one every five years. None occurred in 2005 or 2006. If such an extreme event occurred when the tailrace discharge was discharging at

⁴ A Nephelometric Turbidity Unit is the unit used to measure turbidity in water.

more than 500 m³/s the discharge could increase to the station limit of 665 m³/s. However, such a coincidence of events is very unlikely (~1 in 50 years). A person on the water in Deep Cove for an hour would have a 0.0023% (around 1 in 44,000) chance of encountering a 10 minute increase to 665 m³/s, if they occurred once every five years.

In addition, the MLC flood rules would be changed to allow a maximum tailrace discharge of 550 m³/s when Lake Manapouri is above its maximum control level (178.6 m) while maintaining the other existing flood release characteristics. All other aspects of the operation of the power scheme would remain unchanged, including the other resource consent conditions, gazetted lake level Operational Guidelines, and all other agreements that Meridian has with stakeholders.

3.2.1 Lake control

The proposed MTAD regime would result in changes to the fluctuations in the level of Lake Manapouri. As can be seen from Table 1, there would be an increase of between 26 and 33 days in the amount of time that the Lake is in the 'main range'. As a result, the Lake would spend less time in the high and low ranges. It can be seen that in wet and typical years, the increase in time the Lake is in the main range is mainly at the expense of time it was previously in the high range, while the reverse holds for dry years when the model attempts to stop the lake falling into the low range.

Table 1: Percentage time Lake Manapouri is in operating ranges in MTAD regime compared with existing regime

	High range (> 178.6 m) (change in days/year)	Main range (176.8 – 178.6 m) (change in days/year)	Low range (<176.8 m) (change in days/year)
Wet years	19.9 % (- 27 days)	77.4 % (+ 33 days)	2.7 % (- 6 days)
Typical years	6.0 % (- 14 days)	86.2 % (+ 26 days)	7.7 % (- 11 days)
Dry years	1.6 % (- 6 days)	77.1 % (+ 32 days)	21.3 % (- 26 days)

Figure 2 presents a hydrograph model for a typical year for levels on Lake Manapouri, showing decreases in the upper ranges and increases in the lower ranges.

The proposed MTAD regime would also result in some changes to the fluctuations in the level of Lake Te Anau, although these are somewhat smaller than those at Lake Manapouri. As can be seen from Table 2, there would be a small increase of between 8 and 14 days in the amount of time the Lake is in the 'main range'. In wet years this is primarily at the expense of time previously spent in the 'high range', while for typical and dry years it is the 'low range' that gives up more time.

Table 2: Percentage time Lake Te Anau is in operating ranges in MTAD regime compared with existing regime

	High range (> 202.7 m) (change in days/year)	Main range (201.5 – 202.7 m) (change in days/year)	Low range (< 201.5 m) (change in days/year)
Wet years	26.8 % (- 6 days)	72.4 % (+ 9 days)	0.8 % (- 3 days)
Typical years	11.0 % (- 3 days)	86.2 % (+ 8 days)	2.9 % (- 5 days)
Dry years	3.4 % (- 1 days)	87.9 % (+ 14 days)	8.7 % (- 13 days)

Figure 2: MTAD Lake Manapouri levels during a typical year (1990)

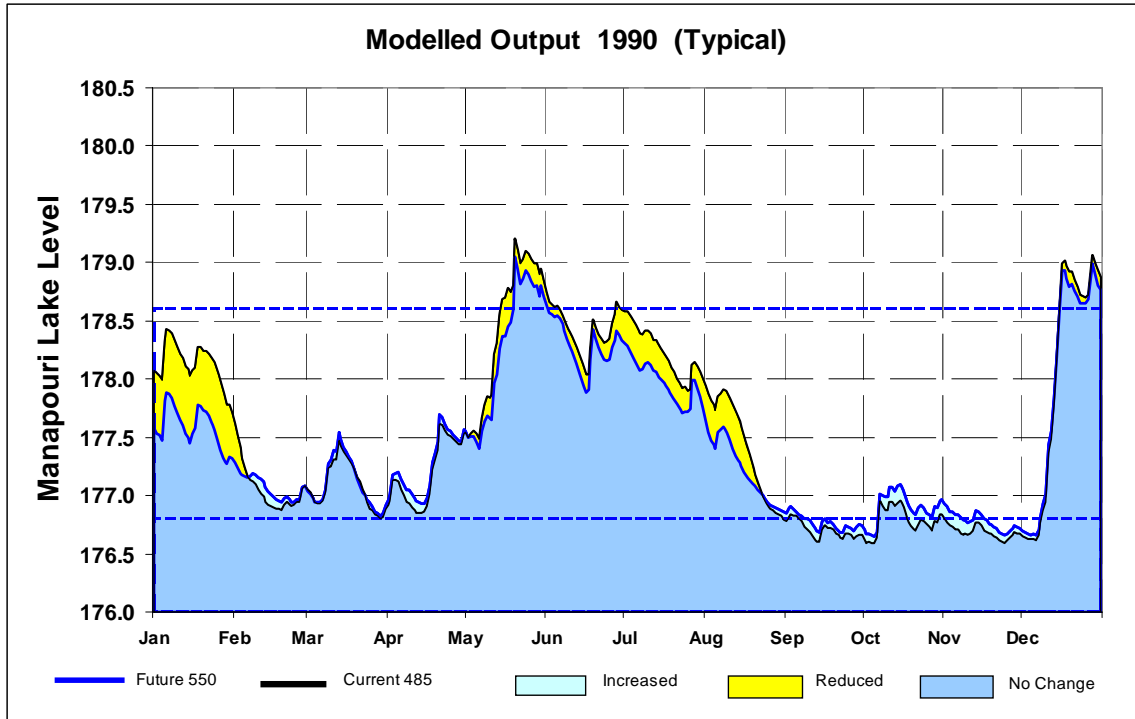
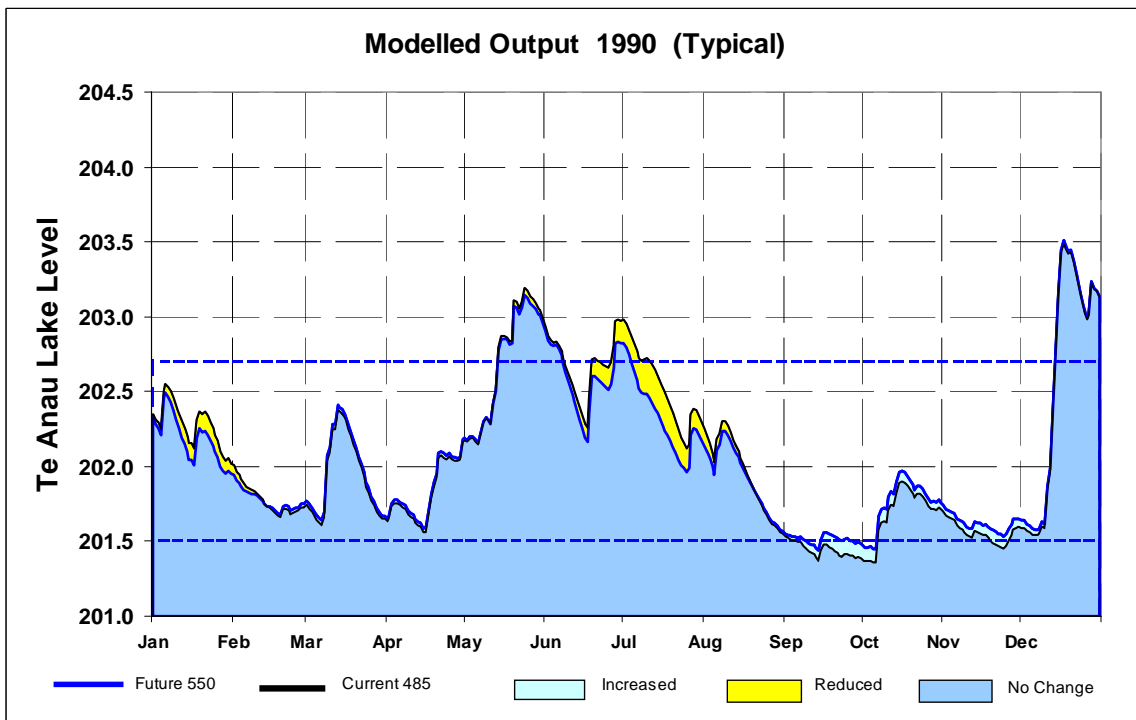


Figure 3 presents a hydrograph model for a typical year for levels on Lake Te Anau, similarly to Lake Manapouri showing decreases in the upper ranges and increases in the lower ranges (range limits shown in dotted blue lines).

Figure 3: MTAD Lake Te Anau levels during a typical year (1990)



3.2.2 Lower Waiau River

Under the MTAD flow regime, modelled for 1947-2006 flows, there would have been on average 25.0 flow events per year that exceeded the minimum flow levels in the Lower Waiau River, which is an increase of 1.3 events per year over the existing regime (Table 3). Minor flows, freshes and small floods would increase slightly in frequency, while other flow events would decline slightly or remain static. There is only a very minor increase in the frequency and duration of minimum flows.

Table 3: MLC average discharge event characteristics (1947 – 2006) in MTAD regime

Event	Magnitude	Frequency	Change from existing	Duration	Change from existing
Minimum flows	12 – 16 m ³ /s	25.0 / year	+ 1.3	10.2 days	- 0.1
Minor flows	>16 – 49 m ³ /s	9.4 / year	+ 0.3	1.1 days	0.0
Freshes	50 – 149 m ³ /s	12.7 / year	+ 1.3	3.6 days	+ 0.1
Small floods	150 – 299 m ³ /s	1.7 / year	+ 0.2	11.1 days	- 0.4
Moderate floods	300 – 599 m ³ /s	0.9 / year	- 0.3	26.4 days	- 1.2
Significant floods	600 – 999 m ³ /s	0.2 / year	0.0	53.6 days	- 7.3
Large floods	>1000 m ³ /s	0.0 / year	- 0.1	85.0 days	- 8.8
TOTAL		25.0 / year	+ 1.3	4.4 days	-0.8

Average length for all events greater than minimum flows under MTAD would be ~ 4.4 days, a slight increase from the existing regime, resulting mainly from the decreased length of significant flood events. Other event durations would change very little.

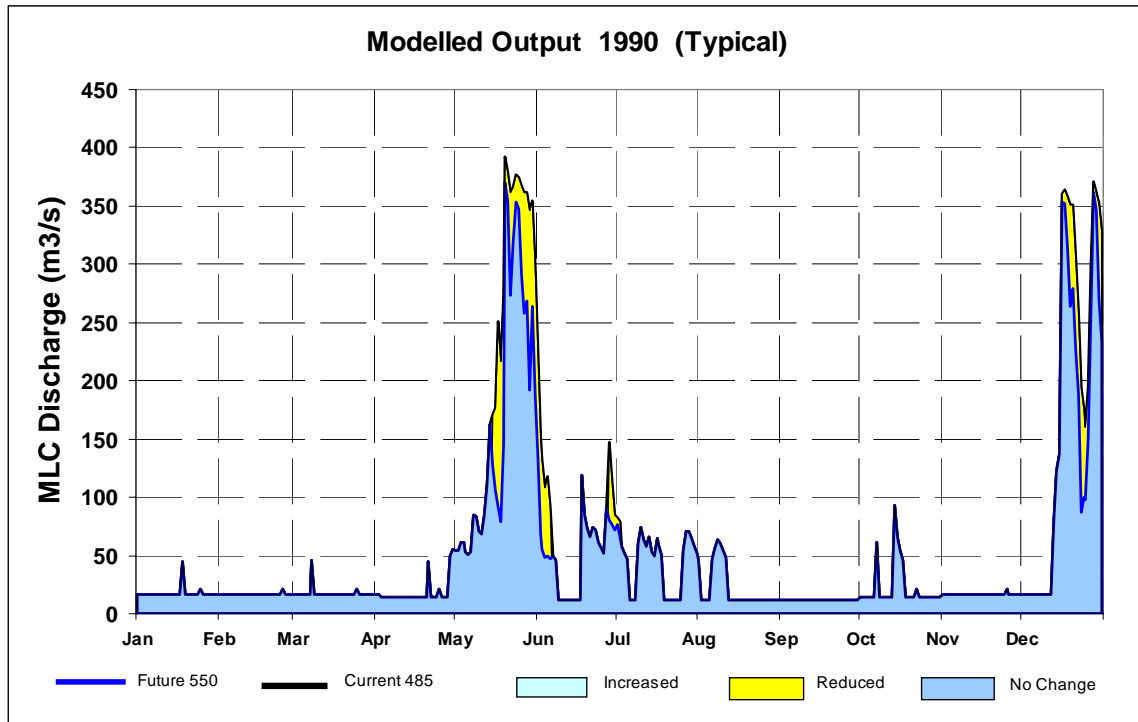
Modelling shows that some MLC discharge events would have reduced duration, particularly during the latter stages as flows are declining. This effect is mainly seen on discharge events that under the MTAD regime would have peaked at 200 m³/s or greater (but not large floods of >1000 m³/s).

The MTAD regime will result in some changes to the seasonal pattern of MLC discharge. In typical years the spring freshes will be reduced, with less change to daily discharges at other times of the year, reflecting the fact that the existing minimum discharge flows will not be changed under the MTAD regime. In a dry year there will be very little change to the discharge pattern – certainly insufficient to be noticed by any recreational user.

In wet years the pattern is similar, with decreases in the average sizes of both the floods in spring, and the large freshes in mid summer and early autumn.

Figure 4 shows a hydrograph model for a typical year for flows on the Lower Waiau River showing reductions in high flow events.

Figure 4: MTAD MLC Discharge during a Typical Year (1990)



3.2.3 Discharge into Deep Cove

The MTAD proposal involves increasing the maximum permitted discharge from the tailrace into Deep Cove from 510 m³/s (effectively 485 m³/s) to 550 m³/s. Although at face value this would result in a potential 13.4 % increase in the peak tailrace discharge, the overall mean daily volume of water passed through the power station would increase from 382 to 392 m³/s, an increase of only 2.6 %. Table 4 shows the MTAD tailrace flow characteristics, compared with the ‘existing regime’ data. While the maximum tailrace discharges could peak at 550 m³/s there would only be small increases in mean daily discharge. Minimum tailrace discharge would not change as the system operator requires Manapouri to deliver at least 260 MW, and this occurs at a flow of 134 m³/s.

Table 4: MTAD daily tailrace flow characteristics (change from existing)

	All years	Wet years	Typical years	Dry years
Maximum discharge	550 m ³ /s (+65)	550 m ³ /s (+65)	550 m ³ /s (+65)	550 m ³ /s (+65)
Average discharge	392 m ³ /s (+10)	453 m ³ /s (+2)	396 m ³ /s (+9)	321 m ³ /s (+2)
Minimum discharge	134 m ³ /s (0)	134 m ³ /s (0)	134 m ³ /s (0)	134 m ³ /s (0)

Under the MTAD regime 33.6 % of tailrace flows would be greater than 500 m³/s, and 8.7 % of flows would be at 550 m³/s. Under the existing regime the main flow range is between 450 – 485 m³/s (47 % of the time).

The modelled MTAD regime results in some changes to the seasonal pattern of tailrace discharges. Figure 5 shows the annual pattern of mean daily tailrace discharge for the existing regime and the proposed MTAD regime for wet, typical and dry years.

From Figure 5 it can be seen for typical years the tailrace discharge will increase about 10 m³/s, with larger increases in winter and spring. The most significant increase is in October – November when 52 % of the increased discharge would occur. During wet years the tailrace discharge will be 25 – 30 m³/s greater under the MTAD regime except for June and July when there would be no

change from the existing regime. In dry years there would be little extra tailrace discharge under the MTAD regime.

Figure 5: Seasonal pattern of tailrace discharge

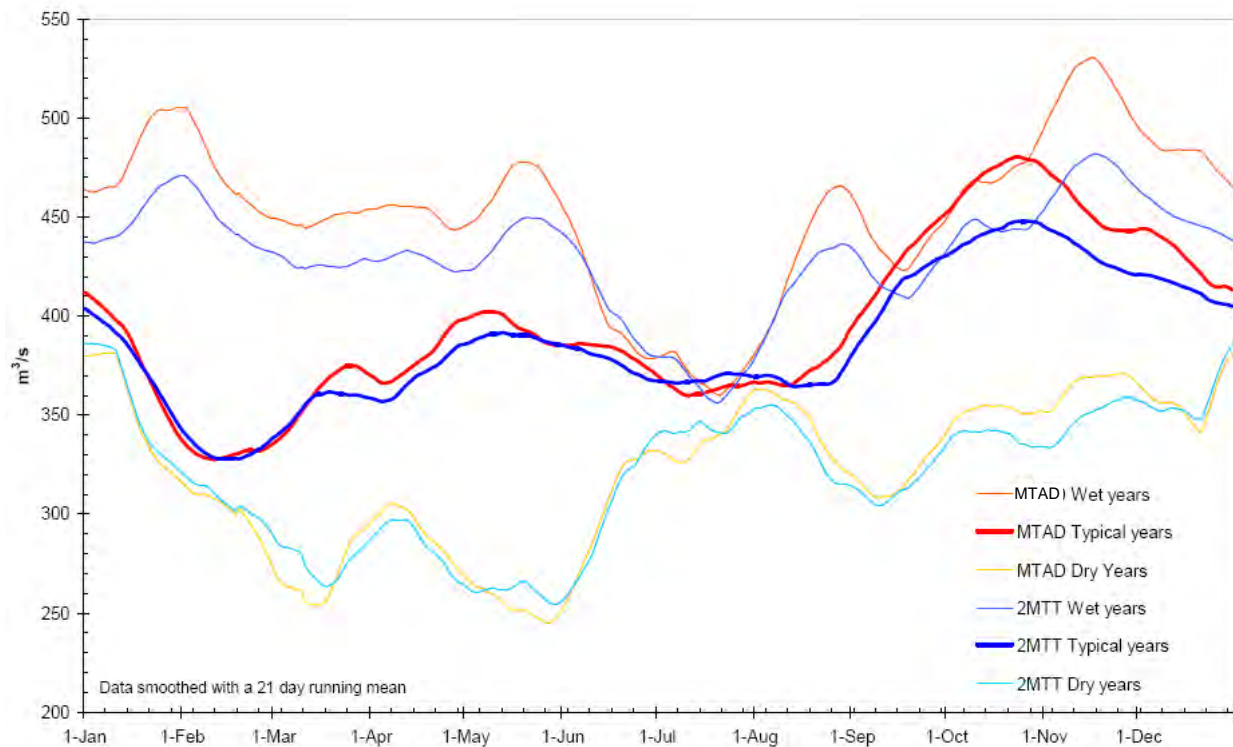


Table 5 shows the characteristics of high tailrace flow events equal to or greater than 485 m³/s, based on modelling of 60 years of Manapouri Power Scheme operating data. It presents an overall view of the total extra water that could be used for electricity generation under the MTAD proposal. In typical years there would be 136 days per year when the mean daily tailrace discharge would be ≥ 485 m³/s, with each event lasting on average 19 days. In wet years there would be an average of 208 days of high tailrace flows, lasting up to a maximum of 32 days continuously.

Table 5: MTAD tailrace flows greater than or equal to 485 m³/s

	% time tailrace flow ≥ 485 m ³ /s	Average #days tailrace flow ≥ 485 m ³ /s	Average duration of tailrace flow events ≥ 485 m ³ /s	Maximum duration of tailrace flow ≥ 485 m ³ /s
All years	37.0 %	135 days / year	21 days	187 days
Wet years	57.0 %	208 days / year	32 days	187 days
Typical years	37.4 %	136 days / year	19 days	126 days
Dry years	17.8 %	65 days / year	16 days	81 days

In Table 6 a variety of MTAD tailrace high flow events are documented for wet, typical, and dry years and comparisons with the existing flow regime are also shown (see Table 4 for ‘existing’ events). The number of ≥ 450 m³/s flow events would be increased by 1.4 in typical years, and their duration would be reduced by 7.2 days.

The very high tailrace flow discharge events at the effective maximum discharge of 550 m³/s (taken as ≥ 549 m³/s) would occur on average 5.1 times per year in wet years, and 3.0 times per year in typical years, with maximum durations of 2.6 months and 1.7 months respectively.

Table 6 MTAD high flow characteristics (change from existing)

Flow band		Wet years	Typical years	Dry years
≥ 450 m ³ /s	Average annual number	6.9 / year (+1.2)	7.9 / year (+1.4)	6.1 / year (+1.2)
	Average duration	32.8 days (-10.6)	20.1 days (-7.2)	13.4 days (-3.8)
	Maximum duration	6.3 months (0)	4.7 months (-0.7)	3.3 month (-0.2)
≥ 500 m ³ /s	Average annual number	6.2 / year	6.6 / year	3.8 / year
	Average duration	31.5 days	18.6 days	14.8 days
	Maximum duration	6.2 months	4.1 months	2.6 months
≥ 549 m ³ /s	Average annual number	5.1 / year	3.0 / year	0.9 / year
	Average duration	15.1 days	9.4 days	8.8 days
	Maximum duration	2.6 months	1.7 months	1.0 month

The differences between the modelled existing regime and the modelled MTAD regime can be seen visually in the hydrograph model outputs, as shown in Figures 6–8 below.

Figure 6: MTAD Manapouri Tailrace Discharge during a wet year (1998)

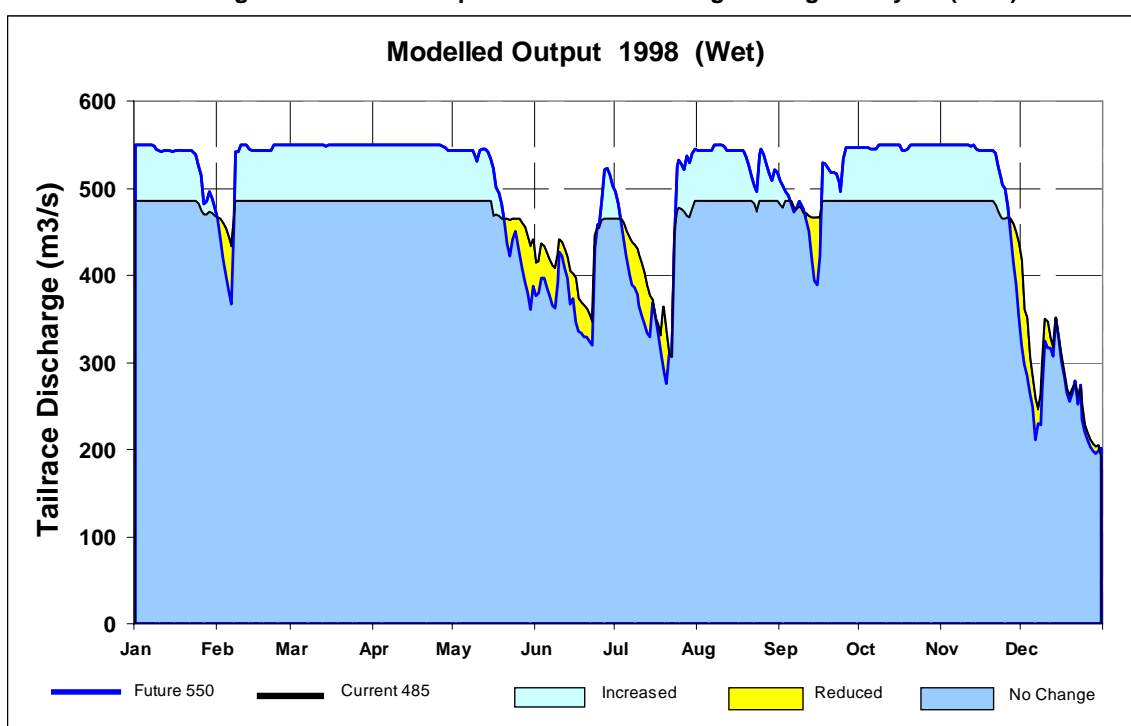


Figure 7: MTAD Manapouri Tailrace Discharge during a typical year (1990)

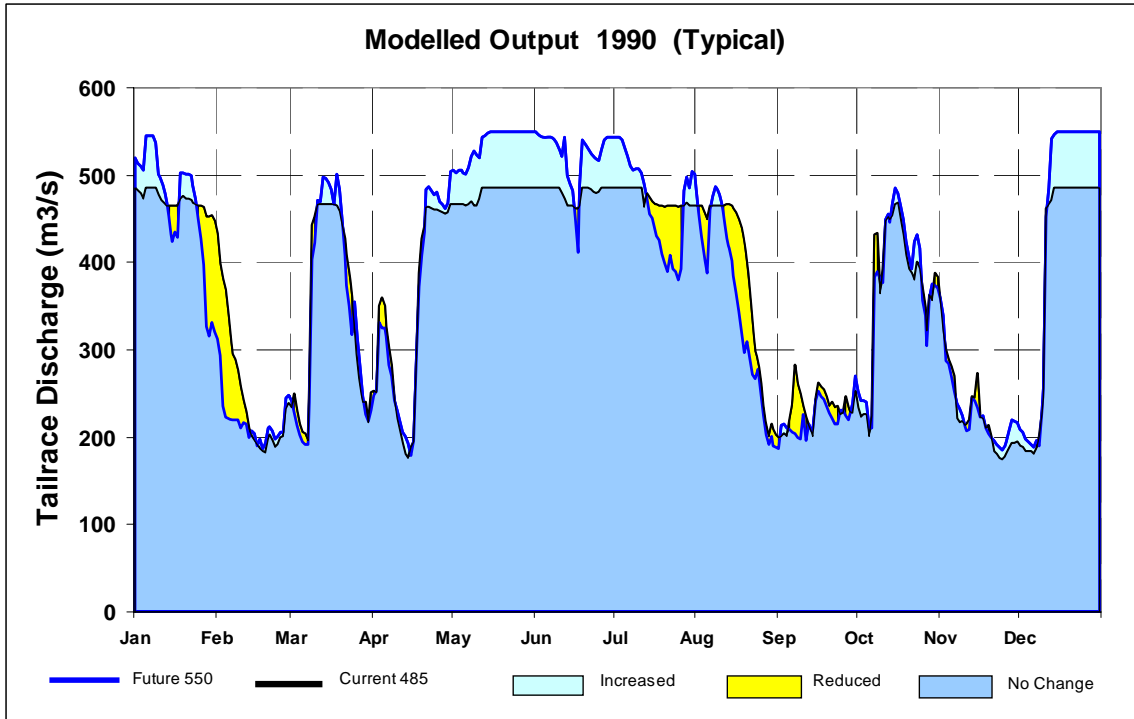
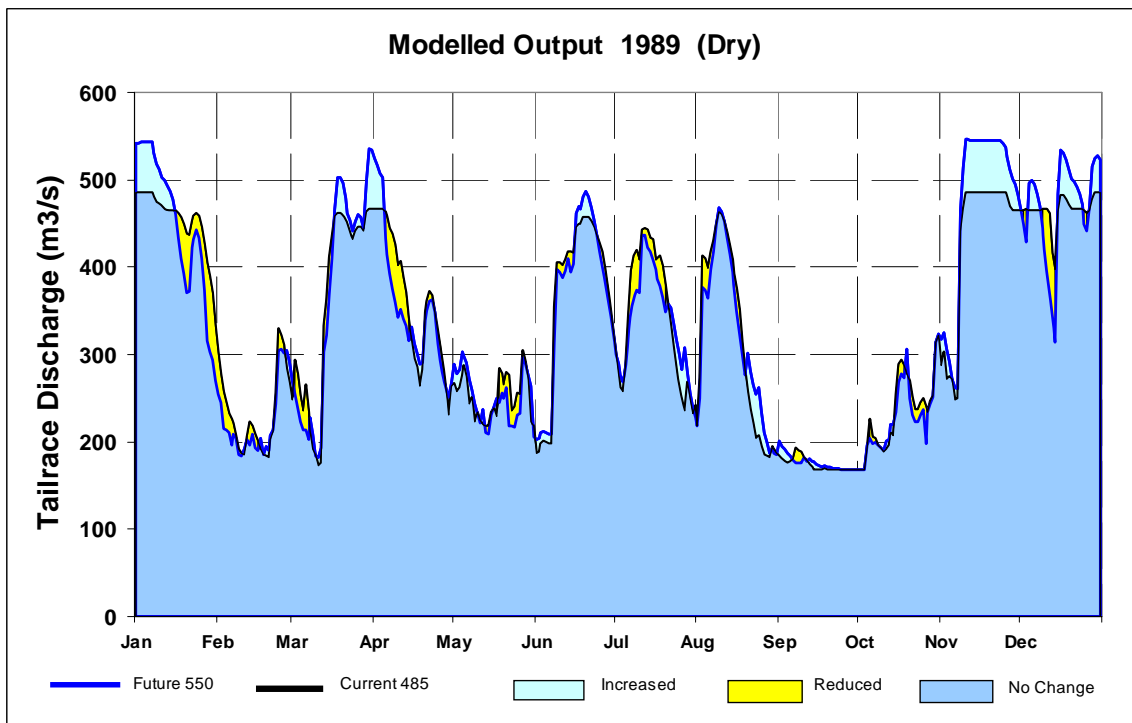


Figure 8: MTAD Manapouri Tailrace Discharge during a dry year (1989)



These annual hydrographs show the increased tailrace discharge up to 550 m³/s. Also apparent are the reduced discharges that would occur as recession limbs of the larger tailrace flood discharges are attenuated under the MTAD regime.

3.2.3.1 Periodicity of wet, typical and dry years

Table 7 describes the frequency with which wet, typical and dry years can be expected to be encountered, based on historical records from 1947. Long-term patterns of wetter and drier inflow phases are related to the Interdecadal Pacific Oscillation and climate change modelling suggests that this may influence more frequent dry inflow years in the future, although human-induced climate change could cause an increase in precipitation, and the future scenario could be similar to that for the 1977 – 2006 period.

Table 7: Inflow periods 1947 – 1976 and 1977 – 2006

Type	Inflow	All years	1947 - 1976	1977 - 2006
Wet years	> 507 m ³ /s	10 (1 yr in 6)	3 (1 yr in 10)	7 (1 yr in 4.3)
Typical years	367 – 507 m ³ /s	39 (1 yr in 1.5)	20 (1 yr in 1.5)	19 (1 yr in 1.6)
Dry years	< 367 m ³ /s	11 (1 yr in 5.5)	7 (1 yr in 4.2)	4 (1 yr in 7.5)

3.2.3.2 Daily and monthly discharge patterns⁵

Table 8 shows the average number of days per month that discharge flows would be close to 550 m³/s, and exceed 500 m³/s, under the MTAD regime. Generation from Manapouri is highest during the high inflow periods of spring and early summer.

Table 8: Modelled MTAD tailrace flows average days per month

	Flow close to 550 m ³ /s	Flow exceeds 500 m ³ /s
January	3	12
February	2	7
March	2	7
April	2	8
May	2	9
June	2	8
July	1	8
August	1	8
September	3	11
October	6	17
November	5	17
December	4	14

Water availability, price and demand dictate the daily pattern of generation at Manapouri. When the daily average flow exceeds 500 m³/s, the MPS can be expected to generate close to full capacity during the morning and afternoon demand peaks, and at times of high prices in Southland, and may generate below 500 cumecs during the night and at weekends. On average, flows close to 550 m³/s should be expected during weekdays for half the time during spring and summer. Conversely, high flows will occur less often during weekends than on weekdays, but will still occur in some weekends in all months.

More refined analysis on a seasonal basis gives the modelled tailrace flows over the recreational period October to April inclusive, referred to here as the 'summer' (Table 9). The data are by flow band, segregated into wet, typical and dry years (see Appendix 9). Percentage figures relate to the

⁵ Data provided by O. McCahon, Meridian, from SoDaPop modelling. Memo *Manapouri Tailrace Amended Discharge: Distribution of Tailrace Flows Through the Day*. 10 September 2008. Included in this report as Appendix 9.

period the specified flow bans would be experienced. These percents do not add to 100 as they do not include the periods at which flows would be less than 485 m³/s.

Discharge (m ³ /s)	Mean days per 'summer' of flow in bands						Mean event duration in days – 'summer'		
	Wet		Typical		Dry		Wet	Typical	Dry
	Days	%	Days	%	Days	%			
485 - 499	6.9	3.2	6.7	2.9	5.4	2.5	1.8	1.5	1.5
500 - 524	15.4	7.2	16.9	7.9	11.9	5.6	3.0	3.0	3.6
525 - 549	56.6	26.5	45.9	21.5	22.5	10.6	8.0	8.8	9.4
550	61.1	28.7	18.3	8.6	5.5	2.5	14.9	9.5	10.2

The average 'summer' duration of the high flow events is slightly longer in dry years than in typical years because there are only six high flow events modelled during the dry years, but three of these last for one week, 2.5 weeks and four weeks respectively. In the typical years there are 75 high flow events, many of which last only a day or two.

Essentially, the 'summer' event durations are broadly similar in dry, wet and typical years, although maximum discharges in wet years will be approximately 50% longer. There will be far fewer days with 550 m³/s discharges in typical years, in comparison with wet years (28.7 % versus 8.6 %), and fewer days with discharges above 524 m³/s and at 550 m³/s in dry years. Days with flows between 485 and 524 m³/s will be similar in frequency for all years.

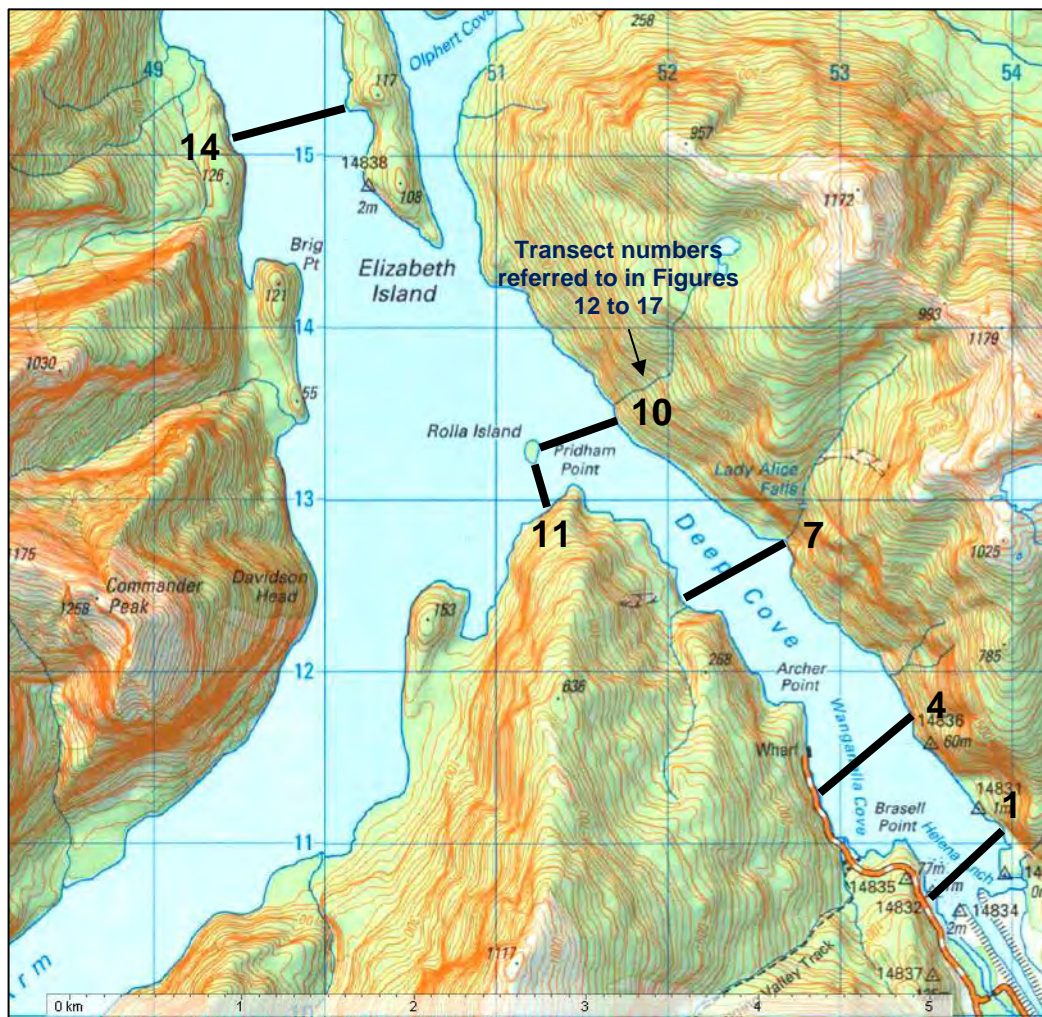
3.2.3.3 Surface water currents

The important results of these flow discharges, in terms of direct effects on recreation and tourism, are changes to the surface water currents and wave effects in Deep Cove and Doubtful Sound.

Velocity measurements were taken during high flow trials are detailed in the MTAD High Flow Trial report using three methods. One involved placing GPS-equipped drogues ('drifters') at various sites in Deep Cove and the tailrace at different levels of discharge and recording their speed and route. The second method relied on a vessel with a mounted ADCP current metre traversing the fiord at specific transects and measuring water speeds from depths of 0.75 metres to 15 metres (Figure 9). The measurements represent the currents in about the top metre of surface water, and not the surface *per se* – hence their being described as 'near surface' water velocity measurements. For the third method, stationary current metres were deployed 1.2 metres below the surface at the Real Journeys and Meridian Wharves (sequentially, using the same meter), at the tailrace exit, and on the M5 mooring opposite Archer Point. All three methods presented corroborating data.

There was much variability in currents from place to place and at different tailrace discharge levels.

Figure 9: Hadfield et al (2008) ADCP transects referred to in this report

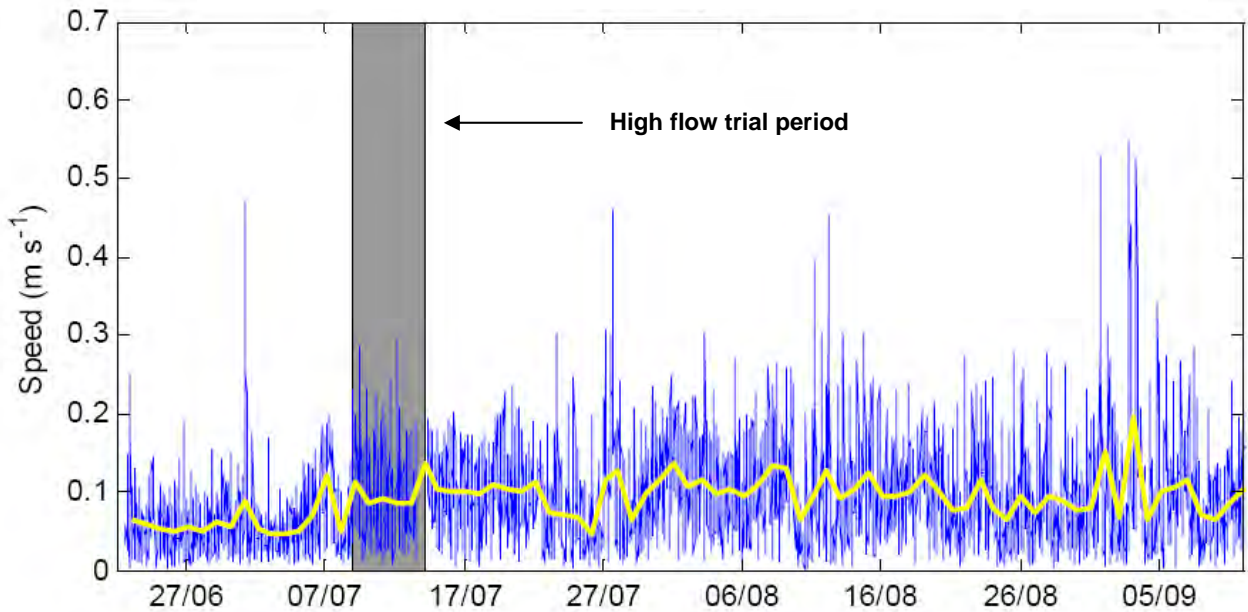


Wanganella Cove

Wanganella Cove features a permanent reverse eddy influenced by the nearby discharge flow, as do many small bays between the headlands along the sides of the fiord. The measurements taken indicated no change to the velocity of the Wanganella Cove eddy, although anecdotal accounts indicate that there may have been some localised current effects. Tide and wind effects also confuse any average estimate of flow at any single point. Generally, discharge currents were lower the further towards the sides of the fiord.

A current meter anchored in Wanganella Cove for an 80 day period showed occasional peaks in current speeds outside the high flow trial period of around 0.5 m/s, with a maximum of 0.3 m/s during the trial (Figure 10). Current speeds were usually faster at low tide than at high tide, with peaks tending to occur at times of elevated Lyvia River flows. At the start of the measurement period the current meter was based at the Real Journeys wharf, and was shifted to the Meridian wharf before the high flow trial. There is an apparent greater background current speed at the Meridian wharf in comparison with that of the Real Journeys wharf, which tallies with anecdotal reports that current speed in Wanganella is generally greater the closer to Archer Point.

Figure 10: Current meter plot from Wanganella Cove wharves, Jun – Sept 2007



Deep Cove

At flows of 470 m³/s, currents peaked at the centre of the tailrace exit at 1.5 m/s. At 550 m³/s, the current peaked at 2.4 m/s. At the sides of the tailrace exit, currents were lower the higher the discharge and tended towards counter currents. Figure 11 (ADCP data) shows the currents measured along a transect from one side of the tailrace exit to the other, showing current velocities at different discharge flows – blue for 470 m³/s and green for 550 m³/s.

Further west, at a transect across Wanganella Cove, the current effects were moderated, with a common peak current just above 1 m/s at 550 m³/s and at 470 m³/s, but with the peak flow affecting a wider area (Figure 12). Figure 12 also shows consistency in the counter current velocity in Wanganella Cove (left side of the chart).

Figure 11: Transect 1: Tailrace Exit - ADCP data

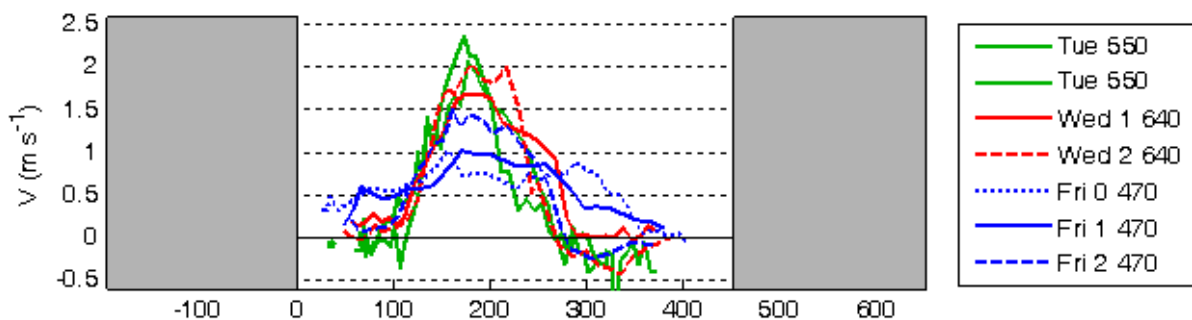
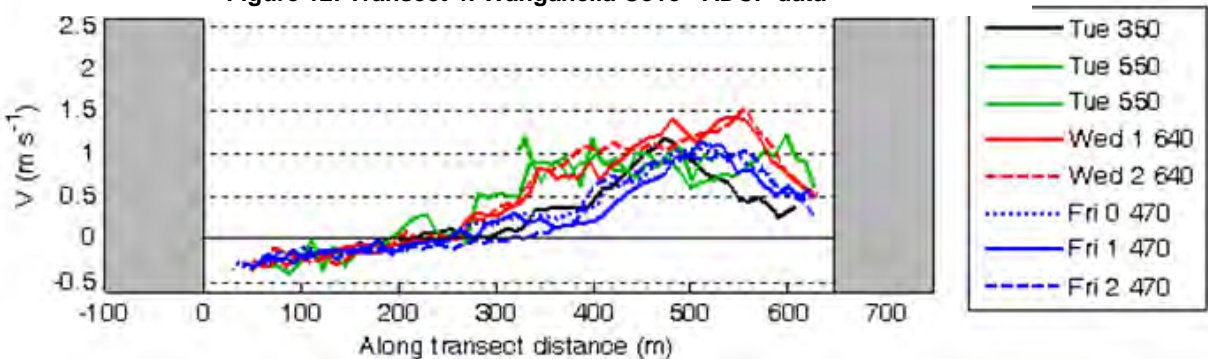


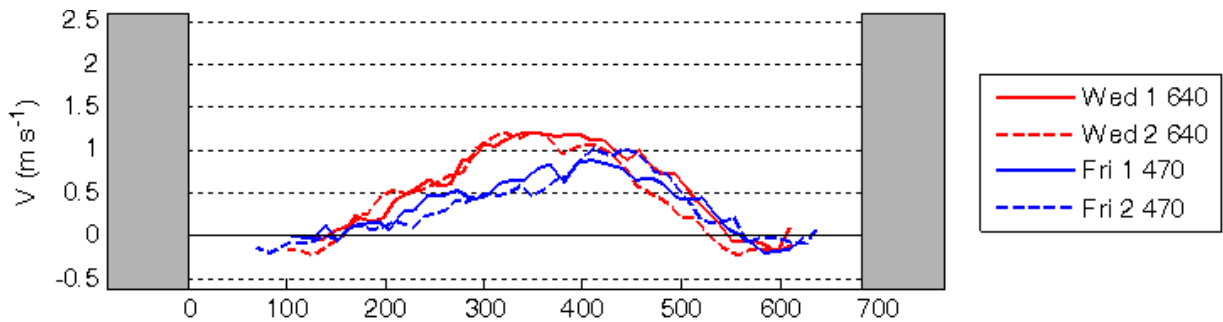
Figure 12: Transect 4: Wanganella Cove - ADCP data



Further away from the tailrace, the velocity changes diminish, but are still noticeable. ADCP data were gathered for only the 470 m³/s and 640 m³/s flow trials west of Archer Point, and the likely effects of a 550 m³/s discharge must be extrapolated as lying between the two.

The Lady Alice Falls transect showed a movement of the centre of the discharge trajectory to the left of the fiord with a ~ 1 m/s current speed increase at one location. The maximum speed, however, only increased by 0.25 m/s, and the current at the sides of the fiord tended to be steady.

Figure 13: Transect 7: Lady Alice Falls - ADCP data



Outside Deep Cove

Opposite Rolla Island, the velocity increase was more consistent across the channel with an increase in speed of just over 0.5 m/s at 640 m³/s (Figure 14). The gap between Rolla Island and the mainland (the 'Rolla Gap') showed an increase using ADCP data from virtually still water to 0.5 m/s on the left hand side (Figure 15). Slightly higher velocities were measured from the drifters, with increases in speed of 0.4 to 0.7 m/s at both 550 and 640 m³/s discharges. The MTAD High Flow Trial Report notes that the stronger current speeds measured by the drifters might relate to higher wind speeds on the relevant flow trial days. The conclusion made is that there may be a flow threshold in the vicinity of 500 m³/s when the tailrace discharge begins to flow through the Rolla Gap. Below this threshold, the local current tends to be slight.

Figure 14: Transect 10: Rolla Island - ADCP data

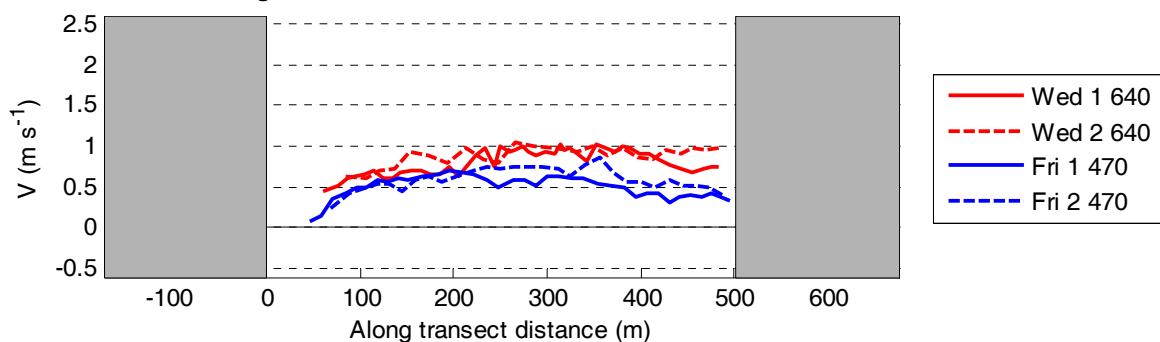
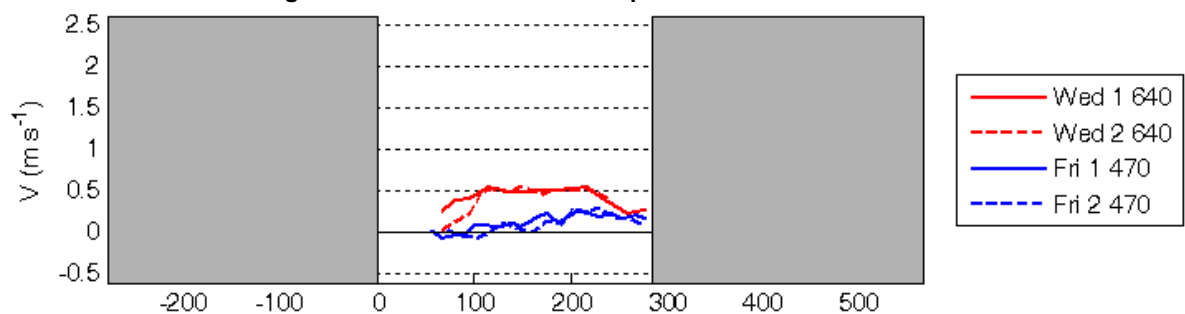
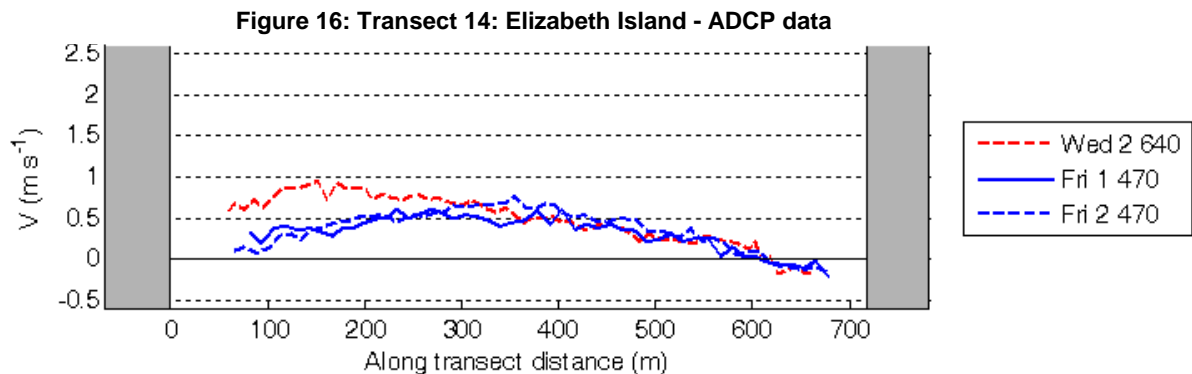


Figure 15: Transect 11: Rolla Gap - ADCP data



At Elizabeth Island, ~ 0.5 m/s increases in current velocity were apparent on the left side of the fiord. There was no effect on velocity on the right hand side of the fiord near Elizabeth Island (Figure 16).



Conclusion – surface velocity

The mean increase in surface water velocity at different discharges above MPS discharges from 485 m³/s are shown in Table 10 (from Appendix 9 of this report). These data can be correlated with those in Table 9 to illustrate the frequency at which these increase in current speed are modelled as likely in dry, wet and typical years.

Table 10: Mean increase in current speed at different discharge rates.

MPS discharge (m ³ /s)	Mean increase in current speed
485	0
500	3%
525	7%
550	12%

Hadfield’s assessment (Appendix 3) concludes that there is a generally predictable correlation between increased tailrace discharge into Deep Cove and ‘near surface’ water velocities. A 50% increase in discharge (say from 400 m³/s to 600 m³/s) resulted in an average increase in ‘near surface’ water velocity in the discharge trajectory of between 33% and 69%. The mean change for all relevant survey points was a 49% increase in ‘near surface’ water velocity with a 50% increase in discharge. The difference between the current consented maximum of 485 m³/s and the proposed 550 m³/s is 12%, and so the conclusion is made that the average effect on maximum near surface water velocities will be an increase of 12% in the discharge trajectory as a result of the MTAD proposal when discharge is at 550 m³/s. However, the reality will be range of current speed changes at different locations and at different discharge rates, including notable increases at such locations as the Rolla Gap and the left side of the fiord opposite Elizabeth Island.

Wave effects

The MTAD High Flow Trial Report reported on the influence of increased surface water currents on the propagation of waves in the fiord. The conclusion was that the effect of a higher tailrace discharge on wave breaking behaviour was difficult to estimate. The current discharge limits already create standing and breaking waves (shown by first-hand experience of the setting and by mathematical modelling carried out for the MTAD High Flow Trial Report). The effect of increasing the flow rate was concluded to be more likely to change the position of wave breaking (pushing it further down the fiord), rather than markedly changing the nature of the waves.

First-hand experience of the tailrace discharge shows that very high flows – such as 640 m³/s – can occur with no wave effects in Deep Cove, when there is no wind, whereas lower flows (350 m³/s) coupled with a moderate up-fiord wind (which is not uncommon) can result in quite pronounced standing and breaking waves opposite Wanganella Cove. Kayakers also report a variety of wind-against-tide conditions in what appears to be the tailrace discharge near Elizabeth Island.



4 Existing environment – recreation and tourism

The activity summaries presented here are drawn from the literature and Web reviews presented in Appendices 1 and 2, the interviews with recreation and tourism users of the study area (the most relevant summarised in Appendix 3), and from data gathered by the author during the MTAD consultation programme.

4.1 Lower Waiau River

The Lower Waiau River is regionally significant for trout fishing and jet boating. The valley also supports a range of walking and sightseeing options, several of which are the work of the Waiau Fisheries and Wildlife Enhancement Trust.

Since the seasonal minimum flow releases began in 1996, the popularity of the fishery has grown considerably (Unwin & Brown 1998, Unwin & Image 2003, Rodway 2001). User surveys carried out by Fish and Game for Meridian between 1996 and 2001 (Rodway 2001) suggest that perceptions of the River's qualities as a fishery did not markedly change in that period. Catch rate appears to be an important value which may have improved, whereas 'scenic beauty' and fish size may have declined. However, the survey had a small sample size in 1996 (25) and this presents problems ensuring the accuracy of any trend analysis using that year as a baseline, considering the similarity of the satisfaction means. The data suggest that the River has increased in relative value in comparison with other rivers fished by respondents, but this does not consider any changes, or possible deterioration, in the alternative fishing areas (the survey does not ask why the Waiau is ranked more highly, or whether other rivers are ranked lower). Further angler perception survey work has been curtailed because of the arrival of didymo in October 2004, which will confuse any trend analysis of angler satisfaction with regard to the increased baseflow.

The national angler surveys (NAS) (Unwin & Image 2003, Unwin & Brown 1998) present a confusing picture for angling activity on the Lower Waiau River. The 2000/01 survey provides separate counts for total use of the Upper and Lower Waiau Rivers, but combines both Rivers when giving seasonal data; and in 1994/96, the two Rivers were treated as one. The total reported angler days on the Upper and Lower Rivers in 1994/96 was 7720 ± 840 , and in 2000/01 was $14,660 \pm 1500$. In the 2000/01 survey, 57% of angling activity on the combined rivers was on the Lower Waiau.

In comparison, Rodway (2001) estimated 148 ± 29 angling visits to the Lower Waiau River (below the MLC) in 1996 and 1757 ± 42 in 2001. If the 57% figure from the 2000/01 NAS for angling activity on the Lower Waiau (below Lake Manapouri) is applied to the NAS data for 1994/96, the NAS figures would be 4400 angler days on the Lower Waiau River in that season, and 8356 in 2000/01. This is a large discrepancy, which is unlikely to be accounted for by the level of angling activity between the MLC and Lake Manapouri, which was not counted in Rodway's (2001) study. Both studies indicate an increase in angling activity on the River since 1996 (albeit one by almost two-fold and one by almost twelve-fold). As the NAS study has applied a consistent methodology over time, that study is most likely to represent reality.

A recreation survey completed prior to the instigation of the seasonal MLC minimum discharge in 1996 indicated that local and regional respondents preferred a consistent flow in preference to a 'natural flow' (Kearsley 1994).⁶

⁶ The local survey population target was all residences of Tuatapere and the rural population of the Waiau Valley, plus a sample of Te Anau residents. A response rate of 73% was achieved. The regional response group was a selection of those on the regional electoral roles, with a sample size of 400 and a response rate of 34%, which would imply a reasonable level of bias in the results towards those with an interest in the study area. A visitor sample was also surveyed with 221 respondents, 50% of whom were on their first visit to the area. The reported results for the latter group do not differentiate between those with prior experience with the setting, and since many of the questions relate to change over time, such as

Jet boating is both a private and commercial option on the River, with Waiau Jet Tours offering rides from Tuatapere to the Monowai power station, some 25 kms downstream of the MLC and some 42 kms upstream of Clifden. Photo 2 shows the boat on the River below Monowai with a flow of 22.2 m³/s as measured on the Environment Southland gauge at Sunnyside (11.4.08).

Recreational releases from the MLC of at least 35 m³/s for not less than 24 hours on the fourth Sunday of each month between October and April are required by Meridian's consent. The NZ Jet Boating Association Southland Branch may also request that two of these releases be increased to 45 m³/s for specific events. These flows enable jet boating at least as far upriver as the



Photo 2. Waiau Jet Tours, 11.4.08

MLC. Under normal flow conditions it is normally only possible to travel as far as Monowai. Two 24 hour 35 m³/s releases are also required in June and August.

Resource attributes of relevance to MTAD relate to the maintenance of minimum flows and recreational releases for jet boating, and maintenance of the habitat of the River for trout.

4.2 Lakes Te Anau and Manapouri

Both lakes are nationally, if not internationally, significant for a range of recreation and tourism activities. Their association with a World Heritage Site, their role in providing access to it, and their inherent tourism value, indicate their importance.

Lake Te Anau is the more popular angling destination with 12,080 ± 1910 angler days in 2000/01, compared with 5920 ± 940 days for Lake Manapouri (Unwin and Image 2003).

Tourism activity on Lake Te Anau focuses on boat excursions to the glow worm caves and the lake generally, and to drop off trampers at the start of the Milford Track. On Lake Manapouri, the route between Manapouri township and West Arm is important for tourists and other recreational visitors to Doubtful Sound and the Manapouri Power Station. The Kepler Track – a DOC Great Walk – overviews both Lakes and passes along parts of their shores.

Resource attributes of relevance to MTAD include the trout fisheries, the beaches (their size and quality) and lake edge scenery.

Kearsley (1994) reported on preferences for beach size and level control for Lakes Manapouri and Te Anau amongst various subsets of survey respondents⁷:

- **Beach sizes in the lakes:** 36% of local residents preferred 'quite a large beach', 25% preferred a 'fairly small beach' and 30% had no preference. Similar results were gained from regional respondents (38%, 26% and 25% respectively)⁷. Locals thought large beaches gave more room, especially for children, looked nicer and allowed more recreational opportunities; smaller beaches looked nicer or were more natural. Regional respondents thought large beaches gave more room to park boats, looked nicer, were safer for children and gave more room for various activities; small

'scenic consequences of river and lake control' it is difficult to rely on relevant results from the visitor response group. They may, for example, be subject to relatively high levels of strategic response not based on real experience.

⁷ The Table 15 on page 25 of Kearsley (1994) describes the data quoted here, although the accompanying text on the same page uses different figures (45% for 'quite a large beach' and 27% for 'a fairly small beach'). The text also notes that the regional sample is similar to the local sample, hence the choice of data in this report.

beaches looked nicer and were more natural. Visitor sample respondents showed a slight comparative preference for small beaches (27% for 'quite a large beach', 39% for 'a fairly small beach' 14% for 'a very small beach'). Smaller beaches were considered to be better looking, whereas large beaches gave better access and more room for activities.

- **Lake level controls:** 34% of local residents thought lake level controls affected their recreation, and 35% said it did not. Regional respondents were less affected, with 47% saying lake levels had no effect, and 25% saying they did. Few reasons were given by the regional sample for negative effects, but included difficulty in parking boats at high levels and impacts of fluctuating levels on angling. Local residents noted: better access for fishing and poorer fishing at low levels; at high levels, no or insufficient beaches and difficulty launching boats; and fluctuating levels being detrimental to fishing. The visitor sample data for both lake and river users were grouped for a similar question, showing that 60% of respondents thought lake and river controls made no difference to the local scenery, 8% thought it was more attractive and 22% less attractive. Ten percent had no opinion. River users were more likely to state a negative change than were lake users. However, 50% of the visitor sample was on their first visit to the study area and would have had difficulty making a comparative assessment. These results should be treated cautiously. The research is also now dated.

4.3 Deep Cove and Doubtful Sound

The level of tourism in Doubtful Sound is far less than that of Milford Sound. Booth et al. (2007) estimated that the ratio of tourism activity between Milford and Doubtful Sound to be 90:10. Department of Conservation concession returns for concession holders taking visitors across Wilmot Pass suggest at least 70,000 individuals visited Doubtful Sound in 2007/08, with almost 500,000 people visiting Milford Sound – suggesting the 90:10 ratio is close (Beth Masser, pers. comm.). Other unrecorded visitors would have accessed Doubtful Sound from the sea. Booth et al (2007) reported that 34% of visitors to Doubtful Sound were New Zealanders and the remainder were of international origin (13% of visitors to Milford Sound were domestic). Approximately 40,000 people visited the Manapouri Power Station in 2007/08 and almost all of these would go on to visit Doubtful Sound (John Twidle, pers. comm.). Conversations with interviewees for this study suggest that between 2500 to 4000 people might kayak in Doubtful Sound depending on the season, not including those on overnight vessels which offer some form of kayaking activity outside Deep Cove, with the ability to select confined sites based on local wind conditions.

Together Milford and Doubtful Sounds represent the only easy access options to the fiords, and are both at least nationally significant for the activity options they offer. Being adjacent to the Te Wahipounamu – South West New Zealand World Heritage Site, and offering the only terrestrial access points, certainly raises the recreation and tourism values of Milford Sound to the international level, and confirms Doubtful Sound as nationally significant. Access to Milford was founded on tourism opportunities, while Doubtful Sound's access, and tourism industry, is a result of the Manapouri Power Scheme (MPS). The scale of tourism within Doubtful Sound would otherwise be the same as for other terrestrially inaccessible sounds in Fiordland. Tourism activity in Doubtful Sound is controlled by the Environment Southland Coastal Plan (2007) and the Department of Conservation's Fiordland National Park Management Plan (2007), and both aim at retaining a strong focus on remote experiences.

Most visitors to Doubtful Sound will travel on a day cruise with Real Journeys or Doubtful Sound Cruises (Fiordland Explorer Charters). Overnight options aboard a vessel are offered by Real Journeys, Fiordland Ecology Holidays, Fiordland Adventure (Adventure Kayak and Cruise) and several charter vessels (such as Fiordland Expeditions (MV Tutoko) and Fiordland Cruises (MV

Waverley – Photo 3)). Most of the smaller charter operations offer diving, fishing and hunting opportunities. Kayaking is often offered by these operators and on other overnight cruises, but visitors are first delivered to a kayaking destination outside Deep Cove, by-passing any direct effects of the tailrace discharge. Fiordland Wilderness Experiences is the only operator offering guided and self-guided kayaking options with a departure and return point within Deep Cove.



The activities of Fiordland Wilderness Experiences are of particular interest to this study. Sea kayaking has the potential to be the most affected activity as a result of the MTAD proposal. The operations of the company are also representative of freedom kayakers in the fiord in terms of areas in the Sound used.

Fiordland Wilderness Experiences offers single-day packages on Milford Sound, multi-day trips in Doubtful Sound and single and multi-day trips on Lakes Manapouri and Te Anau (see Figure 19). Milford tours operate from October to May, and in Doubtful Sound from October to April, inclusive. Seven full-time guides are employed each season. While they take twice as many tours on Milford than on Doubtful Sound, the longer trips on Doubtful means Fiordland Wilderness Experiences can have up to 24 people on the water at any one time in Doubtful, and up to 16 people on Milford. All departures and returns on Doubtful Sound are at Deep Cove. The operation is at capacity for overnight trips, but could increase the number of day trips and the length of the season.

The overnight tours are self-catering, and this ensures clients are to some degree self-reliant and sufficiently competent to be in a wilderness setting. Fiordland Wilderness Experiences also offer rental kayaks, but have a selection process to ensure clients are competent (minimum age, no solo rentals, experienced paddlers).

Guided and rental parties are equipped with two-way hand-held VHF radios, and on Doubtful Sound guided parties also carry a more powerful 24 volt VHF. The Hall Arm campsite is equipped with a satellite phone to which weather forecasts are texted twice daily for use by the company. Satellite phones are not carried on the water due to their vulnerability to moisture and the inability to rely on them in an emergency. They are not generally used for conversations as frequent interruptions are caused by satellite connections being blocked by the terrain.

There is poor VHF reception near Deep Cove, and in many other parts of the fiords, and all operators and commercial craft, including the Deep Cove Outdoor Education Trust (DCOET) hostel, co-operate to relay calls if required.

Fiordland Wilderness Experiences' website, in reference to renting kayaks to unguided parties in Doubtful Sound, states:⁸

Doubtful Sound (minimum 3 days) is for more skilled, experienced and better equipped groups. We apply strict criteria. Kayakers must have significant white water and/or rough water sea kayaking experience, particularly if you want a single kayak. If you are light on experience consider the Doubtful Sound guided and Lake Manapouri rental combination. No solo rentals. Minimum age 18 years.

When choosing between a guided or rental trip, think about:

a. the ratio of strong experienced kayakers to beginners;

⁸ http://www.fiordlandseakayak.co.nz/rental_kayaking.html

- b. *double kayaks are more powerful and stable in adverse conditions - strict skill/experience criteria apply if you wish to use a single kayak;*
- c. *the backgrounds of the group members - fit, confident, outdoor people with experience in activities such as windsurfing surfing, sailing, diving, camping?*

The business has a safety boat on the hard in Deep Cove for use in adverse weather conditions or if a client is unable to continue their tour. This is rarely used and there is no on-site skipper. If the weather looks doubtful, one of the company directors will head over to Deep Cove and await a call from guides if they need a lift back to Deep Cove. The boat is used at the start and end of the season to check on campsites, and generally only once per season to pick up kayakers when they are unable to return to Deep Cove due to poor weather. The boat is consented with Environment Southland as a safety vessel and can only be used as such – although ‘safety’ is not defined in the consent, but it assumed that this means that the boat cannot be used for daily deliveries of kayakers.

The Fiordland National Park Management Plan (DOC 2007) restricts accommodation opportunities in Deep Cove to staff of the DCOET, so no concession holder could, under current rules, base a permanent staff member ashore to manage a safety vessel. The craft itself would need to provide accommodation. Further, under the Environment Southland Coastal Plan (2007) additional commercial boat activity on the Sound is a non-complying activity and consent applications would be required for additional tourism services. Additional use of the existing Fiordland Wilderness Experiences safety boat would most likely fall within their existing consent.

The discharge from the tailrace of the MPS is always a consideration when paddling in the Sound, and varies from a mild influence to a major consideration when weather conditions compound. A strong current and high standing waves means guides have to make some serious decisions about the route taken and the abilities of their clients. When conditions permit, and there is a north-west or up-fiord wind – which is common in the afternoons – parties heading back to Deep Cove will travel in the middle of the Sound, where there is plenty of sea-room, and use the wind to push them along, often with sails. When conditions are rough, the groups will raft-up to create a more stable platform when ‘sailing’. When the current is too strong, headway is lost and the group must paddle along the edge of the fiord. Although there are many eddies between headlands with a counter-current which may assist paddling, the headlands can feature strong winds, waves and currents, and even the eddies can present unusual and rough conditions. Head-currents slow paddlers, and if they are not sufficiently skilled in steering, they can push the bow of the boats away from the coast and back into the main current, and even turn the boats around. More skilled kayakers know to adjust their paddling and steering to stay on track. However, the sides of the fiord generally offer easier paddling routes when there is little wind (not enough to sail) and a strong current.

The Rolla Island gap is normally a comfortable position in which to rest and wait for conditions to improve before moving around the headland into Deep Cove, although it has always had some tidal or discharge-

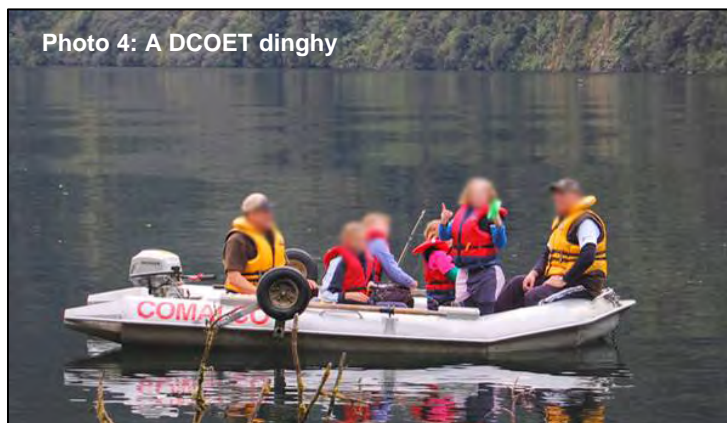


Photo 4: A DCOET dinghy

influenced current. In recent years guides have noted that there is often a more confused current and it takes more energy to stay within shelter. The safety manual for the operation has had to be updated as a result. The Hall Arm intersection is often a tricky area, with occasional high waves east of and opposite Elizabeth Island. On one-day trips, the route normally takes kayakers to the

north of Elizabeth Island and the guide must then make a decision about where to cross back to the south of the fiord, considering currents, winds and waves.

The DCOET takes around 2000 school students from Southland and offers an outdoor education experience,. This includes fishing from small craft in Wanganella Cove, and crossing Deep Cove – and the tailrace discharge – in the same craft, to visit Helena Falls or the north side of the Cove. The DCOET accommodation facilities are available to backpackers and researchers for accommodation under the conditions of the Trust’s DOC concession, but only if the Trust’s primary purpose of providing outdoor education opportunities to students is not compromised. The Department of Conservation’s Fiordland National Park Management Plan (2007) does not allow any permanent or seasonal accommodation in Deep Cove for concession holders other than DCOET staff.

The Trust’s boat operation manual limits use of the craft to within Wanganella Cove, unless specific permission is given by the manager, who will consider the weather and water conditions and the abilities of the skippers. Craft are normally piloted by parents of students, and the manager must be confident that they have sufficient skill. While the walking track to Helena Falls over the tailrace tunnels was unusable⁹ (late 2003 to early 2007), boat access to the Falls was the norm. At the time of writing, the track was again closed due to rockfall. There have been no accidents with the Trust’s boats, besides the occasional engine failure and swamping. The boats are designed to be unsinkable and the outboard motor should remain above the water if a boat is swamped. Three craft are used by the Trust, with one as a safety vessel. During research for this report and the MTAD Marine Safety Report (Appendix 8) it became evident that the safety vessel represented a weakness in the Trust’s operating procedures, being little larger than the day boats – although with a larger motor – and being moored at sea without fuel, slow to launch and to start. The MTAD Marine Safety Report recommends that this vessel and its launching procedure be updated regardless of the MTAD proposal. It is also understood that the Department of Conservation aim to solve the pedestrian access problem to Helena Falls, potentially by installing a bridge over the tailrace channel. Meridian has engaged in this process and will be contributing to the cost of the bridge in accordance with an agreement separate from the MTAD exercise. This assessment proceeds with the assumption that both the safety boat and pedestrian access issues have been addressed.

‘Syndicate’ and other private boats are moored in Wanganella Cove. Syndicate vessels are owned by groups of individuals and provide bases for exploring the fiords, fishing, diving and hunting. Berth and mooring areas are available inside Brasell Point, at the Helena Falls anchorage and on the wharves and pontoon systems in Wanganella Cove (Figure 17 shows the berths in Wanganella Cove). While the Helena Falls anchorage offers some casual mooring and anchoring options, the remainder of Deep Cove’s berthing and mooring options – controlled by Environment Southland – are fully allocated.



Photo 5: Trailers and vehicles stored at West Arm, May

⁹ The Helena Falls Track was developed at the time the first Manapouri tunnel was bored. The second tailrace required the track to be extended. The track is on national park land and DOC is its legal owner. An earthquake in August 2003 loosened rock above the track, and rains in November of that year brought a lot of rock onto the track and Meridian’s tailrace bridge, and the track was closed. The same events closed the Stella Burn Track, which remains closed. At the request of DOC and the DCOET, Meridian had a geotechnical assessment of the Helena Falls Track completed, which was peer reviewed by DOC, who also completed an internal hazard assessment. In early 2007 DOC re-opened the track. (John Twidle, Manapouri Maintenance Manager, Meridian Energy, pers comm.). In 2008, more rockfall forced the closure of the track again and at the time of writing, the track remains closed.

Trailerable private power boats are often brought over Wilmot Pass for short trips into the fiords, particularly for deer hunters during the roar (generally March to May). Four wheel drive vehicles with boat trailers are stored at West Arm – for the season or longer – and craft are generally motored across from Manapouri and towed to Deep Cove.

Figure 17: Wanganella Cove berths



5 Project activities which may have effects, and their scale

This section summarises the effects of the MTAD, discusses the significance of the activities, and considers mitigation opportunities.

The following bullet points summarise the effects of the increased discharge from the tailrace of the MPS on the recreation values of each setting. The assessments refer to effects that are considered to be 'minor', 'more than minor' or 'significant'.¹⁰

- A 'minor' effect refers to a slight change in the recreation setting, but where the original recreational activities can continue. This scale of effect is defined as much by the definition for 'more than minor' and will relate to slight changes in the availability of the activity (such as the number of days it is possible) or its location. The activities' original qualities will remain largely unchanged. For example, a remote experience will remain remote.
- 'More than minor' refers to an activity opportunity where a shift in the recreation setting may modify the characteristics of an activity – such as the frequency it may be undertaken, the location of the favoured sites, and some of the activity's qualities – but the activity setting retains many of its original values and the activity may continue to be pursued.
- A 'significant' effect would refer to an activity opportunity that was removed (the potential of the setting for that activity would be significantly diminished).

Both 'minor' and 'significant' effects are generally easily identified. The scale of effect within which a 'more than minor' assessment can be made is more broad, and some interpretation of the type and degree of effect is necessary. For example, where a 'more than minor' effect is at the major end of the scale, an activity might be described as 'severely restricted'.

5.1 Lower Waiau River

The proposed MTAD flow regime will not reduce the size of minimum flows on the Lower Waiau River and will have a very minor effect on their frequency and duration. Flow reductions will be confined to, mostly, the recessions of floods and freshes. These will have no direct effect on recreational and tourism use of the River. No changes are proposed to recreational releases for jet boating. There are therefore no direct effects on recreation amenity.

Didymo is currently the primary concern for recreational use of the River, including its effects on angling (fouling hooks and its effect on visual amenity) and jet boating (clogging intakes and visual amenity). Should the modified flow regime affect the degree to which didymo and periphyton blooms are flushed from the River, then there may be consequential effects on recreation and tourism. The MTAD River Ecology Report indicates that changes to fish abundance and distribution as a result of MTAD are likely to be 'less than minor', and a reduction in the size and duration of moderate-sized floods may be of benefit to some fish species. Algal proliferations may be longer in duration than under the current regime, although effects are likely to vary depending on distance downstream and distance from the main channel – both with decreasing likelihood of change from the status quo as a result of MTAD – and proximity to tributaries – with less periphyton accumulation as a result of MTAD. The authors recommend ongoing monitoring to identify the flushing flows required to manage periphyton accumulation.

¹⁰ There are no nationally agreed definitions for these terms in relation to recreation. The definitions presented here have been used by the author in several major consent applications of this type over several years, and have been reviewed and improved over time.

5.2 Lakes Te Anau and Manapouri

The proposed MTAD flow regime is modelled to increase the period of time at which Lakes Te Anau and Manapouri are operated within their middle ranges. Kearsley (1994) reported that the main concerns with lake level management from a recreation perspective were high levels reducing the useable area on beaches and making boat parking difficult, and fluctuating levels affecting fishing. Kearsley reported mixed preferences for beach size. The effect of the MTAD regime will be to moderate high lake levels and reduce fluctuations. There are therefore no direct effects on recreation amenity.

However, there may be consequent effects on weed growth on some beaches as a result of a reduced frequency of inundation and changes to beach form as a result of changed beach processes. The MTAD Lakeshore Sediments report indicates that changes to lakeshore processes would be 'minor and not necessarily adverse'. The MTAD Lakeshore Vegetation Report indicates that while there may be some changes in lakeshore vegetation, they would be subtle and unlikely to be detected by non-specialists.

5.3 Deep Cove and Doubtful Sound

Any assessment of effects in this case must recognise the variability and inherent risks posed by the natural conditions in Doubtful Sound. (Appendix 5 provides a review of risk management frameworks in outdoor recreation.) The degree of exposure to natural hazards reflects the information available to users, and the decisions they make based on that information, with consideration of their own abilities and equipment. Weather data are fundamental, but must be grounded with a good understanding of local conditions and how certain weather events can compound with tides, the MPS tailrace discharge, winds and the local geography to create dangers in some or all areas. As such, the existing regime and proposed MTAD discharges are contributory factors to the risk environment in Deep Cove and Doubtful Sound. For an incident or accident to occur, several other risk factors would need to have contributed to the outcome (see Appendix 5).

The worst-case scenario is the death of a small boat user in Deep Cove or Doubtful Sound. In any such circumstance, the tailrace discharge will never be the sole cause of this outcome, in as much as the weather is never the sole cause of a sailing accident in the open sea. For a death or serious accident to occur, an individual or group would need to be insufficiently prepared or skilled for the existing environment, or be particularly foolhardy. That is, kayakers should be prepared to wait-out bad weather and, if this means camping in the Sound, have communication options to advise of any problems – at best a portable VHF to contact passing boats, potentially a satellite phone, and as a last resort, an EPRIB (see Appendix 4).

The sophisticated operating manual of a veteran tourism business like Fiordland Wilderness Experiences recognises the variable risks posed by Fiordland and plans ahead to manage them. Freedom kayakers must work with more limited experience. However, considering the basic character of Fiordland, a reasonable level of competence is assumed. In a setting like Doubtful Sound it must be taken as read that recreational visitors and tourism operators are accustomed to making sound judgements about their activities based on the information available and are suitably equipped.

The Fiordland National Park Management Plan (DOC 2007) classes the DOC-administered land at Deep Cove as a 'frontcountry' visitor setting, adjoining the Doubtful Sound 'remote' setting. The MTAD proposal will have no effect on these recreation setting classifications as they are not risk-based (consider the comparative risks of cycling in a city and tramping in a wilderness – it might be a jungle in the former, but an urban setting is not 'wilderness' just because it is dangerous), and the discharge is outside the classified areas.

The effect of the MTAD proposal on moored vessels is most likely to be minor or less, as the existing data indicate greater current velocity changes outside the high flow trial period than within it. The potential effects of MTAD on moored vessels do not indicate a change from what can normally be experienced.

Modelling in the MTAD Marine Surface Water Report suggests that the increased discharge will not have a marked effect on the degree to which standing waves break in the Sound, but may push areas of breaking waves further down the fiord. The presence of standing and / or breaking waves in the tailrace discharge will depend on wind and tidal effects. In periods of low wind, wave effects may not be noticeable. Conversely, when there is an up-fiord wind, the increased discharge may change the setting from one which is acceptable for recreation to one which is marginal, and from a marginal setting to a potentially unsafe one. The consequent scale of effect of when the tailrace discharge is periodically high is difficult to quantify. The additional review of surface water data in Appendix 3 (Request 2) shows that it is not possible, with the existing data, to extrapolate any direct relationship between water speed and wave characteristics. However, the following review in relation to kayak ground speed is relevant.

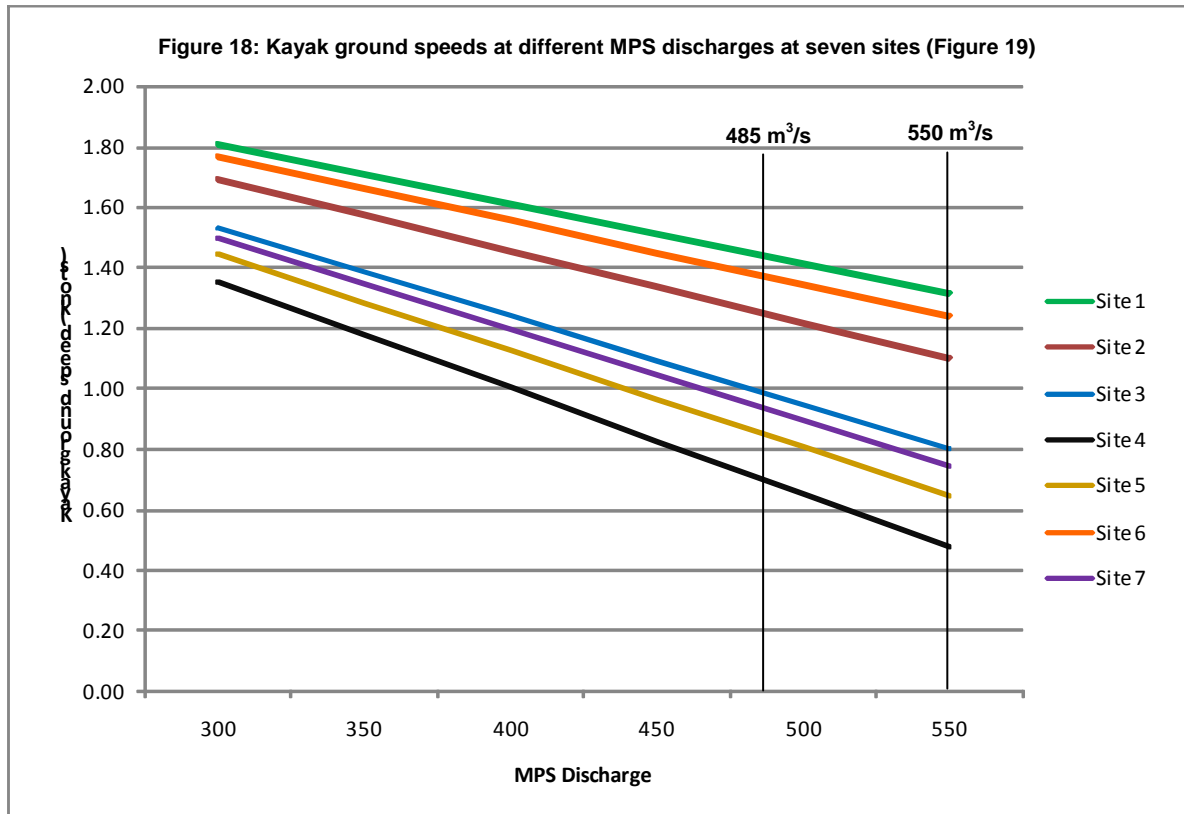
Kayak ground speed

The MTAD Marine Surface Water Report indicates that an average ~12% increase in near surface water velocity will result at flows of 550 m³/s, which are modelled to occur on almost 29% of 'summer' days in wet years. Mean velocity increases of at least 7% above that of a 485 m³/s MPS discharge are modelled to be likely occur more than 55% of the time in wet 'summers' (1 year in 6), 30% of the time in typical 'summers' (1 year in 1.5) and 13% of the time in dry summers (1 year in 5.5). Typically, high flow events could last for just over a week to a fortnight.

However, site-specific effects will vary, with, for example, an increase of up to 0.7 m/s at 550 m³/s from a generally static flow in the Rolla Gap. Figure 18 shows the effect of changes to kayak ground speed as a result of increases to the MPS tailrace discharge up to 550 m³/s at seven sites in the Sound (as located in Figure 19). These sites have been chosen to represent 'pinch points' on the standard kayak routes used (and identified) by Fiordland Wilderness Experiences. These data have been generated by the author of the MTAD Marine Surface Water Report in response to specific questions about the discharge effects on the recreation setting (see Appendix 3).

Figure 18 assumes kayakers have a water speed of 2.5 knots (4.6 km/hr) and shows that the effect of the discharge is not related to distance from the tailrace, but by local marine landforms and the trajectory of the discharge. Sites 1, 2 and 6 have the least effect, with a decrease in kayak ground speed between discharges of 485 m³/s and 550 m³/s of 0.13 of a knot at Site 1 (9% slower) and 0.15 of a knot at Site 2 (12% slower). At Site 4, the most effected, the reduction in ground speed is 0.23 of a knot (33% slower). At Site 5, in the middle of the discharge stream in the centre of the fiord, the reduction is 0.21 of a knot (25%).

Kayakers will naturally aim to avoid areas with the most swift currents, if they know where they are. They often rely on up-fiord winds and sails to save paddling, dodging between headlands to take advantage of counter-currents and wind shelter, rest in still areas before taking on the currents and / or winds around a headland, and occasionally rely on a guide to offer a tow for short distances. The MTAD release has the potential to change the current and wave setting in unpredictable ways, and the scale of effect will depend very much on the skills, experience, knowledge and fitness of the individual.



For the purposes of this assessment, the reduction in kayak ground speed between 485 m³/s and 550 m³/s is estimated to range from nil to 12% (the mean current speed change), but could be up to 33% at specific points at 550 m³/s, and nil at others (indeed, reverse eddies between headlands may increase ground speeds in the right direction). Although discharge events above 500 m³/s under the MTAD model will tend to occur more frequently during the morning and evenings, during weekdays, and in the spring, any user of Doubtful Sound should assume that they could occur at any time and potentially continue for days

If a kayaker paddled the 2.7 nautical miles from Brig Point to the beach at Wanganella Cove at a water speed of 2.5 knots during a 485 m³/s discharge with an opposing current of 1.5 knots¹¹ and no wind, the trip would take ~108 minutes. Assuming a mean surface water current increase of 12% at 550 m³/s, the time taken would increase to ~121 minutes. The extra 13 minutes paddling will only be an issue when a paddler is nearing exhaustion, unless the increased current speed accentuates or creates wave-against-current effects and increases the risk of capsiz.

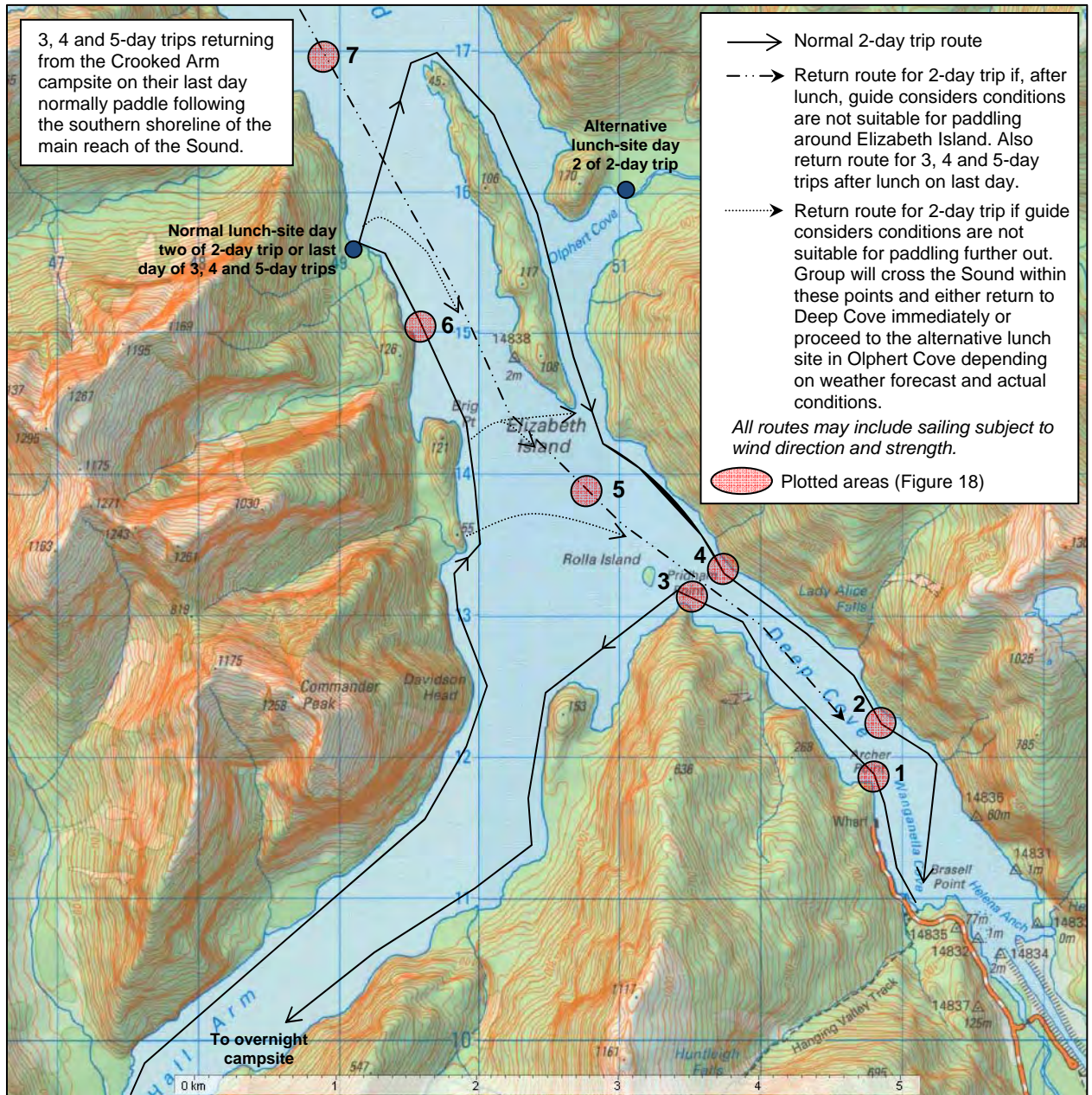
Conversely, a kayaker exiting Deep Cove will decrease their paddling time by the same amount and would not be exposed to the same level of increased risk at elevated discharge levels.

5.4 Summary

The potential effects of the MTAD proposal on recreation and tourism, without any mitigations, are listed below. Examples of adverse outcomes to which MTAD could contribute are given, including a worst case example (low chance, high impact) and a moderate outcome (more likely, low impact). These examples are given to illustrate how the increased discharge would only ever be a contributory factor in the event of an incident or accident. In the following section of this report, the same 'worst case' scenario is repeated with mitigations in place to illustrate the effect of the mitigations.

¹¹ The mean kayak ground speed of the seven plotted sites at 485 m³/s was 1 knot: the 1.5 knot water speed = (2.5 knots ground speed) – (1 knot opposing current).

Figure 19: Fiordland Wilderness Experiences two-day and multi-day kayaking routes



- **Sea kayakers:** Periodic increased surface water velocity and consequent changes to the wave characteristics in Deep Cove, and further out into Doubtful Sound, potentially increasing the risk of capsize, and exhaustion on the return leg of an excursion.

Scenario 1 – worst case: A party is returning from a multi-day kayaking trip in the Sound and its members have aimed at completing a long paddle on their last day. The weather is not good and deteriorating, but the group has insufficient food for another night out and two members of the team have a flight booked the following day. By the time they reach Elizabeth Island, the group is very tired and although members are struggling, decide to push on. They choose to attempt to sail the last section in the centre of the Sound, but an outgoing tide, a high MPS discharge and an up-fiord wind combine to create unexpectedly high standing waves. Two members in single boats capsize and are insufficiently skilled to either Eskimo roll or perform a wet entry (self rescue at sea), and are already very tired. Although the

remaining paddlers have a hand-held VHF, there are no vessels in the area to receive an emergency call. An EPIRB is activated but the capsized members suffer hypothermia as night falls.

In this situation, a commercially guided operation would not place their clients at this level of risk and would operate within a more advanced strategy. Either Scenario 2 would apply (but with adequate food) or the guide would request a pick-up by safety vessel by satellite phone at the Hall Arm campsite or via VHF relay.

Scenario 2 – moderate: The same party encounters poor weather and high waves on the return journey, resulting from the coincidence of tide, wind and MPS discharge, and decide to overnight inside Elizabeth Island. They are hungry, but early in the morning return to Deep Cove by hugging the northern side of the Fiord and crossing near Wanganella Cove. Two members miss their flights.

- **DCOET:** Periodic reduced opportunities for taking boats out of Wanganella Cove due to changed wave characteristics, and increased risk as a result of greater surface water velocity in the event of a boating incident (anyone in the water or an incapacitated boat will travel faster away from Deep Cove). Existing safety management protocols with regard to deciding whether to use boats outside Wanganella Cove, considering weather and water conditions, should retain the 'risk status quo' in terms of whether boats are exposed to dangerous seas. Coincidental existing issues – the loss of the Helena Falls Track and need for the Trust to review the operation of its safety vessel – compound to highlight issues with the status quo, which when addressed will reduce the level of risk exposure for the Trust generally.

Example 3 – worst case: The DCOET manager is reluctant to permit boat access to Helena Falls due to marginal conditions in Deep Cove, but is convinced by one parent who states that he is very skilled with small boats. Two boats cross the fiord safely and spend 40 minutes at the Falls. All members get wet and cold. In this time the MPS discharge has increased and although the crossing is clearly more dangerous, and it is possible to return to the Trust buildings by foot, the lead parent decides to hurry back by boat. The second parent's boat is swamped and its motor stops. One child panics and falls overboard. In the bouncing waves it is not possible to reach the child and the first parent is not willing to risk the students in his boat in a rescue. He drops them on the beach and heads back alone. The time delay is too great and the child drowns as he continues to panic in the current and chop. The DCOET manager was distracted by an injured child at the camp and did not see the incident in time.

Example 4 – moderate: The same party sees that conditions are too rough to return by boat and so perform some warm-up exercises on the beach before returning to the Trust buildings on foot. Three children slip on rocks and get blisters and bruises and never take up tramping as a hobby. The boats are unavailable for two days until they can be returned.

- **Moored vessels:** Although measurements reported in the MTAD High Flow Trial Report showed no changes to the characteristics of the Wanganella Cove counter current, there were anecdotal reports of an increased offshore 'push' against vessels attempting to berth, or already berthed, in the Cove during the high flow trials. This effect has been difficult to quantify as it is reported to also exist under quite low discharge patterns (~ 200 m³/s). Anecdotally the effect is stronger further from Brasell Point. Further review of the high flow trial data were requested of the author of the MTAD Marine Surface Water Report to confirm the scale of this effect

(Appendix 3, Request 1). The review concluded that there is no evidence in the data measured during the second high flow trial, or in the months following, that the current speeds at Meridian wharf or elsewhere in Wanganella Cove increase substantially when the tailrace discharge exceeds the present operational limit of 485 m³/s. Current speed is expected to increase with tailrace discharge, but only in an approximately proportional manner. For example, an increase in tailrace discharge of 12%, from 485 to 550 m³/s, should lead to a corresponding increase in the current speeds in Wanganella Cove. However, given that the current speed in Wanganella Cove is in the order of 0.1 m³/s, the expected velocity increase is in the order of 0.01 m³/s, which is too small to be detected against background variability. Should the MTAD discharge have a recognisable influence on this phenomenon, the potential effect on recreation and tourism would relate to minor increased wear (chafe) on mooring equipment, very minor increased risk of an accident when berthing, and the need for increased surveillance of mooring lines when boarding passengers.

The focus of this assessment relates to marginal effects on, in the case of kayaking especially, potentially marginal conditions. A marginal change in a marginal state may have a significant effect. However, in all cases, due to the many factors which influence sea conditions in the Sound, and the intermittent nature of the proposed increase in discharge, it is difficult to directly correlate a change in discharge with a specific and predictable effect, apart from a general increase in surface water velocity.

Potential effects of interest relate to increased personal risk, and loss of days on the water to freedom kayakers, commercial kayak operations and the DCOET. The effect of the increased surface water velocity in itself is 'minor', but coupled with adverse wind conditions, could be 'more than minor'. Table 11 details each effect, their likely magnitude and frequency, and their scale of effect considering two scenarios:

- Participants choosing to continue their activities at the same frequency as currently, and potentially increasing their level of risk exposure as a result of MTAD. This scenario applies primarily to sea kayakers.
- Participants choosing to do their activity less frequently as a result of the increased risk posed by MTAD, maintaining their level of risk exposure, but reducing the number of days their activity is possible. This scenario applies primarily to the DCOET.

The background conditions are of normally elevated potential risk compared with many coastal settings – an outcome of the changeable natural conditions in Fiordland and the existing tailrace discharge. As a result, no kayaker or other boat user should be surprised by seriously adverse conditions which require trip cancellation, or extra days spent in the Sound waiting for better weather. That is, kayakers and other boaters will not choose to experience worse conditions as a result of MTAD. However, with MTAD in place, periodic increased discharges may surprise kayakers already on the water, and increase their level of risk exposure when compounded with aggravating weather conditions, reducing the potential number of days of opportunity in general. None of these effects is considered 'significant' as they do not remove the small-boat potential from the setting.

A 'more than minor' effect is assessed to be an adverse effect potentially occurring on more than one third of the days of the year. The term 'potential' is important in this assessment as it refers to the requirement for adverse wind conditions to coincide with increased discharge to create increased risk due to wave effects. The scale of real effect will therefore be less than that indicated

by the modelled periods of each discharge. This assessment takes that into account, but also tends towards the conservative.

Table 11: Summary of potential effects without mitigation		
User group and potential effects	Potential outcomes	Potential scale and frequency of effect
Freedom sea kayakers. Periodic encounters with increased adverse wave conditions, increased paddle times on return	<ul style="list-style-type: none"> ▪ Fewer potential days on the water ▪ Increased risk exposure ▪ Decreased recreation potential for less competent individuals 	<ul style="list-style-type: none"> ▪ Minor in dry years. In 'summer' in 1 year in 5.5, the flow would be between 525 and 549 m³/s on average for ~22 days (11 %) and at 550 m³/s for ~5 days (3 %) ▪ More than minor in typical years. In 'summer' in 1 year in 1.5, the flow would be between 525 and 549 m³/s on average for ~50 days (22 %) and at 550 m³/s for ~18 days (9 %) ▪ More than minor in wet years. In 'summer' in 1 year in 6, the flow would be between 525 and 549 m³/s on average for ~57 days (27 %) and at 550 m³/s for ~61 days (29 %)
Guided sea kayaking. Periodic encounters with increased adverse wave conditions, increased paddle times on return	<ul style="list-style-type: none"> ▪ Fewer potential days on the water ▪ Increased risk exposure ▪ Increased use of safety boat ▪ Increased effort by guides – more towing, higher levels of professional competence required ▪ Reduced potential clientele – higher levels of personal competence required ▪ Increased cost of service 	
DCOET less frequently accessing Helena Falls and the north side of the fiord in small boats.	<p>Assuming the availability of pedestrian access to Helena Falls and the Trust's existing safety vessel being reviewed:</p> <ul style="list-style-type: none"> ▪ Fewer potential days crossing the tailrace discharge. Use of Wanganella Cove will be unaffected. 	<ul style="list-style-type: none"> ▪ Minor in all years.

6 Recommendations to avoid, remedy or mitigate

The management of effects on recreation and tourism on Lakes Manapouri and Te Anau, and on the Lower Waiau River, will reflect any changes in aquatic and terrestrial ecology, and this assessment defers to those studies in relation to these areas.

Mitigation options relate to:

- Reducing the risks to which freedom and guided kayakers may be exposed by providing relevant tailrace discharge information, and facilitating access to that information,
- Increasing the understanding of discharge, wave and wind effects in the Sound and disseminating this information.

6.1.1 Deep Cove Outdoor Education Trust

During research for this and the MTAD Boating Safety Report it became apparent that the Trust should review its existing safety boat and its deployment system. It is also unlikely that the Portal Track to Helena Falls will be maintained due to continuing rockfall and the Department of Conservation is reviewing the access options with a view to providing a bridge across the tailrace channel. Both these issues exist outside the MTAD consenting process, and it is assumed in this review that both have been attended to. Minimum and superior mitigation options are given.

Minimum mitigation

- Meridian provide to DCOET a full description of the potential effects of the proposal in relation to likely current speeds, wave effects and frequency and duration of discharge rates.

Mitigation effect on worst case scenario:

- The manager continues to make prudent decisions about risks posed by the setting, aware that tailrace discharges can vary unpredictably. He errs on the side of caution, does not permit access to Helena Falls by boat, and the students have the option of walking. A precautionary approach would be more common under the minimum mitigation option than under the enhanced option.

Superior mitigation

- Meridian provides real-time MPS discharge data via the Internet and an 0800 number.

Mitigation effect on worst case scenario:

- The manager observes the marginal conditions outside Wanganella Cove and notes via the Internet that the MPS discharge is shown to be moderate, with the obvious potential to increase. He does not permit access to Helena Falls by boat and the students have the option of walking.

6.1.2 Commercial and freedom kayakers

Mitigations are presented as a series of options, ranging from making available general information about the tailrace discharge to providing real-time data within Deep Sound. The former represents the minimum recommended mitigation, and the latter relates to various options which offer, in addition, general enhancements to the recreation and commercial setting. The minimum options refer to activities which should be undertaken upon granting of consent. The latter options are those which can be investigated over time as monitoring data are analysed. Each mitigation option is incremental and includes the prior mitigation.

Minimum mitigation

- Provide all commercial operators in the Sound with a full description of the potential effects of the proposal in relation to current speeds, wave effects and frequency and duration of proposed discharges.
- Make available a full description of the potential effects of the proposal in relation to likely current speeds, wave effects and frequency and duration of proposed discharges via the Internet, relevant marine charts and guides, and printed material distributed through regional visitor information offices (including DOC), kayak rental agencies, regional kayak clubs, outdoor shops and at Deep Cove. If requested, provide staff to discuss discharge effects with recognised regional recreation groups.

Mitigation effect on worst case scenario:

- The freedom kayak group – introduced in Section 5.4 – would be more likely to be aware of the vagaries of the MPS discharge and adopt a more risk averse approach to their trip. Recognising that the return journey could be longer if the discharge is high, the party divides the return paddle into two days and arrives off Elizabeth Island earlier in the day and with more vigour and safely navigate the poor conditions. They have been able to explore less of the Sound in the given time as a result.
- Commercially guided operations will also be more risk averse and increase the frequency of use of safety vessels, incurring additional costs and the removal of some satisfaction from the experience as a result of the increased intrusion of a motorised vessel on the remote experience.

Moderate mitigation

- Provide real-time data about MPS discharge rates via the Internet and an 0800 line.

Mitigation effect on worst case scenario:

- Marginal improvement for the freedom kayak group on the minimum mitigation unless they had a satellite phone. However, as they would be very unlikely to use the satellite phone on the water, the lag time between a call from a landing site and their entering the discharge trajectory could be long enough to render the information useless or, worse, misleading. However, the availability of the data on the internet would promote a more precautionary approach from the outset and may have encouraged the group to carry an extra day's food. Should a kayaker be able to establish a VHF link with the DCOET (direct or via a third-party relay), they would be able to request information about the flow. This could not, however, be guaranteed.
- Commercially guided operators would benefit in the same manner as the freedom kayak group. However, the longer experience of the guided group would mean a more advanced understanding of seasonal patterns. Daily data about the discharge via satellite phone, tempered by experience, would be a marginal advantage.

Advanced mitigation

- Real-time MPS data via telemetry to an in-fiord information system, such as a lighted marine buoy located outside the entrance to Deep Cove. This would show if the discharge was, for example, high, moderate or low. Considering potential costs, it may be advantageous to replace this option with the 'superior mitigation with enhancement'.

Mitigation effect on worst case scenario:

- Reduction in risk exposure by detailing likely sea conditions for the freedom kayakers. The party are aware that conditions are potentially relatively difficult, encouraging an early decision to camp overnight.
- Less likelihood of use of rescue boat for commercially guided groups as they are more certain about likelihood of adverse sea conditions (less need to be overly cautious).

Superior mitigation with enhancement

- Real-time MPS discharge data via VHF 'nowcasting' service into the fiord, offering broadcast communication options into and out of Doubtful Sound and Deep Cove via a strategically located VHF repeater station with up to three channels – 16 (emergency), 20 (nowcasting) and an additional working channel. Each channel is an incremental cost in hardware but can be based at the same site. The 'nowcasting' channel would be the core mitigation element, but could also be an on-request service on a working channel, so long as Meridian constantly monitored that channel from West Arm. This would reduce the number of repeaters, but would restrict access to the service to only those individuals with VHF licences (those without a licence are only permitted to transmit emergency calls and to listen to provided services, such as scheduled or 'nowcast' weather forecasts).

Mitigation effect on worst case scenario:

- Reduction in risk exposure for commercial and casual sea kayaking by providing advanced on-the-water inter- and intra-Sound communications, access to weather forecasts and MPS discharge data. Reduction in use of rescue boat via better forward planning. More effective broadcast communications in case of emergency.

Summary

It is arguable whether freedom kayakers will be less likely to cancel their trip in the event of increased tailrace discharges, as they tend to plan for their trip some period in advance without the advice of, and monitoring of the fiord by a guiding company. The effect of the discharge may be to generally increase the caution applied by freedom kayakers, reducing the willingness of less skilled kayakers to attempt the setting. However, any freedom kayaker in the Sounds needs a high level of competence under the status quo, and there may be no change to the skill threshold, which is already set high. At each level of mitigation there will remain an effect on the number of days that small boat opportunities remain. Each mitigation level provides an increased ability to manage risk on-the-water. This means less requirement to be precautionary and more ability to make more reliable decisions on an ongoing basis. This would be reflected in a reduction in the number of lost days to recreation. The final effect on kayaking will generally be minor in dry and typical years and may be more than minor in some wet years when adverse wind conditions and increased discharge flows conspire. The net effect on the DCOET will be minor.

Monitoring over time will indicate the degree to which each level of mitigation reduces the scales of effect from, potentially, more than minor in wet years.

7 Monitoring

Monitoring recommendations relate to the main area of uncertainty in this assessment, specifically the ongoing effects of increased discharge on surface water currents within the Sound. Two options are evident: ongoing review and consultation with Fiordland Wilderness Experiences as a proxy for independent kayakers, and with the DCOET; and/or empirical monitoring of 'near surface' water velocities and wave effects. The empirical monitoring of 'near surface' water velocity and wave effects is not recommended, as data will be subject to inevitable degrees of uncertainty as a result of the natural vagaries of the setting and the narrow focus of the measuring equipment (Mark Hadfield, pers comm.). It is doubtful that wave monitoring equipment will provide information that is reliable enough to be of any value. Rather, it is recommended that conditions in the Sound are monitored via direct communication between Meridian, Fiordland Wilderness Experiences and DCOET.

Direct communication with Fiordland Wilderness Experiences and DCOET regarding their experience of the setting over time, and formal review of the setting after a sufficient period (two years) will allow review of the relevance of increased levels of mitigation, as identified in Section 6 of this report. This recommendation also serves as a mitigation in itself, since it will enable Meridian to provide ongoing information to all users of the Sound about local water conditions, which will assist in risk reduction.

A formal recording process of observations by Fiordland Wilderness Experiences and DCOET of their experiences and observations would increase the reliability of assessments and the ability to correlate observations with specific discharge levels. It is therefore recommended that Meridian maintain and encourage ongoing communication with Fiordland Wilderness Experiences and DCOET with the aim of collecting anecdotal data about tailrace discharge effects. Data would be most useful if it includes:

- Date and time
- Observed weather conditions
- Observed sea state
- Effect on operation

Therefore it is recommended that Meridian advise Fiordland Wilderness Experiences and DCOET that if they experience adverse conditions that they think may be attributable to the tailrace discharge, that they record this information, and contact an identified liaison person at Meridian directly so that data can be recorded and investigated.

As Meridian cannot necessarily rely on an independent third party to provide information, it is also recommended that Meridian contact Fiordland Wilderness Experiences and DCOET, on an annual basis, to consult regarding the possible effects of the tailrace discharge operations.

8 Conclusion

The MTAD proposal will have no direct effects on recreation and tourism in Lakes Manapouri and Te Anau, and on the Lower Waiau River. Ecological, landscape and sediment effects are unlikely to be important, and changes to periphyton accumulation in the Lower Waiau River is recommended to be monitored and managed by flushing flows.

The core area of interest is surface water effects on recreation and tourism use of Deep Cove and Doubtful Sound. The unmitigated effects relate to:

- A potential increase in the level of risk exposure,
- A reduction in the number of days that some activities are possible on the Sound (kayaking and DCOET boat use specifically), and
- Effects on the berthing and mooring of vessels in Wanganella Cove.

The latter issue has been reviewed by NIWA, as detailed in Appendix 3, and it appears that MTAD effects will be no greater than that experienced under the status quo or too minor to be measured.

Changes to level of risk, and the number of days boating activities are possible (or safety boats are required to return kayakers to Deep Cove) are difficult to quantify. This assessment indicates that while the changes in themselves may be minor, they may have a compounding effect within a setting that often features marginal conditions.

For guided and freedom sea kayaking, more than minor adverse effects are anticipated for typical and wet years in relation to increased exposure to risk and a reduction in the number of days that small boat activities are possible. Minor effects are anticipated in dry years. Adverse effects may be mitigated to minor in typical years, but will remain more than minor in wet years.

For the DCOET, this review and that of the MTAD Marine Safety Report have highlighted the need to upgrade the Trust's existing safety boat. The closure of the Portal Track to Helen Falls has also compounded the need to manage pedestrian access to Helena Falls, and addressing this issue is being considered outside the MTAD process. Potential adverse effects of the Trust will be minor.

The recommendations made in this study relate to:

- Providing and enabling access to information services,
- Developing a monitoring and review programme in consultation with Fiordland Wilderness Experiences and DCOET in relation to changes to the amenity of the coastal environment as a result of MTAD, and reviewing the scale of necessary mitigation over time.

It is expected that the MTAD proposal will change the background water conditions in the fiord. Prior to the development of the scheme, the current recreational uses of the setting did not exist to anywhere near their current scale – Doubtful Sound would otherwise be the same as any other fiord, bar Milford. As a result, the existing discharge patterns represent a baseline environment to which skippers, crew and recreational boat users have become accustomed – many may have not known anything different. The MTAD proposal represents a minor shift in that baseline and it will take some time for users of the fiord to adjust.

It is arguable whether freedom kayakers will be less likely to cancel their trip in the event of increased tailrace discharges, as they tend to plan for their trip some period in advance without the advice and monitoring of the fiord of a guiding company. The effect of the discharge may be to generally increase the caution applied by freedom kayakers, reducing the willingness of less skilled kayakers to attempt the setting. However, any freedom kayaker in the Sounds needs a high level of

competence under the status quo, and there may be no change to the skill threshold, which is already set high. At each level of mitigation there will remain an effect on the number of days that small boat opportunities remain. Each mitigation level, however, provides an increased ability to manage risk on-the-water. This means less requirement to be precautionary and more ability to make more reliable decisions on an ongoing basis. This would be reflected in a reduction in the number of lost days to recreation. The final effect on kayaking will generally be minor in dry and typical years and may be more-than-minor in some wet years when adverse wind conditions and increased discharge flows conspire. The net effect on the DCOET will be minor.

Monitoring over time will indicate the degree to which each level of mitigation reduces the scales of effect from, potentially, more than minor in wet and typical years.

9 References

- Allan, S., Booth, K. 1992. *River and lake recreation: issues, research priorities and annotated bibliography*. Environmental Planning and Assessment, Wellington.
- Anderson, M. 1992. *Report on Tourism and Recreation in the Waiau Catchment*. Client report for the Waiau River Working Party – Recreation Task Group.
- Boffa Miskell Ltd, 2000. *Public perception monitoring report. Second Manapouri tailrace excavations*. Client report for Meridian Energy Ltd.
- Boffa Miskell Ltd, 2000. *Lower Waiau Landscape monitoring report*. Client report for Meridian Energy Ltd.
- Booth, K. Espiner, S. Higham, J.E.S. 2007. *Fiordland (Te Moana o Atawhenua) Marine Area User Study 2007*. Kay Booth and Associates client report prepared for MAF, Biosecurity New Zealand, Department of Conservation, Environment Southland, Fiordland Marine Guardians, Ministry for the Environment and Ministry of Fisheries.
- Davis, S.F. 1987. *Wetlands of national importance to fisheries*. New Zealand Freshwater Fisheries Report No. 90. MAFFish, Christchurch.
- Department of Conservation. 2007. *Fiordland National Park Management Plan*. DOC, Southland (unpublished format).
- Egarr, G. 1995. *New Zealand's South Rivers, A Guide for Canoeists, Kayakers and Rafters*. Nikau Press.
- Egarr, G.D, Egarr, J.H. 1981. *New Zealand Recreational River Survey Parts I, II and III*. Water & Soil Division, Ministry of Works and Development.
- Fink-Jensen, K. Johnson, M. Simpson-Edwards, M. 2004a. *Freshwater recreational users. Survey of freshwater use in New Zealand*. BRC Marketing & Social Research for MfE.
- Fink-Jensen, K. Johnson, M. Simpson-Edwards, M. 2004b. *Freshwater recreational users. Internet survey of freshwater use in New Zealand*. BRC Marketing & Social Research for MfE.
- Greenaway, R. 2006. *Assessments of effects for hydro schemes*. Paper presented at the 2006 NZ Association for Impact Assessment (NZAIA) national annual conference, Dunedin.
- Greenaway, R. 2002. *Port Hills Recreation Survey 2002*. Christchurch City Council.
- Greenaway, R. 2001. *Hurunui River Recreation Study 2000/01*. Fish and Game Council and Environment Canterbury.
- Grindel, D.S. (ed) 1984. *A national inventory of wild and scenic rivers*. Water and Soil Directorate, Ministry of Works and Development. Water and Soil Miscellaneous Publication No. 68.
- Grindel, D.S. Guest, P.A. (eds) 1986. *A list of rivers and lakes deserving inclusion in a Schedule of Protected Waters*. Report of the Protected Waters Assessment Committee. Water and Soil Directorate, Ministry of Works and Development. Water and Soil Miscellaneous Publication No. 97.
- Haddock, H. 1993. *Outdoor safety – risk management for outdoor leaders*. Mountain Safety Manual 38. New Zealand Mountain Safety Council, Wellington.
- Hadfield, M. O'Callaghan, J. Stevens, C. Grant, B. Stewart, C. 2008. *Effects of Manapouri Tailrace high-flow conditions on currents and waves in Deep Cove and Doubtful Sound*. NIWA client report WLG2007-75 for Meridian Energy Ltd.
- Kearsley, G. 1994. *Waiau River Recreation Survey*. Client report for Waiau River Working Party.
- Kelly, G.R. 1988. *An inventory of whitebaiting rivers in the South Island*. New Zealand Freshwater Fisheries report No. 101. MAFFish, Christchurch.
- Kent, J. 2006. *South Island, Trout Fishing Guide*. Reed Publishing (NZ) Ltd.
- Mabin, M. 2008. *Manapouri Amended Tailrace Discharge Project: Description of the proposed activity*. URS client report for Meridian Energy.
- Ministry for the Environment. 2004a. *Potential Water Bodies of National Importance for Recreation Value*. MfE number 559. Wellington.
- Ministry for the Environment. 2004b. *Sustainable Water Programme of Action: Potential water bodies of national importance. Technical Working Paper*. MfE number 562. Wellington.
- Ministry for the Environment. 1988. *Flow Guidelines for Instream Values Vol A*. MfE, Wellington.
- Ministry of Tourism. 2004. *Waters of national importance for tourism*. Ministry of Tourism, Wellington.

- Rodway, M. 2001. *Angler use of the Waiau River between the Mararoa Weir and Monowai 1996 – 2001*. Fish and Game Southland Region report for Meridian Energy.
- Tierney, L.D., Unwin, M.J., Richardson, J. 1984. *The relative values of Southland Rivers to New Zealand anglers*. Fisheries Environmental Report No. 50. NZ Ministry of Agriculture and Fisheries. Wellington.
- Tierney, L.D., Unwin, M.J., Rowe, D.K., McDowall, R.M., Graynoth, E. 1982. *Submission on the draft inventory of wild and scenic rivers of national importance*. Ministry of Agriculture and Fisheries. Fisheries Environmental Report No. 28.
- Unwin, M.J., Brown, S. 1998. *The geography of freshwater angling in New Zealand: A summary of results from the 1994/96 National Angling Survey*. NIWA Christchurch
- Unwin, M.J., Image, K. 2003. *Angler usage of lake and river fisheries managed by Fish and Game New Zealand: results from the 2001/02 National Angling Survey*. NIWA Christchurch.
- Wild, G.J.S. 2001. *Target Risk 2*. PDE Publications, Canada.

1 Appendix 1: Supporting data

This section reviews new and existing data to describe the recreation activities and values of the proposal area. As no quantified survey of recreational users of the entire study area has been completed it is necessary to rely on a multi-method approach, and to triangulate between several data sources to support the assessment of effects.

This literature review includes reference to:

- Published recreation-related research on the study area,
- Relevant and contemporary popular published guides to recreation in New Zealand,
- Relevant websites detailing recreation opportunities in the proposal area and New Zealand.

Website references are given in footnotes to the text of the report (all web references are based on searches carried out in April 2008).

The results from these studies and reviews are used to identify the recreational uses of the waterbodies in the proposal area, and to advise the assessment of significance of each activity and each location.

1.1 On-line presence

The on-line presence survey was based on an internet search (Google) for references to 12 specific waterbodies in and around the proposal area – each chosen due to their scale and location within the region. The major waterbodies in the catchment were included and a number of other sites chosen to offer the ability to make some comparisons. The full method is described in Appendix 7. The locations were:

- | | | |
|---------------------------|-----------------|------------------|
| ▪ Lake Manapouri | ▪ Deep Cove | ▪ Tuatapere |
| ▪ Lake Te Anau | ▪ Mararoa River | ▪ Crooked Arm |
| ▪ Waiau River | ▪ Te Waewae Bay | ▪ Hall Arm |
| ▪ Manapouri Power Station | ▪ Waiau Arm | ▪ Doubtful Sound |

Several other sites were also searched, but no recreation-related results were found. These were:

- | | | |
|-------------------|-------------------|--------------------|
| ▪ Upukerora River | ▪ Wanganella Cove | ▪ Helena Anchorage |
|-------------------|-------------------|--------------------|

Websites were reviewed for their main focus and were categorised according to eight subject areas: tourism/recreation, academic, commercial, community news/local government, media/news, photography, conservation and 'other'. Where a recreation or tourism focused page was identified, the activities it recommended were counted.

The study generated a set of results to show the relative significance of each site (in terms of on-line presence), and the recreation activities which were recommended or reported to occur at each site. Figure 20 presents the relative significance of each site and shows the percent of web pages which related to recreation or tourism activities (in green, or extending clockwise from the horizontal if in black and white). That is, the size of the circle relates to the number of results for each waterbody, and the area in green identifies the proportion of pages that were primarily about the waterbody's recreational attributes.

Doubtful Sound, Lake Manapouri and Tuatapere gained the most results. Doubtful Sound also had the highest percentage of recreation related references.

Charts 1 and 2 quantify the recreation and tourism activities which were reported by websites for each location (by activity and by location). All data shown in Figure 20 and the two charts feature in

Table 14. Relevant text from websites with information relating to recreation on each location are listed in Appendix 6.

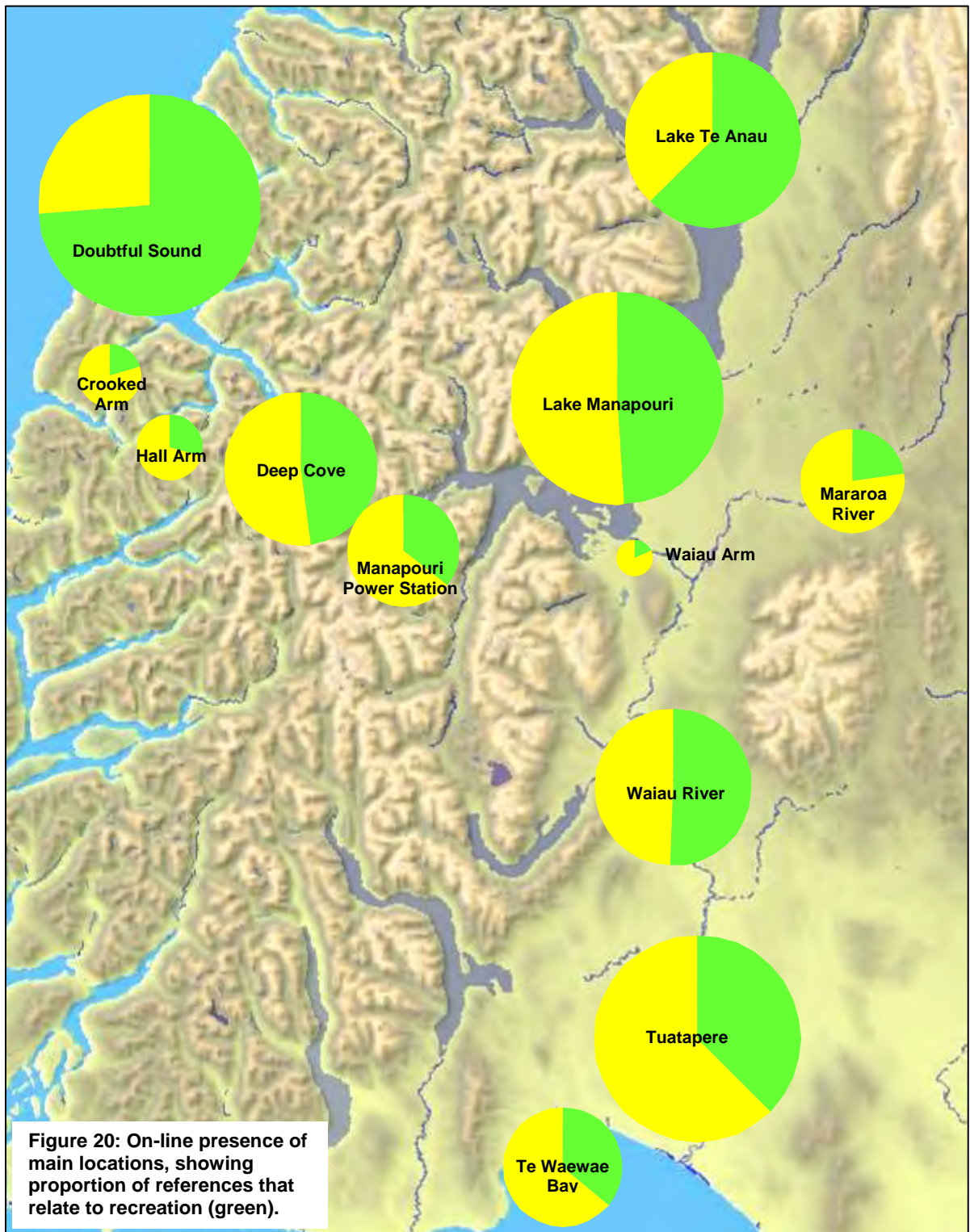


Chart 1: On-line presence - location by activity

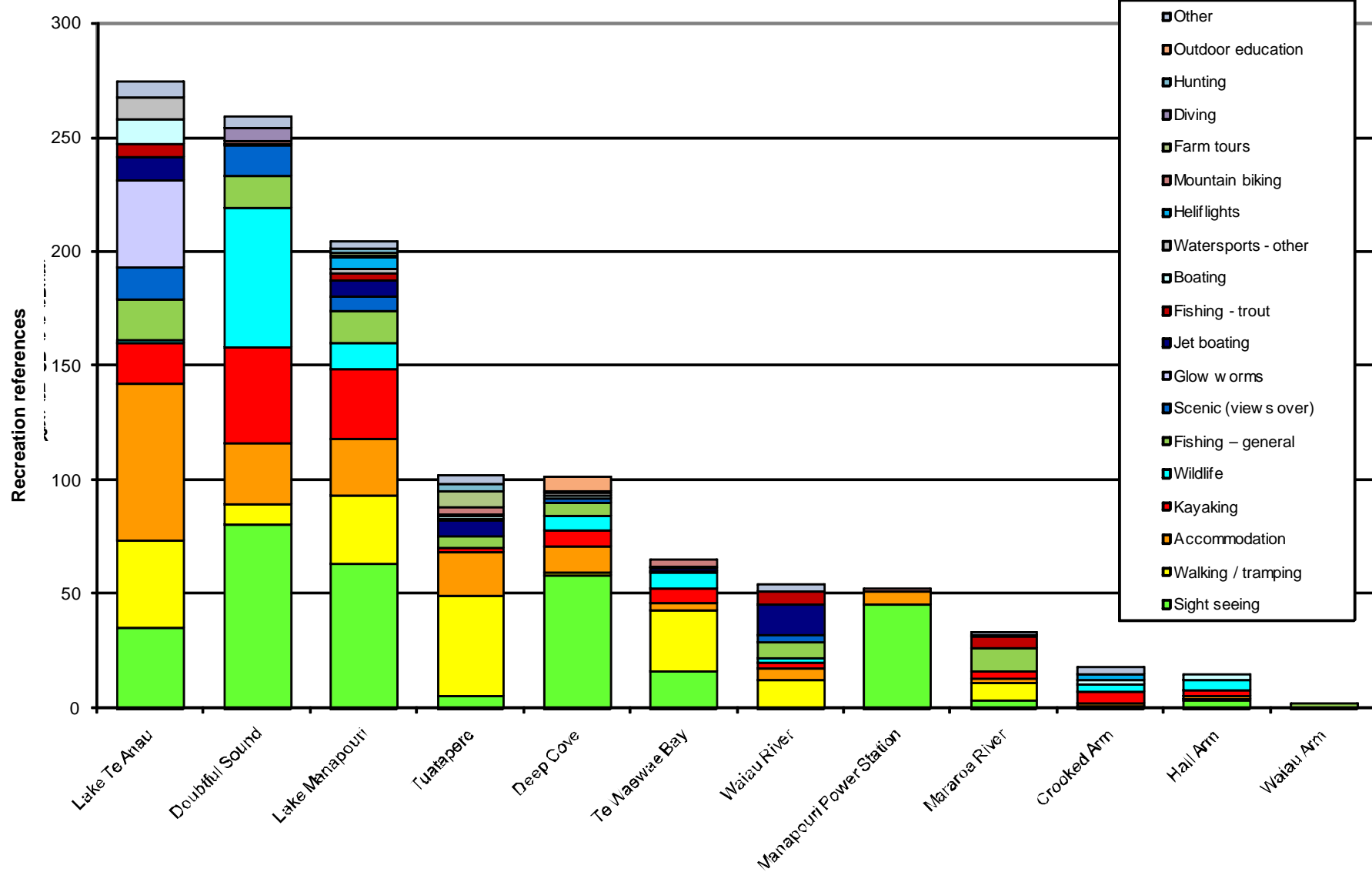


Chart 2: On-line presence - Activity by location

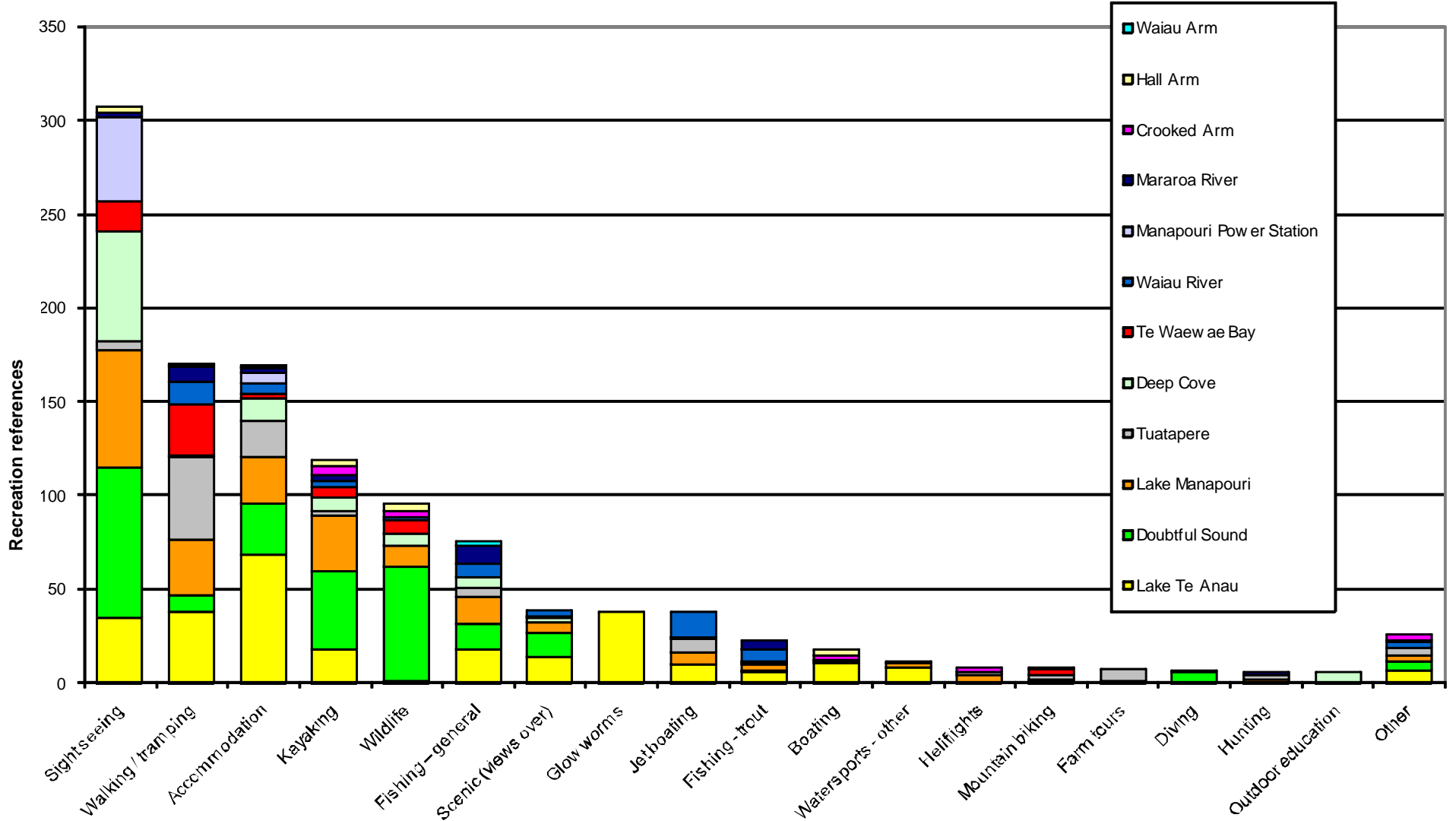


Table 14: Summary of on-line presence study. Location by number of results and by number and type of recreation reference. Sorted from left by greatest number of web pages with recreation results.

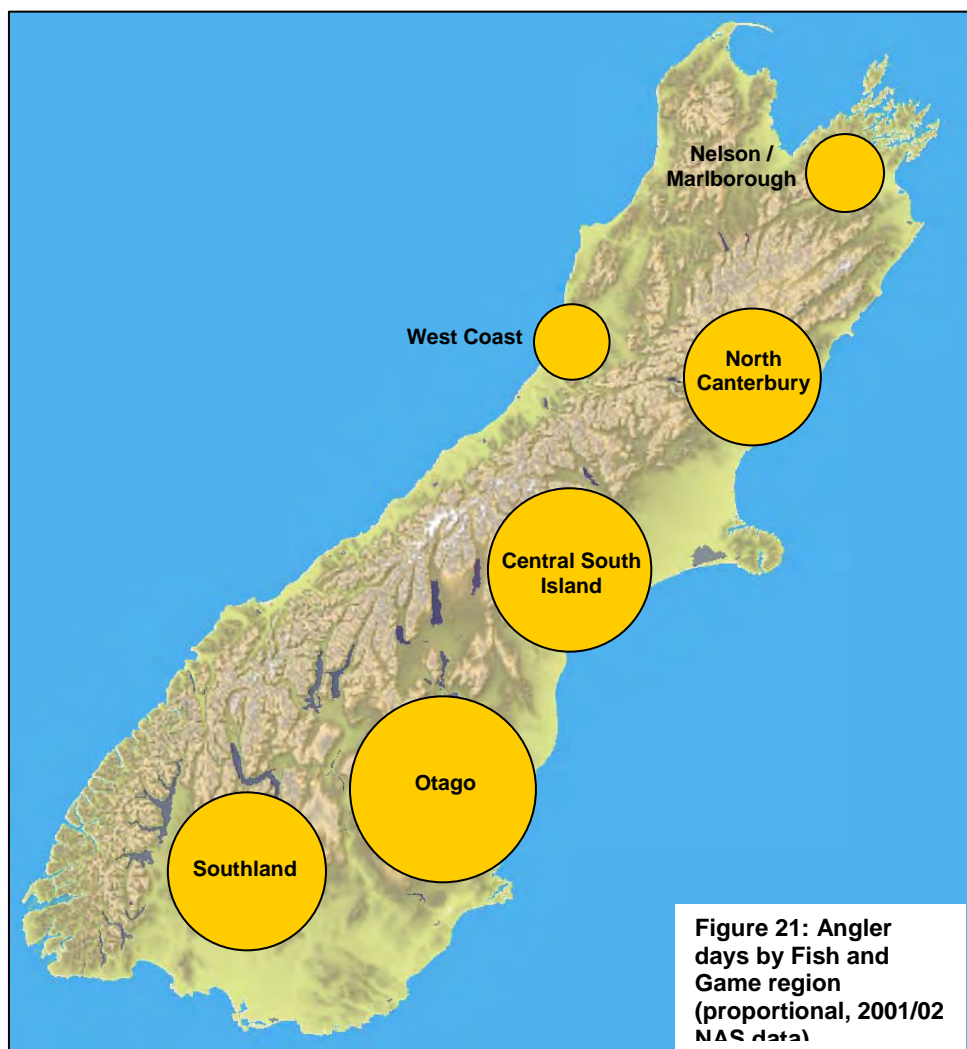
	Doubtful Sound	Lake Te Anau	Lake Manapouri	Tuatapere	Deep Cove	Te Waewae Bay	Waiau River	Manapouri Power Station	Mararoa River	Crooked Arm	Hall Arm	Waiau Arm
Web pages listed¹²	715	425	641	616	342	205	352	187	155	54	63	13
Percent recreation	74%	63%	49%	37%	48%	36%	51%	36%	23%	29%	20%	18%
Sight seeing	80	35	63	5	58	16		45	3		3	
Walking / tramping	9	38	30	44	1	27	12		8	1	1	
Accommodation	27	69	25	19	12	3	5	6	2	1	1	
Kayaking	42	18	30	2	7	6	3		3	5	3	
Wildlife	61	1	12		6	7	2			3	4	
Fishing – general	14	18	14	5	6		7		10			2
Scenic (views over)	13	14	6		2	1	3					
Glow worms		38										
Jet boating		10	7	7		1	13					
Fishing - trout	1	6	3	1		1	6		5			
Boating		11		1	1					2	3	
Watersports - other		9	2		1							
Heliflights			5	1						3		
Mountain biking	1		1	3		3		1				
Farm tours			1	7								
Diving	6				1							
Hunting			2	3					1			
Outdoor education					6							
Other	5	7	3	4			3		1	3		

¹² See Appendix 2 for a definition of this term.

1.2 The 2001/02 and 1994/96 national angler surveys

The national angler surveys (NAS) completed for Fish and Game New Zealand by NIWA are useful for comparing the level of recreational use of the various waterbodies in the proposal area (Unwin and Image 2003 and Unwin and Brown 1998).

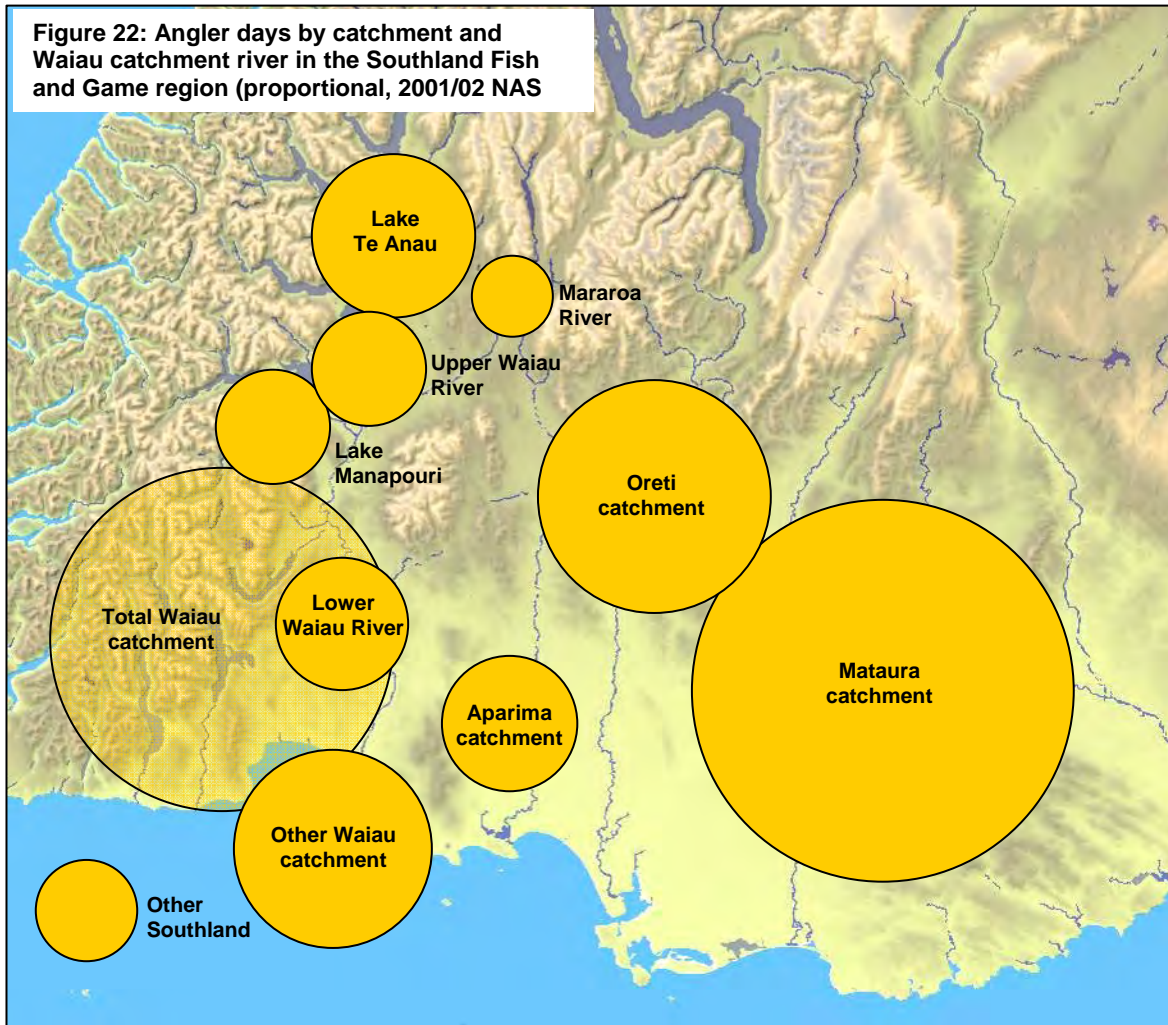
The NAS results are based on a national phone survey of a sample of licensed anglers, relying on their recall over a two month period. The sample size (those phoned and interviewed) relative to the target population (licence holders) varied between a high level of coverage in regions with low levels of licence sales (30% in Northland) and a lower level of coverage in areas with higher numbers of sales (5% in the Central South Island). Regional Fish and Game staff managed the respondent interviewing process at the regional level.



The survey process was complex and required a number of assumptions to be used in sampling and analysis, all of which are necessary and inevitable in studies of this complexity. However, without calibration it is impossible to check whether the assumptions and survey technique are in fact offering accurate data. As calibration has not been completed (Martin Unwin, NIWA, pers comm.), the NAS studies should be used only in a relative sense (comparing levels of use, rather than defining actual levels of use at specific sites) as any error is most likely to have been applied evenly across all data sets. This means that while the figure of 5920 (± 1120) angler days on the Upper Waiau River for the 2001/02 period covered by the national angler survey might be unreliable (more so due to the high error), it is possible to more confidently state that the Upper Waiau is only a little less popular than the Lower Waiau River (7890 (± 1120) angler days), and that the Waiau catchment (53,490 (± 3160) angler days) is only somewhat less popular than the Matakura catchment (66,270 (± 4250) angler days).

Figure 22 illustrates how Lake Te Anau contributed 22% of the angler days in the Waiau catchment and 8% of all angling in the Southland Fish and Game region. The Upper Waiau River contributed 4% of all angling in the region and the Lower 5%.

Figure 22: Angler days by catchment and Waiau catchment river in the Southland Fish and Game region (proportional, 2001/02 NAS)



1.3 Relative value of Southland Rivers to New Zealand anglers

In the 1980s a series of New Zealand Freshwater Fisheries Reports were issued with the aim of identifying and assessing the local and regionally significant angling rivers of each region. These reports were based on the 1979 – 1981 national angler study developed to support the Fisheries Research Division submission on the *Draft inventory of wild and scenic rivers of national importance* (Teirney *et al* 1982). The submission was intended to identify rivers of national significance, and did not include the Waiau River.

The Fisheries Environmental Report No. 50 (Teirney *et al* 1984) reported on findings of the postal survey in reference to Southland rivers, which was responded to by 430 anglers from the Southland region. Of the 430 respondents, 158 respondents had fished the Waiau River. The average annual number of trips reported for trout anglers was 6.3 and an estimate of 100 anglers was generated for all use of the Waiau River, with an estimate of 988 annual angler visits was made. Respondents described the River as of high importance (4 on a 5 point scale).

Notably the survey results do not differentiate the Upper and Lower Waiau Rivers, and the text relating to the results suggest that only the Lower Waiau River was considered (p45):

“Before the Waiau and Mararoa River water was diverted back to lake Manapouri and through the power scheme, the Waiau was one of New Zealand's largest and swiftest rivers, with a mean annual flow of 500 m³/s. Discharge of water into the 2-km reach

immediately downstream of the Mararoa weir, just below the confluence of these rivers, is now sporadic owing to Electricity Division (Ministry of Energy) operations. At the river mouth, discharge has been reduced to a mean annual flow of 170 m³/s (Duffill Watts & King Ltd. 1983)."

The report concludes by identifying eight rivers in Southland of 'regional/national, regional or local importance'. The Waiau was identified as of 'regional importance' (p57):

"The Waiau may once have been of national importance because it was reputedly of exceptional value before the diversion of water for hydro-electric generation. Overall, the survey results indicate that the Waiau now supports a good, but not exceptional, fishery, and it is of regional importance."

1.4 Angler use of the Waiau River between the Mararoa Weir and Monowai 1996 – 2001

Rodway (2001) of Fish and Game Southland completed a telephone survey of 60 Lower Waiau River anglers during the 2001 season for Meridian, and compared the results with five similar surveys carried out from 1996. The first survey was completed prior to the minimum flows of 12 m³/s (winter) and 16 m³/s (summer) being instated on the Lower Waiau River, and so some comparison between flow regimes was possible.

The survey data indicated a 12-fold increase in use of the Lower Waiau River between 1996 and 2001. By comparison, the 1994/96 and 2001/02 NAS results showed less than a doubling in the same period for the Lower and Upper Waiau Rivers combined. Both studies relied on different research methods and comparisons are difficult to make.

The survey canvassed opinion regarding eight river attributes: peace and solitude, scenic beauty, catch rate, wilderness, river beauty, fish size, river size, and reputation. The results showed (p4), "no strong trends in any of the attributes over the period of the survey [1996 – 2001] or significant differences overall.... However catch rate appeared to be relatively important, with fish size being less so. Attributes relating to peace and solitude may have declined."

The change in quality of the fishery was assessed by asking anglers to rate the quality of the fishery on a five point scale, and to rank the Lower Waiau in comparison with other rivers fished. Table 15 shows the means for each year, with 1996 the baseline for the River without the seasonal minimum flows.

Year	1996	1997	1998	1999	2000	2001
Number of survey respondents	25	24	28	40	47	60
Quality of the river (5=exceptional, 1= very poor)	3.4	3.6	3.7	3.5	3.8	3.8
River score relative to other rivers (1=worst)	3.1	3.9	4.2	3.7	3.7	3.8

At face value the data suggest an improvement in the fishery over time, although satisfaction was stable in the last two to three seasons. However, the baseline data (1996) with a sample size of 25 has a high margin of error ($\pm 19.4\%$ at the 95% confidence level at the sample mean, giving an error range for 1996 of 4.1 to 2.7), and although there is a difference between the means, the high error margins confuse the true picture and makes any trend data unreliable. The same errors apply to the river score means (3.7 to 2.5 for 1996, 4.9 to 3.4 for 1998).

The report suggests in relation to the quality score that (p6), "comparisons revealed differences suggesting factors other than a change in the river flow and know abundance of fish were important." And concludes:

“Despite the increase [in base flow] the opinions of anglers surveyed do not reveal any significant change over the six years of the survey for most of the attributes ascribed to the [Lower] Waiau River angling experience. However, it is likely that a high catch rate is now one of the most important attributes of the river. With the increasing use of the river, peace and solitude may have declined.

Anglers now appear to rank the Waiau more highly when compared to other rivers than they did in 1996.”

As stated above, the high error margins make the final conclusion unreliable.

1.5 The Waiau River Recreation Survey 1994

Kearsley (1994) completed a comprehensive survey of the recreation and tourism values of the Waiau catchment by targeting four respondent groups: residents of Tuatapere, the Waiau Valley and a sample of Te Anau residents (461 respondents, or 73% of the target population); a sample of 137 Southland residents (34% response rate); and visitors to Te Anau, Manapouri, Tuatapere and various recreational sites along the Waiau River (it is not clear if the Upper Waiau was targeted) (221 responses). Forty interviews were also carried out with anglers who had fished the Lower Waiau River prior to hydro control.

The study predated the instatement of the seasonal minimum flows in the Lower Waiau River, so the results in relation to the River do not represent the current setting, particularly considering that the NAS data show a doubling in the level of angling between 1994/1996 and 2001/02. Nonetheless, some of the data remains useful (data excluded here includes reference to the level or ratios of recreation activity in the River and reference to data about increasing base flows):

- **Managing river flows:** Local residents were more likely to consider that a consistent flow in the Lower Waiau River would improve recreation than a ‘natural flow’, with a similar preference from regional respondents.
- **Beach sizes in the lakes:** 36% of local residents preferred ‘quite a large beach’, 25% preferred a ‘fairly small beach’ and 30% had no preference. Similar results were gained from regional respondents (38%, 26% and 25% respectively)¹³. Locals thought large beaches gave more room, especially for children, looked nicer and allowed more recreational opportunities; smaller beaches looked nicer or were more natural. Regional respondents thought large beaches gave more room to park boats, looked nicer, were safer for children and gave more room for various activities; small beaches looked nicer and were more natural. The visitor sample respondents showed a slight comparative preference for small beaches (27% for ‘quite a large beach’, 39% for ‘a fairly small beach’ 14% for ‘a very small beach’). Smaller beaches were considered to be better looking, whereas large beaches gave better access and more room for activities.
- **Lake level controls:** 34% of local residents thought lake level controls affected their recreation, and 35% said it did not. Regional respondents were less affected, with 47% saying lake levels had no effect, and 25% saying they did. Few reasons were given by the regional sample for negative effects, but included difficulty in parking boats at high levels and impacts of fluctuating levels on angling. Local residents noted: better access for fishing and poorer fishing at low levels; at high levels, no or insufficient beaches and difficulty launching boats; and fluctuating levels being detrimental to fishing. The visitor sample data for both lake and river users were

¹³ The Table 15 on page 25 of Kearsley (1994) describes the data quoted here, although the accompanying text on the same page uses different figures (45% for ‘quite a large beach’ and 27% for ‘a fairly small beach’). The text also notes that the regional sample is similar to the local sample, hence the choice of data in this report.

grouped for a similar question, showing that 60% of respondents thought lake and river controls made no difference to the local scenery, 8% thought it was more attractive and 22% less attractive. 10% had no opinion. River users were more likely to state a negative change than were lake users.

- **Regional visitor activities:** On-water activities undertaken by the regional visitor sample included: on Lake Te Anau, most importantly, visiting the glow worm caves, followed by boating, fishing and Milford Track access; an Lake Manapouri, a visit to Deep Cove / Doubtful Sound, a power station visit, boating and fishing.

1.6 Report on Tourism and Recreation in the Waiau Catchment, 1992

Anderson (1992) collated information existing at the time, and completed an extensive list of interviews, to describe the recreation and tourism setting in the Waiau catchment and to recommend to the Waiau River Working Party further research requirements. Kearsley's 1994 study was an outcome of those recommendations. Table 16 shows Anderson's review of the scale of the recreation and tourism activities in the study areas relevant to this AEE. Anderson notes that the assessments of scale are 'subjective and relate to comparison across the line'.

Activity by category	Lakes	Lower Waiau River
Tourism	High	Some
Visitor numbers	High	Some
Operators	Many	Some
Transport	Many	Some
Accommodation	High	Some
Services	High	Some
Recreation	High	Some
Swimming	Yes	Yes
Tramping	Yes	Yes
Canoeing	Some	?
Rafting	No	?
Camping	High	High
Boating	High	Some
Fishing	High	Some
Onlooking	Yes	Some
Picnicking	Yes	Yes
Bird watching	Some	Yes
Others	Golf, sailing	Cycling

In terms of lake level variations, Anderson noted (p14):

"The most common comment from these [sport and recreation] clubs is that the fluctuations in lake levels, especially low levels, cause some difficulty for them in access to beaches and for launching boats, and devalue the natural beauty of the environment. Problems encountered by boat users at low lake levels include exposure of unmarked hazards such as rocks, restricted access to moorings and harbours, and launching ramps not adequate in length, while high water levels often bring debris and other hazards into the lakes as well as damaging the boat harbours and straining moorings..."

The recreational activity that seems to be most affected by changes in lake and river levels is fishing. Anecdotal information suggests that the quality and size of the fish, as well as numbers, has deteriorated over the last 30 years. The Te Anau region has enjoyed an

international reputation for fishing, especially fly fishing (in the rivers) and trolling (on the lakes) for brown and rainbow trout, but local fishing guides feel that this reputation is in danger because of poor catches and disappointed anglers.

It is worth noting that the NAS (Unwin and Image 2003) indicated an increase in angler days on Lake Te Anau from 10,280 in 1994/96 to 12,080 in 2001/02, and an increase on Lake Manapouri from 5,490 to 5,920.

1.7 Sustainable Water Programme of Action (MfE)

The Ministry for the Environment (MfE) carried out a national review of the sustainable management of waterbodies to advise government policy. Various studies were commissioned by MfE to identify and quantify various freshwater values, and a process of consultation completed.

Three studies commissioned by MfE are relevant to this exercise.

1.7.1 Potential waterbodies of national importance for recreation value (MfE)

Six criteria were used to identify potentially national significant waterbodies:

- That the NAS results for the 2001/02 and/or 1994/96 showed at least 10,000 angler days for a waterbody: *The Waiau River in Southland (Upper and Lower combined) featured 14,660 angler days in 2001/02 and 7720 in 1994/96. However, the MfE report confuses the Canterbury Waiau River (2130 angler days in 2001/02) with its Southland namesake and gives national status to the wrong waterbody using this criteria. Regardless of this confusion, it would be more relevant to treat the Upper and Lower Waiau Rivers as separate waterbodies, which indeed they are with different flow regimes and recreation settings. In this case, the Upper Waiau gained 5920 angler days and the Lower 7890 days – both below this nominal threshold for potential national status. Lake Te Anau had 12,080 angler days in 2001/02 and is listed as potentially nationally significant for this criteria. Lake Manapouri had only 5920.*
- Of a national telephone survey (Fink-Jensen *et al* 2004a) of just over 1000 'freshwater recreational users' at least ten¹⁴ respondents had to report use of a waterbody. Lake Taupo topped the list with 250 references, followed by the Lake Rotorua with 55 and the Lake Wakatipu at 52. For most waterbodies this represents a very small sample from which to draw any conclusions. Also, the response rate for the survey was only 21.5%, so the sample cannot be considered to be random: *The data relating to the Waiau River is confused in the report and it is not clear whether the Canterbury or Southland Rivers are referred to accurately – although if both rivers are combined, only four references were made, plus one to a Wairau River in Southland which does not exist. Lake Manapouri had 20 references and Lake Te Anau 27 (although it is identified as being in Otago), and both were listed as potentially nationally significant by MfE using this criteria.*
- Selected recreation groups were requested to respond to an internet-based survey to identify significant waterbodies (Fink-Jensen *et al* 2004b). The threshold was a mention of a waterbody by more than ten people: *One respondent noted the Waiau River as a recreation destination, 16 referred to Lake Te Anau (listed as both a Southland and Otago waterbody) and nine identified Lake Manapouri. MfE listed only Lake Te Anau using this criteria.*
- The presence of a water conservation order: *Not applicable.*

¹⁴ The MfE report states 'over 10 people' as a measure in its text (p9), but uses ten (more than nine people) as the threshold in its summary table which presents the relevant rivers.

- Priority listing as a 'Wetland of national importance to fisheries' in Davis 1987: *This is an inappropriate criteria and is used inconsistently. For example, the Wairau River (Marlborough) is identified as potentially nationally significant as a result of its association with the Vernon Lagoons, which is listed by Davis (1987), but MfE does not list the Waiau River as a result of its association with the Waiau River (Te Waewae) Lagoon, which is also listed by Davis (1987). Either this is an omission, or reflective of the unsuitability of the criteria (Davis assessed wetlands, not rivers and does not identify the degree of association between each from recreation or ecological perspectives)*
- Reporting of significance for whitebaiting by a number of key informants: *No waterbody in this study was identified, although the assessment is applied inconsistently, with the Titoroa River in Southland identified by MfE, but not the Waiau River, which are both described by Kelly (1988) as of 'minor recreational importance'. MfE ignores the Aparima River, which Kelly (1988) describes as of 'significant or average' recreational importance (greater than either the Titroa or Waiau Rivers). Kelly's systematic assessment of all whitebaiting opportunities in the South Island is more reliable than MfE's, but this work is not referred to by the Ministry. Kelly also notes that (p9) 'it is very difficult to rank rivers of lesser importance, because fishing pressure and catches are extremely variable'.*

1.7.2 Waters of national importance for tourism (Ministry of Tourism)

The Ministry of Tourism used the results of their International Visitor Survey (2002 data) and Domestic Travel Survey (2001 data) to describe how tourists use freshwater resources in New Zealand, and to locate their activities. The report uses these data to develop a list of waterbodies considered to be of national importance for tourism (Ministry of Tourism 2004).

For international tourists, the Ministry identified the top eight locations of importance for freshwater-based activities undertaken by international visitors, including those locations where more than 20,000 visitors participated in the activity in 2002. The regions in decreasing order of importance were:

- | | | | |
|---------------|------------|-----------------|-------------------|
| 1. Queenstown | 3. Rotorua | 5. Te Anau | 7. Hanmer Springs |
| 2. Waitomo | 4. Taupo | 6. Christchurch | 8. Auckland |

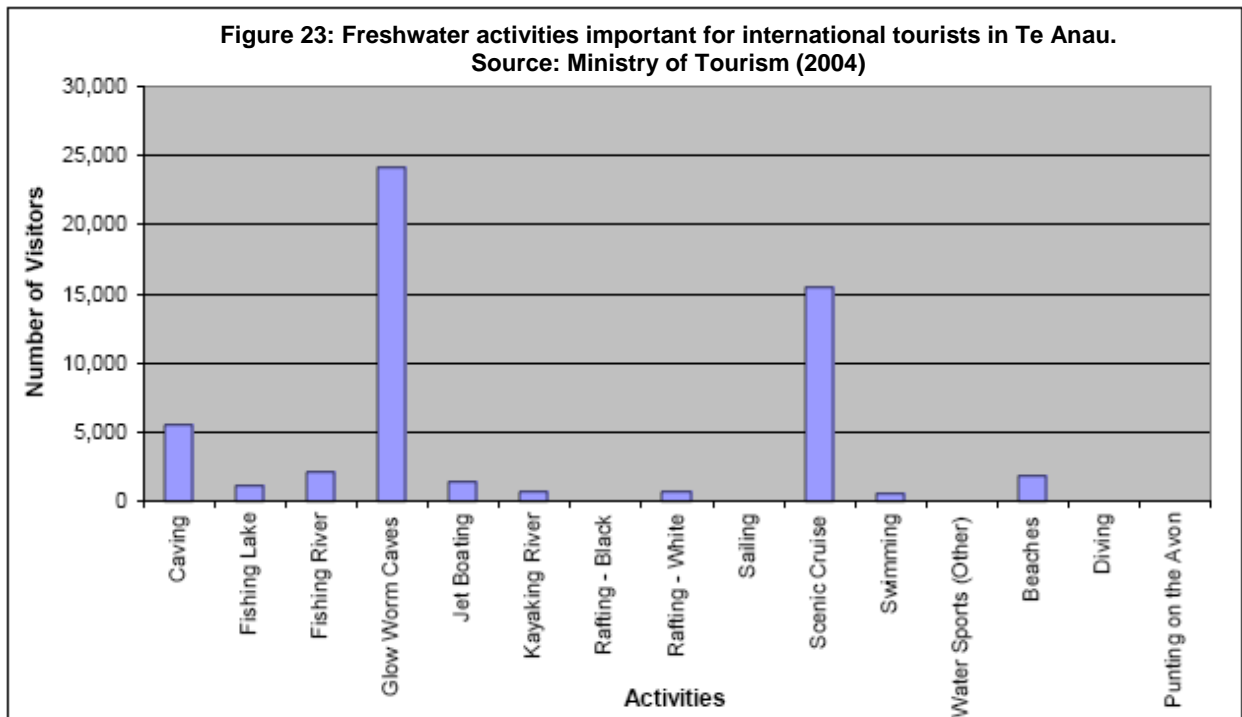
The most popular activities for these visitors included jet boating, visiting glow worm caves and going on scenic cruises.

The data from the Domestic Travel Survey (DTS) showed some parallels between international and domestic visitors and their preferred freshwater locations. The Ministry selected the top four locations from the DTS data, as these were the only statistically significant locations. The top locations for freshwater activity by domestic tourists were:

- | | | | |
|----------|---------------------|-------------|------------|
| 1. Taupo | 2. Hamilton/Waikato | 3. Auckland | 4. Rotorua |
|----------|---------------------|-------------|------------|

Domestic tourists' favourite freshwater-based activities nationally were rafting, swimming and 'sitting on the foreshore/beach'.

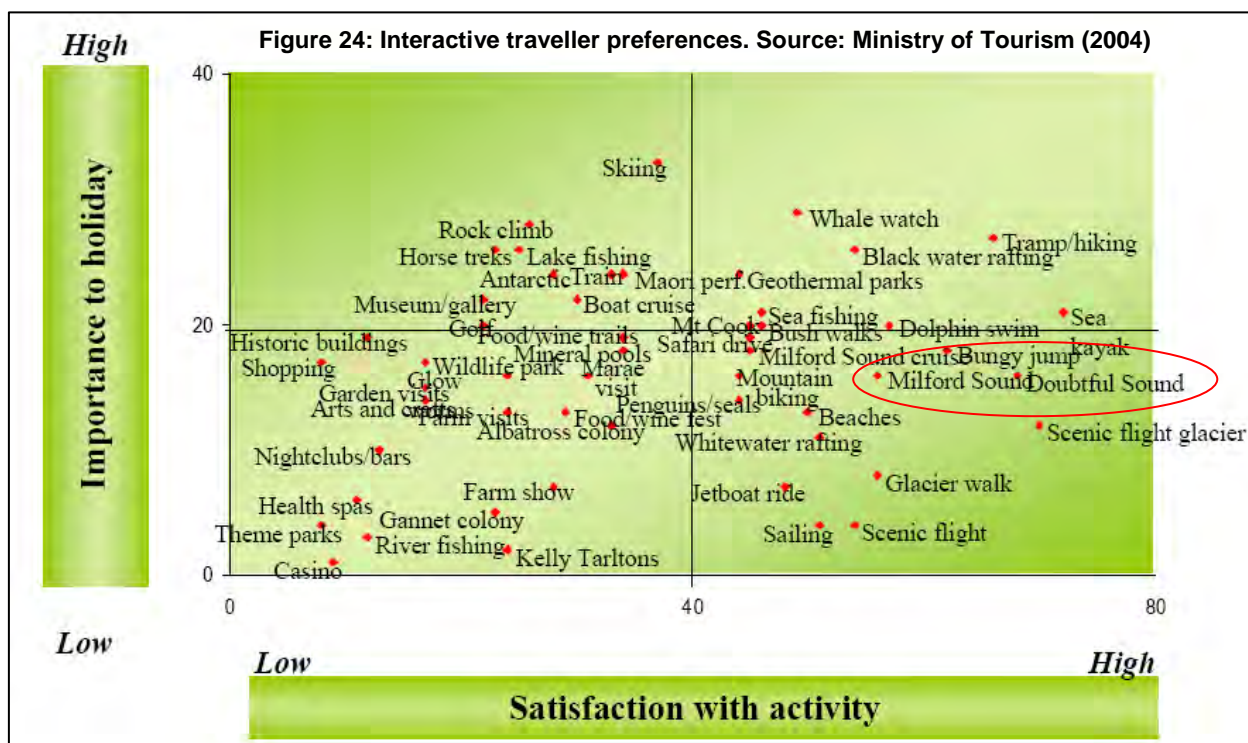
Te Anau area waterbodies were described as significant for international visitors for, predominantly, visiting glow worm caves and scenic cruises – the latter often associated with Milford Track transport (Figure 23).



Waterbodies in the Te Anau area identified as important to tourism were:

- Lake Te Anau – popular for scenic cruises, with cruises often transporting passengers from Te Anau to the caves and to the Milford Track. Approximately 70,000 people visit the Te Anau Glow-worm caves each year.
- Tunnelburn River – a tributary to Lake Te Anau that flows through the caves.
- Arthur River – flows into Milford Sound and is used predominately for fishing and jet boating.
- Clinton River – flows alongside the Milford Track, popular for fishing and other recreational uses.
- Hollyford River – popular for jet boating and fishing.
- Lake Hauroko
- Wairarahiri River
- Waiau River (it is not clear if this refers to the Upper or Lower Waiau, but it is doubtful that the Lower Waiau River would be described as being in the Te Anau area).
- Mavora Lakes
- Lake Manapouri

The Ministry of Tourism assessment identifies activity preferences for the ‘interactive traveller’, which is described as the nation’s ‘ideal visitor’ – this group does more activities, ostensibly has less environmental impact (‘takes photographs and leaves only footprints’, are ‘environmentally aware’ and ‘goes slow and savours the experience’). This is the target group for the Ministry’s offshore marketing campaigns. Figure 24 shows a preference and satisfaction matrix for the interactive traveller, indicating the moderate level of importance of Doubtful Sound (similar to Milford) but the relatively high level of satisfaction. Sample sizes are not given for these data and so the level of reliability is not clear.



1.7.3 Sustainable Water Programme of Action: Potential water bodies of national importance. Technical Working Paper. July 2004.

This report summarises the findings of a variety of studies into the significance of the nation's waterways, including the two studies listed above (although the technical report apparently pre-dates those).

The technical report notes the following 'assumptions and limitations' in the method applied to identifying waterbodies of potential national significance for recreation:

- Some of the initial list (survey, angling and whitebaiting information) is based on numbers of people using water bodies for recreational activities. This approach assumes there is a correlation between the number of people who visit a water body and its value for recreation. Under this approach the very special and remote places that are not highly visited may be under represented.
- Some of the initial list is based on dated reports or unclear information.
- Comparison across the different sources of information may not be a valid approach.

The technical report lists Lakes Manapouri and Te Anau as of potential national significance for recreation, and lists a 'Waiiau' in Canterbury as also potentially important. This is likely to be an error, and using the MfE criteria, this should refer to the Waiiau River in Southland. As noted above, however, the MfE criteria in relation to the Waiiau River are used inappropriately and if the River is treated as two distinct waterbodies, it would not be listed.

Lakes Te Anau and Manapouri are listed as of potential national significance for tourism, and also the Waiiau River (Whether this refers to the Upper and/or Lower Waiiau Rivers is not defined, assuming it is supposed to be referring to the Southland Rivers).

1.8 Fiordland (Te Moana o Atawhenua) Marine Area User Study 2007

Booth et al (2007) prepared a baseline user monitor for recreational and commercial users of the Fiordland Marine Area (FMA) for a number of clients¹⁵. Intercept surveys were conducted at Deep Cove and Milford Sound and a postal survey was also completed (802 responses in total), in addition to 39 in-depth interviews with key informants (13 commercial and recreational fishers, 11 commercial tourism operators, a recreational diver, seven charter vessel operators, two researchers, two iwi, a commercial aircraft operator and two radio operators). Survey respondents were grouped into 'visitors' – tourists, and 'users' – commercial and recreational fishers, tourism operators and employees, researchers and independent recreational visitors (unguided divers and kayakers). Findings of relevance to Deep Cove and Doubtful Sound include:

- 'Visitors' to Doubtful Sound were more likely to be New Zealanders (34%) than at Milford Sound (13%).
- 29% of Doubtful Sound 'visitors' had visited the FMA on at least one previous occasion compared with only 15% of Milford Sound respondents.
- 'Nearly 50% of Milford Sound visits were of two hours duration or less, compared with under 10% of 'visitors' at Doubtful Sound. 62% of Doubtful Sound respondents spent a day or more in the FMA, compared with 24% of those from Milford Sound.
- Of all FMA visits reported by commercial fishers, the South Fiords (38%) accounted for the greatest proportion, and Doubtful Sound (10%) the smallest. The converse was true for recreational fishers/boaties, among whom the highest percentage of FMA visits were made to Doubtful Sound (45%), with the remainder split relatively evenly between North Fiords (23%), South Fiords (19%) and Milford Sound (14%).
- Doubtful Sound respondents placed more emphasis on 'experiencing nature' (6.45), 'experiencing a quiet place' (5.02) and 'getting away from people' (3.40), than did their Milford counterparts (6.19, 4.38 and 2.81 respectively).
- 'Visitors' believed the FMA area to be threatened by more activities than any other sub-group. Their top five concerns (in order of importance) were pollution, commercial fishing, marine pests, climate change and recreational power craft. Recreational and commercial fishers were the *least* likely to perceive the area to be under threat from other activities. Overall, the lowest perceived threats were associated with non-motorised recreational craft. Twenty-seven respondents listed 'other' activities that they felt were threats. The most common activities were: freshwater discharge from the Manapouri power station (n=5), research, especially of dolphins (n=3), tourism operations (harassing dolphins, overflights, smell from Real Journeys' Doubtful Sound/Patea treatment plant, general) (n=6), marine reserves restricting fishing (n=2), and cruise ships (n=2). Those respondents who noted the tailrace discharge as a threat were not specific about the type of effect that concerned them (whether it related to ecological values, recreation or commercial fishing, for example). Volume 2 of the report gives the exact phrases used by the respondents (verbatim): operation of the power station Doubtful; Increasing tailrace discharge; Outflow from Manapouri; Fresh water from Meridian's power station; Power station (fresh water in fiord).
- When asked about changes to the quality of the FMA over the past five years, one respondent noted that they were unsure of the effect of the 'possible increase of

¹⁵ Biosecurity New Zealand, Department of Conservation, Environment Southland, Ministry for the Environment, Ministry of Fisheries and Fiordland Marine Guardians, with the latter group the key promoter.

fresh water from Manapouri', and another noted the 'excess of freshwater' 'increasing the freshwater layer'.

- Of the 40 interviewees, one commercial fisher noted that the amount of fresh water in Doubtful Sound posed a problem for crayfish holding pots. Otherwise there was no mention by the interviewees of the tailrace discharge or surface water currents in Deep Cove. Primary concerns related to the depletion of fish stocks, pollution and increasing visitor pressure (more tourists).

1.9 Environment Southland Regional Coastal Plan for Southland, 2007

The Environment Southland Regional Coastal Plan (April 2007) makes the following observations about recreation and tourism in Doubtful Sound:

- The diversion of freshwater from Lake Manapouri via the MPS into Doubtful Sound has little visual impact on the naturalness of the area, landscape experience or amenity values. (s 3.2.4)
- The principal value of this region is the overwhelming naturalness of the environment and associated factors such as water clarity, open space, peace, quiet, isolation and remoteness, which tend to enhance any recreational experience, whether it be a diving, kayaking, sightseeing, ocean cruising or nature-watching experience. Doubtful Sound is commercially promoted as the "Sound of Silence". (s 3.2.8)
- Traditionally, Milford Sound has been the major tourist attraction in the area. It remains one of the top five tourist attractions in New Zealand. Deep Cove in Doubtful Sound is also the base for boat tours of the Sound and adjoining arms. Increasingly, the whole coastal region is being viewed as a tourist attraction, with cruises of a duration measured in days, becoming an alternative to day trips. The attraction of such trips is a chance to appreciate not only the scenic values of the area but its heritage and ecosystems as well. There are also many more people actively partaking in the recreational opportunities such as diving and kayaking within the Fjords in particular. (s 3.2.9)
- One of the values of Doubtful Sound is the contribution it makes to the remote educational experience of school children who visit the Deep Cove Hostel. Annually, over 2,500 children stay at this facility for a few nights whilst on class camps. As part of that educational experience and as a means of appreciating their natural heritage, children take a launch trip on commercial tourist ships based at Deep Cove, as well as engaging in tramping, fishing and nature study activities in, on and around Deep Cove. Visitors other than school children also seek to participate in and share the educational values of the area. (s 3.2.10)
- There is either a shortage of mooring space or no space left in Harrison Cove, Deep Water Basin, Golden Bay, Thule Bay and Deep Cove. (s 11.7.7)
- It is a non-complying activity for cruise ships to enter Doubtful Sound beyond a line between Joseph Point and Espinosa Point, excluding First Arm and areas east of First Arm, (Rule 13.1 iii)
- Any commercial surface water activity in the internal waters of Fiordland, apart from Doubtful and Thompson Sounds and the arms thereof, is a discretionary activity. In Doubtful and Thompson Sounds and the arms thereof the use of non-motorised ships is also a discretionary activity. In Doubtful Sound, Thompson Sound and Crooked Arm east of Turn Point, commercial backcountry activities are also discretionary activities. In other parts of Doubtful and Thompson Sounds and the

arms thereof, commercial backcountry activities are discretionary activities up to a certain level of use after which they become non-complying activities. Similarly, commercial day trip activities in Hall Arm, Doubtful Sound and Crooked Arm east of Turn Point are discretionary activities up to a certain level of use after which they become non-complying activities. Commercial day trip activities in Crooked Arm west of Turn Point, First Arm and Bradshaw Sound are prohibited activities. (Rule 16.2.1)

- The rule status of each activity is dependent upon the ability of the environment to absorb those activities while protecting the natural character and amenity and providing for administrative flexibility and a range of different experiences within Fiordland. Within Milford Sound, Doubtful Sound and Thompson Sound, the effects of commercial backcountry activities are considered relatively minor, having regard to the range and extent of other commercial activities undertaken within those areas, and in Doubtful and Thompson Sounds, the frequent thoroughfare nature of backcountry activity within those areas. (Rule 16.2.1)

1.10 Department of Conservation

The Department of Conservation has no control over the waters in the fiords, although virtually all the land surrounding the fiords is within the Fiordland National Park, and the Department controls the road over Wilmot Pass. The Department's approach to the surface waters is covered in the following excerpt from the Fiordland National Park Management Plan (DOC 2007, p126):

Transport by boat is a distinct feature of visitor opportunities in Fiordland. While having no direct jurisdiction over the waters of the fiords, the challenge for Fiordland National Park management is to ensure management between the water/land interface is consistent. Hall Arm in Doubtful Sound / Patea, for example, is promoted as the "Sound of Silence".

The Management Plan specifies the activities of the Deep Cove Outdoor Education Trust (p237), noting that the Trust's site will be the only site where accommodation will be permitted in Deep Cove. The concession allows the Trust to offer 'backpacker-style' accommodation ('within existing capacity'), but only if this does not compromise its primary purpose as an outdoor education centre for school children. Commercial ventures other than backpackers' and research accommodation will not be permitted. The plan also notes that, "Concessionaires or their staff will not be accommodated at Deep Cove, except DCOET staff and other essential people (as agreed to by the Department of Conservation) associated with offering safety support for the Hostel. Other infrastructure supporting concessionaire operations including garages, storage sheds and other buildings will not be permitted at Deep Cove." (p238).

The visitor management methods for Doubtful Sound are given here in reasonable detail as they provide a clear statement about the scale of kayaking activity desired within the Sound (DOC 2007, p157):

Doubtful Sound Remote Setting

The Wilmot Pass Road when combined with boat access across Lake Manapouri, provides ready access to Doubtful Sound / Patea. Apart from Milford Sound / Piopiotahi, Doubtful Sound / Patea is the most accessible of the fiords. The Department of Conservation provides a range of facilities, such as huts and campsites, within Doubtful Sound / Patea and the road and Sound provide important access to remote recreation opportunities within the surrounding areas of Fiordland National Park.

Kayaking is a popular activity within Doubtful Sound / Patea and it is expected that this will increase over the next ten years. As a result, it is expected there will be increased pressure

on the campsites within this part of Fiordland National Park. The campsite at Hall Arm is currently managed as a formed campsite (refer to section 5.8). While this site is situated in a remote zone it is recognised that existing use at this site is more towards the backcountry end of the remote spectrum.

While not actively managed as a formed campsite, the existing informal campsite at Crooked Arm receives a regular level of use during the summer months and some site hardening has occurred as a result of this. To ensure the remote experience is retained within the areas of Fiordland National Park adjoining Doubtful Sound / Patea there will only be a limited number of formed campsites provided. It is considered that the existing formed campsite at Hall Arm and formalising the campsite at Crooked Arm adequately provides for this opportunity. Any application by concessionaires to develop new campsites will need to demonstrate the remote experience is not diluted and environmental effects can be avoided.

A number of other informal camp sites exist within Doubtful Sound / Patea. While these offer sites at which freedom camping can occur, they are not managed as formed campsites by the Department of Conservation. In order to protect the remote opportunities provided by the Doubtful Sound Remote Setting, independent kayakers will be encouraged to use existing formed or informal campsites. It is considered that management of the sites and frequencies at which areas of the Fiordland National Park adjoining Doubtful Sound / Patea can be utilised by guided kayaking is also necessary in order to continue to provide a remote experience....

Objective 1. To manage the Doubtful Sound remote setting to protect the following key attributes:

- a) The remote experiences of the Doubtful Sound Remote Setting;
- b) As a place that provides a key remote access opportunity for a marine/national park interface; and
- c) As a place where biodiversity values are significant, particularly on the islands in Doubtful Sound / Patea.

Implementation

1. Concessions for overnight use of areas of Fiordland National Park adjoining Doubtful Sound / Patea by commercial kayaking companies should be confined to the existing formed and informal campsites at Hall Arm, Crooked Arm, Camelot, Olphert Cove and Campbells Kingdom only. The following conditions should apply:

- a) A maximum party size of ten people, per trip, inclusive of guides, should be permitted;
- b) Not more than a combined total of ten trips per week for all concessionaires should be permitted at Hall Arm;
- c) Not more than two trips per concession per week should be permitted at Crooked Arm;
- d) Not more than one trip per concession per week should be permitted at each of the Camelot and Olphert Cove sites;
- e) Should an applicant seek changes to these limits, the applicant should be required to undertake appropriate research approved by the Department of Conservation that addresses physical and social carrying capacity effects; and
- f) Concessionaires should not be permitted to leave equipment or establish facilities at these sites.

g) There should be no more than four commercial kayaking concession operations utilising Fiordland National Park from the coastal marine area. The Doubtful Sound / Patea complex is included within this total limit (see section 5.6).

2. Encourage recreational kayakers to camp at existing formed and informal campsites at Hall Arm, Crooked Arm, Camelot, Olphert Cove, Campbells Kingdom, Malaspina Reach, Pendula Reach, Surgeon Bay and Precipice Cove. Where adverse effects arise, restrictions may be sought on the sites at which freedom camping can occur.

3. Retain the remote experience adjoining Doubtful Sound / Patea. The existing informal campsite at Crooked Arm will be the only place at which a future formed camping site should be considered. Consideration of any other sites will need to be supported by appropriate research approved by the Department of Conservation including a full assessment of effects to determine that it adequately meets the remote experience objectives....

The Management Plan defines Deep Cove as a 'frontcountry' visitor setting, along with West Arm and Wilmot Pass (p228 - 230):

West Arm, Wilmot Pass and Deep Cove are arguably the most visited areas of Fiordland National Park outside of Milford Sound / Piopiotahi and Milford Road. In 2003 there were approximately 70,000 visitors using Wilmot Pass Road, with the majority of these visitors accessing Doubtful Sound / Patea. It is expected that visitor use in this area will continue to grow. The challenge facing the Department of Conservation is to ensure that the unique values of these places which are dominated by nature are retained; while providing opportunities for visitors to them.

There has been considerable support for ensuring that these places, including Doubtful Sound / Patea, do not become as busy and congested as Milford Sound / Piopiotahi. The Southland Regional Council has acknowledged this by managing commercial surface water activities at Doubtful Sound / Patea through a limiting regime. It is important that this management plan reflects this and ensures consistency with this approach where possible. Mechanisms identified in this plan for this include managing visitor flows over Wilmot Pass Road, and using zoning to manage activities at West Arm and Deep Cove....

Wilmot Pass Road was established to provide important access to Deep Cove for the Manapōuri Power Station development and its ongoing use is required for access to Deep Cove for operational requirements and emergency response activities. It has also enabled access to Deep Cove for a variety of other purposes including relatively easy access to Doubtful Sound / Patea for recreation and tourist activities. It has also enabled the development of the Deep Cove Outdoor Education Trust centre. The road provides a magnificent opportunity for immersion into the wildness that Fiordland has to offer – massive mountains and incredible views of rivers and the sea....

Deep Cove is a busy transit node at particular times of the day and the year. There is a small fishing fleet, a series of jetties, mostly associated with the tourist industry, the Meridian Energy Limited wharf, national park management and buildings associated with the Deep Cove Outdoor Education Trust centre. There are vehicle movements associated with recreation, eco-tourism, scenic tourism, fishing and the power station operations. The outlet for the tailrace associated with the Manapōuri power station is located at Deep Cove. Even though these activities occur at Deep Cove, it retains a contained feeling, which is dominated by nature.

There are a number of challenges for managing space at Deep Cove to protect its special values; and for ensuring that the opportunities offered at the Deep Cove Outdoor Education Trust centre are not compromised by commercial operators.

The Deep Cove Outdoor Education Trust centre seeks to provide education programmes in a backcountry setting largely free of commercial tourism and significant recreation interests. Some adventure or eco-tourism operators are seeking to provide small parties of their own clients with a quality experience in a remote setting, without encountering large numbers of other visitors and with few of the comforts of modern life. In contrast to this, other concessionaires are providing a more leisurely experience for relatively large numbers of visitors in modern and comfortable coaches and launches.

To provide for these differing uses and to maintain the quality of the experiences sought, the site requires careful management. Strict controls will be imposed on where parking can occur. The range of activities and facility provisions will be limited to what is there at present (2006)....

The area below mean high water spring of Doubtful Sound / Patea is administered by Southland Regional Council under the Resource Management Act and the Southland Regional Coastal Plan. The Department of Conservation does have an advocacy role in ensuring sustainable management of the fiords and consistency between national park management and management of the adjoining waters. In broad terms, the Department of Conservation's advocacy position will be based on maintaining a relatively remote visitor experience on the fiord. This will be characterised by the number of visitors and other vessels encountered generally being far less than might be encountered on Milford Sound / Piopiotahi, but more than in the more remote southern fiords. Some parts of the fiord (Bradshaw, Crooked Arm, and First Arm) should be managed for even lower use levels, while opportunities for non-motorised zones in the more remote areas should also be considered. The need for firm, explicit limits to control the level of surface water activity on the fiord is recognised.

2 Appendix 2: Stakeholder interview summaries

Interviews were carried out with ten individuals who had knowledge or recreational experience of the proposal area. Where relevant information was gained, the interview was summarised and forwarded to the individual to verify the summary and to check for omissions.

2.1 Bill Gibson and Daphne Taylor, owner/operators Fiordland Wilderness Experiences¹⁶

Bill and Daphne established Fiordland Wilderness Experiences in 1992 to offer guided sea kayaking in Fiordland and on Lakes Te Anau and Manapouri. They are founding and current members of the NZ Sea Kayak Operators Association and are a Qualmark Endorsed Visitor Activity. Their concessions and related codes of behaviour permit them to kayak in the 'no-boat' zones in the fiords (a lot of work over many years went into gaining concessions and consents).

Fiordland Wilderness Experiences currently offers single-day packages on Milford Sound, multi-day trips in Doubtful Sound and single and multi-day trips on Lakes Manapouri and Te Anau. Typically, Milford tours operate from September to May, and in Doubtful Sound from October to April, inclusive. Seven full-time guides are employed each season. While they take twice as many tours on Milford than on Doubtful Sound, the longer trips on Doubtful means they can have up to 24 people on the water at any one time on the latter, and up to 16 on Milford. They are also consented to operate day trips on Doubtful Sound, which does happen from time to time.

The overnight tours are self-catering, and this ensures clients are to some degree self-reliant and sufficiently competent to be in a wilderness setting. They also offer rental kayaks, but have a selection process to ensure clients are competent (minimum age, no solo rentals, experienced paddlers).

Guided and rental parties are equipped with two-way hand-held 12 volt VHF radios, and on Doubtful Sound guided parties also carry a waterproof handheld VHF. The Hall Arm campsite is equipped with a satellite phone. There is poor VHF reception near Deep Cove, and in many other parts of the fiords, and all operators, including the DCOET hostel, cooperate to relay calls if required. Bill and Daphne consider the VHF communications systems in the area to be weak considering the level of local tourism activity. The existing marine radio repeater funded by the Fiordland Fisherman's Association is aimed at boats off the coast. DOC has temporary repeaters in place to assist predator control work on Secretary Island, but these will be removed once this work is complete. Real Journeys has been considering installing a repeater.

The business has a safety boat on the hard in Deep Cove, but this is rarely used and there is no on-site skipper. If the weather looks doubtful, Bill will head over to Deep Cove and be on standby. The boat is consented with Environment Southland as a safety vessel and can only be used as such – although 'safety' is not defined in the consent. Bill and Daphne assume this means that they cannot use it to take kayaks out from Deep Cove if the local conditions are too rough. All consents for tour boats on the Sound are allocated (Bill and Daphne were among the key individuals who pushed for a limited number of consents) so there is no scope under the current Southland Coastal Plan to create a new boat-supported kayak operation.

The Manapouri tailrace discharge is always a consideration when paddling in the Sound, and varies from a mild inconvenience to a more significant consideration, subject to the effect of flow rates which can be both compounded and moderated by weather conditions. A strong current and high standing waves means guides have to make some serious decisions about the route taken and the abilities of their clients. When conditions permit, and there is an on-shore or up-fiord wind – which is the prevailing wind direction – parties heading back to Deep Cove will travel out from the

¹⁶ Interview with Rob Greenaway and Tom Sawyer, 16.4.08. Confirmed with corrections by email 9.7.08

edges in the middle of the Sound, where there is plenty of sea-room, raft the kayaks together and use the wind to push them along, often with sails.

When conditions are rough, the groups will raft-up as for sailing, creating a cohesive, stable platform that keeps all kayaks together and allows the group to use the wind and waves to push the raft through a rough or exposed section of water, potentially staying rafted up until arriving at Deep Cove. Sails may be used to increase the speed of the raft depending on the wind strength. However when the current is too strong, headway is lost and the group must paddle along the edge of the fiord, which is also the typical paddling route used when paddling into wind and waves. Although there are many eddies between headlands with a counter-current which may assist paddling, the headlands can feature strong winds, waves and currents, and even the eddies can present unusual and rough conditions. Head-currents slow paddlers, and if the paddlers are not sufficiently skilled in steering, they can also push the bow of the boats away from the coast and back into the main current, and even turn the boats around. More skilled kayakers know to adjust their paddling and steering to stay on track. The sides of the fiord generally offer easier paddling routes when there is little wind (not enough to sail) and a strong current.

Bill and Daphne have noted a change in the discharge pattern after completion of the second tailrace. For example, the Rolla Island gap is normally a comfortable position in which to rest and wait for conditions to improve before moving around the headland into Deep Cove, although it has always had some tidal or discharge-influenced current. In recent years there is often a confused current and it takes more energy to stay within shelter. The safety manual for the operation has had to be updated as a result. The Hall Arm intersection is often a tricky area, with occasional high waves west of and opposite Elizabeth Island. On one- and two-day trips, the route normally takes kayakers to the north of and around Elizabeth Island and the guide must then make a decision about where to cross back to the south of the fiord, considering currents, winds and waves.

Due to the complex effects and interaction of naturally generated wind, waves and rainfall with the tailrace discharge, Bill and Daphne find it difficult to put their finger on the discharge as the main cause of any single sea condition, beyond the obvious conclusions that increased discharge will result in stronger currents and steeper waves in some parts of the fiord. For example, in heavy rains there are standing waves at the mouth of Hall Arm as water escapes. The degree of leeway in light of changing or higher flows is therefore not clear.

Over time, as business operators in a dynamic natural environment, Bill and Daphne feel that they have probably become more cautious and feel that they are probably more likely to cancel trips than when they first started, reflecting the changing 'risk climate'. They also note that tourists are less flexible than in former years, with shorter holidays and more committed schedules. Whereas they used to accept sitting out a weather event, they now move on. Cancellations are therefore more costly to the company.

Bill estimates that an average kayaker travels a little faster than walking speed, which is about 5 km/hr. A good speed is around 3 knots (5.5 km/hr), but 2.5 knots would be more sustainable (4.6 km/hr).

2.2 Nigel Lamb, owner/operator Doubtful Sound Cruises (Fiordland Explorer Charters Ltd)¹⁷

Doubtful Sound Cruises offers a full-day tour package including a cruise across Lake Manapouri to the DOC visitor centre at West Arm, a tour of the power station and a three-hour cruise on Doubtful Sound aboard the catamaran Charmaine Karol. The main season is October to April, but the operation runs all year. Nigel only occasionally pilots the vessel. He also owns a launch moored in the Helena Anchorage.



The Charmaine Karol is moored inside Brasell Point and uses the DCOET wharf, and occasionally the Meridian wharf, in Deep Cove for boarding passengers. Normally the service operates with only the skipper as crew.

Nigel has observed that the back-eddy in Wanganella Cove always dominates over local tidal currents. In the heads of other fiords there is normally very little current effect and boats will answer to the wind rather than the direction of the tide. In Wanganella Cove there is always a current influenced by the Manapouri tailrace discharge, and its strength varies over time and location within the Cove. For example, at his mooring inside Brasell Point there is very little, if any, current. At the slipway, some effect is apparent, and at the Meridian wharf, it is often quite strong. The current moves in a general southerly direction, counter to the flow of the Manapouri tailrace discharge. However, there is often an additional flow away from the walls of the Cove. This can create a push on boats as they attempt to berth, making getting alongside difficult. With crew it may be possible to get a line off the bow onto shore and to then bring the boat side on, but with only the skipper on board the Charmaine Karol, this is more difficult.

The side current is generally quite manageable, being only occasional and not of sufficient strength to limit any berthing activities.

The current at Helena Anchorage is quite variable – sometimes there is no flow around the boat and at others times there is a discernable current. Nigel has not worked out if the stronger flows coincide with a particular state of the tide. Overall, the anchorage remains very comfortable and well sheltered.

2.3 Graham Sharp, Gore Boating Club¹⁸

Graham Sharp is an executive member of the Gore Boating Club and since 1988 has organised a group trip of club members into Doubtful Sound every second Easter. Each trip involves 12 to 14 motorboats (5m to 8m) being taken over Wilmot Pass to cruise the Sound for a week. Graham has never had, or is aware of an incidents or problems occurring in Doubtful Sound resulting from the Manapouri tailrace discharge.

2.4 Kevin O’Sullivan, Southland Harbour Master¹⁹

Kevin O’Sullivan is the Southland Harbour Master employed by Environment Southland. He has oversight of all navigation and associated water safety in Southland. Kevin has visited Doubtful Sound five or six time in 2007 and has noticed head currents when travelling up Doubtful Sound near Elizabeth Island. He was aboard a charter vessel – the 20m launch Tutuko. The current

¹⁷ Rob Greenaway interview 1.5.08. Confirmed by phone.

¹⁸ Interview completed by Tom Sawyer. 7.4.08. Confirmed 9.4.08

¹⁹ Interview completed by Tom Sawyer. 4.4.08. Confirmed 7.4.08

slowed the vessel by approximately 2 knots but this was nothing that would be a danger to safety or navigation.

As Harbour Master he should be notified of all relevant marine incidents or accidents in Southland. He knows of none that have occurred in Doubtful Sound resulting from the flow of the tailrace.

2.5 Mark Peychers, Skipper²⁰

Mark has been a Fiordland Marine Guardian for about seven years.

He has a wide experience of Doubtful Sound over a period of thirty years as both a commercial fisherman in Fiordland and for the last eighteen months as second captain on the Department of Conservation vessel *Southern Wind*.

In this thirty years experience he knows of no incidents concerning vessel safety that have occurred owing to the flow from the tailrace at Deep Cove.

2.6 Robin Wilson, Skipper²¹

Robin is one of 20 owners of the vessel *James McKerrow*, a 14 metre wooden launch which has been based in Deep Cove since 1995 and has been owned by this syndicate since 1997. The vessel is used recreationally by the owners and their friends for about 40 weekends each year.

This vessel is one of five that moor by tying to a long, strong rope that is fixed to the Meridian wharf at one end, is looped round a steel mooring dolphin immediately south and then to one of the mooring points in the rock face about 70 metres further south that were used for the Wanganella. The vessel is always moored with the bow pointing out of the Sound and facing the oncoming counter-current from the tailrace flow.

This mooring system is not consented, but is recognised in the Environment Southland Coastal Plan as an existing use and is accepted as an efficient method for mooring vessels in the area

The only incident that Robin is aware of occurred about seven years ago when the mooring rope mentioned above broke. Luckily it broke between the forward and after lines of his vessel, so that the vessel itself acted as the mooring rope. Had it parted between vessels the two ends of the mooring rope would have swung out with the currents and caused possible damage to any vessels attached.

The cause of this mooring rope breaking cannot be ascertained. There is no evidence that it was due to the counter-current in Deep Cove.

2.7 Charlie Patterson, Manager DCOET²²

Charlie has been Manager of the Deep Cove Hostel for 3½ years. The Hostel is run by the Deep Cove Outdoor Education Trust.

The Hostel has been operational since 1971 and is situated on the south side of Deep Cove. About 2000 pupils from 21 schools visit annually, staying three to five days. As part of their Deep Cove experience they spend some time in small boats. Three boats are available. All are aluminium pontoon boats. Two are approximately 4m long, one of these is rated for five children and one adult; the other for eight children and two adults. The third boat is a safety boat and is kept behind as an emergency boat when the others are in use.

The boats are run to SGS/M&I safety audit requirements. All people involved in the school camps get a general boat safety briefing from the Manager. Parents or teachers who are nominated as

²⁰ Interview completed by Tom Sawyer. 28.4.08. Confirmed 28.4.08

²¹ Interview completed by Tom Sawyer. 20.4.08.

²² Interview by Rob Greenaway and Tom Sawyer 17.4.08. Not confirmed, but discussed with Paul Gay and Judith Cambridge of DCOET – see their interview.

boat drivers receive a special briefing. Following this the nominated drivers can use the boats in Wanganella Cove without permission. However, should they be required, or wish, to cross the tailrace flow they must get special permission from the Manager to do so.

The Manager will give, or deny, permission after visual assessment of weather and water conditions. Such permissions are refused approximately one third of the time.

Charlie states that increased or decreased flow from the tailrace is as relevant to the water surface conditions as wind and tide. A flood (rising) tide or a wind coming up the Sound against the water flow will cause waves on the surface to heighten and steepen. Such pressure waves are generally localised and can be uncomfortable in small boats.

Areas of such waves will be a reason for the Manager to refuse permission for boats to cross the tailrace current.

The walking track over the tailrace portal is repaired and open again. Accordingly young people can walk to and from the Helena Falls as opposed to having to go by boat, as previously when the track was closed. Boats now seldom have to cross the tailrace current.

In 3½ years Charlie knows of only one incident happening with the boats that related to the tailrace flow. This was a driver misjudgement incident where one of the boats was semi swamped by pressure waves. Being pontoon boats they are very safe and will float even when fully swamped, with the outboard power pack above the water. They are capable of being driven to shore in this condition.

2.8 Paul Gay and Judith Cambridge, DCOET Trust²³

Paul has been Chairman of DCOET since its inception. Judith is a member of the Trust Board.

Paul noted that while Charlie Paterson mentioned one boat swamping in his interview, Paul knew of another similar incident, but did not know the cause.

It would appear that there are two incidents mentioned above known about. In addition although Charlie stated that crossings of the tailrace current are cancelled about one third of the time for weather or water reasons, Paul thinks this figure is a minimum and the actual figure would be higher.

Also, while they both agree that the interview transcript with Charlie is mostly factual they would disagree with the statement "Boats now seldom have to cross the tailrace current". They point out that their boats cross the current not only to take children to and from Helena Falls, but also that the water area on the far side is used for fishing, water sampling and general exploring of the Northern shoreline.

Overall it appears that with two boat swampings and trips across the current cancelled over one third of the time that the conditions, whilst not being inherently unsafe at present, can be marginal for some of the children's activities.

DCOET endeavours to give the school children in their care a memorable and exciting wilderness and water experience. While this experience must never be dangerous, it must be exciting. To achieve this, safety is paramount but they feel that restrictions must be kept to a safe minimum.

There are already weather and water restrictions on crossing the tailrace as mentioned in the previous paragraph. In addition, although the Helena Falls track is open now after a two year closure it is liable to be closed by DoC at short notice. The DoC consent specifies that DoC will close the track for safety reasons after heavy rain or seismic events. Such events can be common in this area.

²³ Interview by Tom Sawyer, 17.4.08

Parties walking to the Helena Falls also have to cross the stream that flows from it. This has been known to rise very rapidly and on at least one occasion a children's party had to be brought back by DCOET boats as the stream had risen so much as to make crossing unsafe.

Overall Paul and Judith find that the weather and water safety parameters they have at present are restrictive but necessary. They worry that increased tailrace flow will further restrict the children's activities in the area and severely impinge upon their stated aim of a memorable and exciting wilderness and water experience.

3 Appendix 3: Additional analysis of surface water current effects for recreation

Request 1

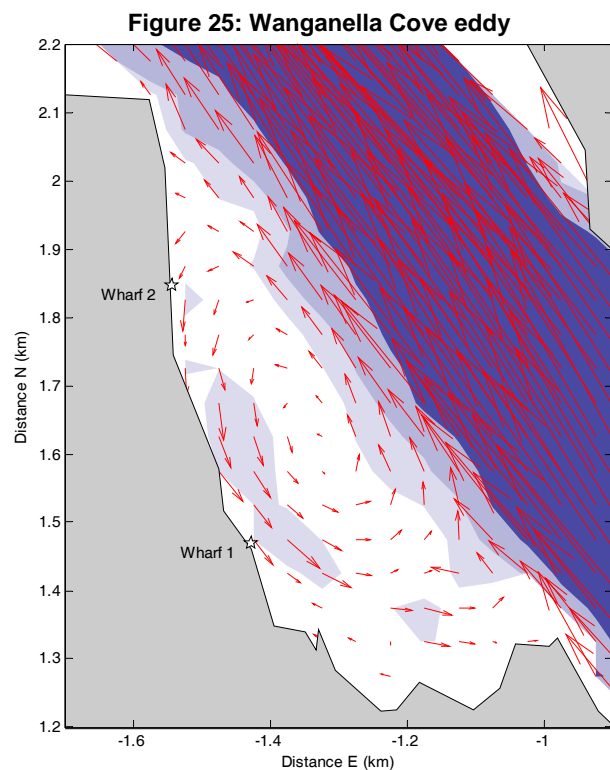
Review the water velocity data for Wanganella Cove (Meridian Wharf) and assess the degree to which the data give confidence that the MTAD discharge will have negligible effect on the existing mooring conditions. That is, are we confident that the high flow trial showed similar (or in fact lower) spikes in flow than outside the trial period and does this illustrate a negligible effect?

Surveys of the surface velocity during the second high flow trial (HFT2) confirm that the discharge of water from the Manapouri Tailrace generates a stream of low-salinity water (the LSS) out through Deep Cove, and that associated with the LSS there is an anticlockwise circulation in Wanganella Cove. We shall call this circulation the Wanganella Cove Eddy (WCE). The WCE shows up well in the figure (right), which is a plot of velocity vectors calculated from drifter trajectories, in the same way as Figure 26 in the High Flow Trial Report. The WCE is also evident in several other figures in the MTAD Marine Surface Water Report, namely Figures 25, 29 (transect 4), 33-35, 36 (transect 4), and 40 (transect 4).

The velocity vectors in the figure were calculated by averaging over all drifter observations, at various different tailrace discharges, but averaging 450-500 m³/s. They therefore represent the flow at tailrace discharges near the current operating limit. The shading in the figure indicates the magnitude of the velocity vector, as follows: white, 0-0.1 m/s; light blue, 0.1-0.2 m/s; mid blue, 0.2-0.5 m/s; dark blue, > 0.5 m/s. Near the shore between Wharf 2 (the Real Journeys wharf) and Wharf 1 (Meridian wharf) the speed of the WCE flow is ~ 0.1 m/s and nowhere more than 0.2 m/s.

The High Flow Trial Report found that the currents in the LSS generally became stronger as the tailrace discharge increased. The increase observed during HFT2 was nearly proportional, i.e., a 50% increase in tailrace discharge (from 400 to 600 m³/s generated a 30-70% (mean 45%) increase in the overall velocity of the LSS. It is reasonable to expect that the WCE should also speed up as the tailrace discharge increases. However, given that the speeds in the WCE are relatively low, this effect might be hard to detect. The best data on the variation of speeds in Wanganella Cove with tailrace discharge are in Figure 40 (transect 4). With tailrace discharges in the range 350-640 m³/s, all the ADCP surveys show a negative velocity (i.e., flow towards the southeast) at the left-hand end of the transect, but there is no clear trend for it to become stronger as the tailrace discharge increases. In other words, the WCE probably does speed up with the tailrace discharge, but the effect is hidden by random variability and instrumental uncertainty.

As explained in the High Flow Trial Report, a current meter was installed in Wanganella Cove for an 80-day period (22 June to 12 September) bracketing HFT2. There were two different sites: the Real Journeys wharf and the Meridian wharf, with the instrument being moved from the former to



the latter on Sunday 8 July, immediately before HFT2. Direction data from this instrument is considered suspect, indicating a problem with the instrument's compass, but there is no reason to doubt the speed data. Figure 21 in the High Flow Trial Report shows the data from this current meter for the HFT2 period only and Figure 22 shows the data for the entire deployment.

During HFT2, the mean speed measured by the wharf current meter was approximately 0.1 m/s and the maximum was between 0.3 and 0.35 m/s. These values are consistent with the drifter and ADCP data in Wanganella Cove during the same period.

The data from the wharf current meter indicate that the speeds measured at the Meridian wharf were not higher when the tailrace discharge exceeded the present operating limit (485 m³/s) than when it was below this limit, because:

There is not a pronounced tendency for current speeds to increase during the high-flow pulses during HFT2 (Figure 21).

The highest speeds measured during HFT2 were not unusual in the context of the longer time series, and were exceeded substantially on several occasions in the longer time series, when the tailrace discharge was at or below the operating limit (Figure 22).

For the present report we compared the speed measured by the current meter at Meridian wharf with time series of possible controlling factors: tailrace discharge, tidal sea level, Lyvia River flow and wind speed. There is a tendency for the current speed to increase with tailrace discharge, but the effect is small: the relationship explains only 0.7% of the variance in the current speed time series.

Conclusion: There is no evidence in the data measured during HFT2, or in the months following, that the current speeds at Meridian wharf or elsewhere in Wanganella Cove increase substantially when the tailrace discharge exceeds the present operational limit of 485 m³/s. We expect that there will be an increase in current speed with increased tailrace discharge, but only in an approximately proportional manner, e.g. an increase in tailrace discharge of 13%, from 485 to 550 m³/s, should lead to an increase of approximately 13% in the current speeds in Wanganella Cove. Given that the current speed in the WCE is of the order of 0.1 m/s, the expected speed-up is of the order of 0.01 m/s, which is too small to be detected against background variability.

Request 2

Can the average and site-specific changes in surface water velocity be directly correlated (with a defined degree of confidence) with a change in wave conditions? If breaking waves resulting from wind against [current] indicate that conditions that are too dangerous for small-boat recreation, can we assume a direct relationship between the increased velocity of the water and the frequency with which breaking waves will be encountered opposite Wanganella Cove and immediately southwest of the southern point of Elizabeth Island?

One cannot assume a direct relationship between the increased velocity of the water and the frequency of breaking waves. Specifically, given that a tailrace discharge increase from 485 to 550 m³/s is expected to result in an approximate 12% increase in near surface water velocity (High Flow Trial report, p 49), we cannot conclude that there will be 12% fewer days on which boating activities are possible. There is insufficient information to relate the change in surface water velocity to the effect on breaking waves or to the number of days on which this limits recreational activities.

Request 3

Plot decay curves for kayaker ground speed at the points marked in Figure 20 for discharge flows ranging from, say, 300 to 550 m³/s, assuming an average kayaker water speed of 2.5 kt and all travel is against the flow and on an outgoing tide.

A spreadsheet has been produced presenting this data. There are seven sites, corresponding to the areas in Figure 2 of the request document (Figure 19 of this report).

For each site I found all the drifter-velocity data within 50 m of the site and calculated the average. (Strictly speaking, I took magnitude of the mean velocity vector.) This is shown in columns 2 (m/s) and 3 (converted to kt) of the table below. I also calculated the average tailrace discharge associated with those drifter observations. (I tried calculating this a few different ways and settled on the average of the tailrace discharge at the time the drifter was released and the tailrace discharge at the time of each observation.) This is in column 4. Columns 5 and 6 show the speed of the outgoing tide, in m/s and kt, respectively. We don't have good data on this, so for the time being I took 0.05 m/s, or 0.097 kt for every site.

The remaining columns show the kayaker ground speed as a function of the tailrace discharge, estimated according to the formula:

$$\text{kayaker ground speed} = (\text{kayaker water speed, 2.5 kt}) - (\text{LSS speed, adjusted for tailrace discharge}) - (\text{tidal speed})$$

Kayaker ground speed at different MTAD rates (300 m ³ /s – 550 m ³ /s)											
Site	LSS speed		Flow (m ³ /s)	Tidal speed		Kayaker ground speed (knots) at specified discharge (m ³ /s)					
	(m/s)	(kt)		(m/s)	(kt)	300	350	400	450	500	550
Site 1	0.510	0.991	500	0.05	0.097	1.81	1.71	1.61	1.51	1.41	1.31
Site 2	0.677	1.315	555	0.05	0.097	1.69	1.57	1.45	1.34	1.22	1.10
Site 3	0.804	1.562	535	0.05	0.097	1.53	1.38	1.23	1.09	0.94	0.80
Site 4	1.069	2.077	592	0.05	0.097	1.35	1.17	1.00	0.82	0.65	0.47
Site 5	0.889	1.727	539	0.05	0.097	1.44	1.28	1.12	0.96	0.80	0.64
Site 6	0.635	1.234	583	0.05	0.097	1.77	1.66	1.56	1.45	1.34	1.24
Site 7	0.889	1.727	571	0.05	0.097	1.50	1.34	1.19	1.04	0.89	0.74

4 Appendix 4: Marine communications summary

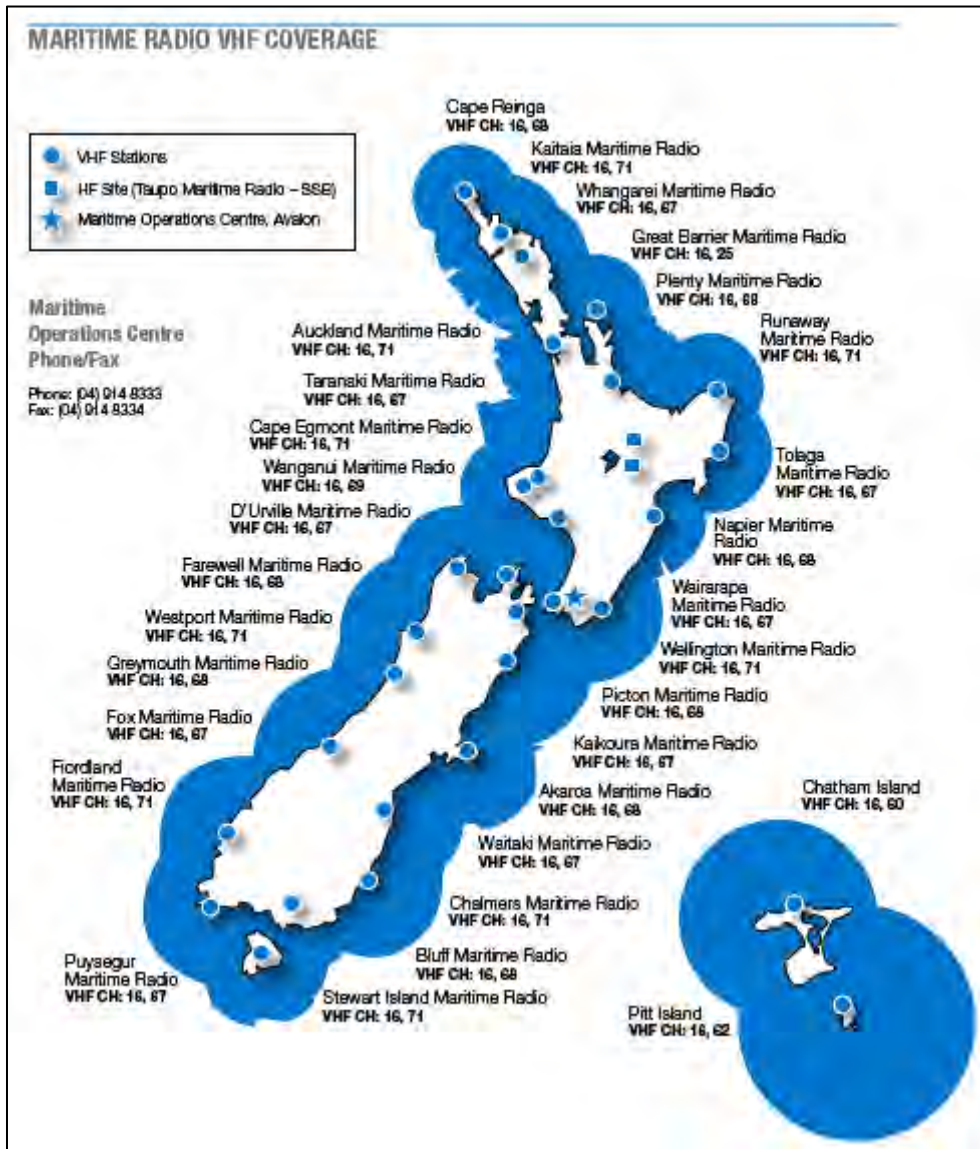
The following is summarised from the Maritime New Zealand *Radio Handbook for Coastal Vessels (Maritime New Zealand 2007)* and personal communication with Maritime New Zealand Manager of Recreational Boating, Jim Lott.

- The primary form of marine communication in New Zealand's coastal waters is VHF (very high frequency) radio. VHF permits line-of-sight communication with another vessel (simplex, ship-to-ship) or stations out-of-sight via an intermediary repeater station (duplex). Ship-to-ship can extend up to 10 nautical miles where there are no obstructions. A repeater can increase the distance to 70 miles.
- The VHF system relies on a national network of repeaters. The Maritime Radio Service operated by Maritime New Zealand (MNZ) offers a publicly funded non-commercial service and is responsible for maintaining the VHF and HF (high frequency) services in New Zealand and a large part of the South Pacific, with 32 VHF radio stations operating nationally (Figure 26). This provides extensive coverage for New Zealand's coastal waters, but does not provide complete coverage in areas where topography interferes, or where repeaters are not located – such as the inner fiords.
- A number of private agencies have installed repeaters and provide; VHF coverage in specific areas; subscription radio services (such as phoning the office and ordering a helicopter to take a catch); and commercial services, such as a connection to the telephone network. These are generally for commercial groups, particularly fishing, and are funded by that group. Coastguard New Zealand operates a network of stations funded by membership fees and donations.
- A repeater, by definition, will service one channel. If more than one channel is required, additional repeaters are needed, and they can be mounted on the one site. For example, a private repeater will only respond to calls made on, for example, Channel 60. An emergency Channel 16 call will be heard on any vessel monitoring that channel (which is standard practice), but will only be heard by external emergency services if there is a Channel 16 repeater in the locality to relay the message. Notably, Lake Taupo, although a popular recreational boating area has no monitored Channel 16 service as there is no commercial imperative. Boats can still radio each other, but an emergency call on Channel 16 would only be picked up by casual radio operators – there is no link to MNZ.
- A VHF operator's licence is required before an individual can make transmissions on VHF, other than emergency calls. Otherwise, a VHF radio could only be used for listening to, for example, weather forecasts. The licence is reasonably easy to obtain by applying for a call-sign (such as ZMT4439) and sitting a short exam.
- VHF radios are relatively cheap (\$200 to \$400). Communication between vessels and with Maritime Radio is otherwise free. Coastguard Radio is funded by memberships and donations. Membership is recommended, although Coastguard and private stations will respond to any distress call on Channel 16.
- Busy recreational and commercial boating areas are served by Coastguard-operated 'nowcasting' services. These deliver weather forecasts, current conditions and small craft advisories with an automatically repeated message broadcast on specific VHF channels (20 to 23). These can be picked up at any time. Much of the north of the North Island is serviced, as well as Wellington and Canterbury. It is up to the individual as to whether they contribute to the cost of providing this service – it is not

possible to restrict listenership. Forecasts, warnings and advisories are also provided by MNZ where VHF coverage is available at specific times.

- SSB (single side band) is an alternative long-distance radio communication option which does not rely on line-of-sight. Rather, HF (high frequency) radio waves bounce off electromagnetic layers in the ionosphere. These are affected by sunlight and so SSB works best at certain times of the day. SSB is better suited to oceanic cruising and is normally carried by commercial vessels. Sets are relatively expensive – more than \$4000.
- An SSB is required for a vessel to have a Category 1 marine rating – which means it is certified by MNZ for international cruising. However, MNZ will also permit a satellite phone instead. However, this is only because all vessels will be carrying an EPIRB (emergency position indicating radio beacon) for emergencies. A satellite phone is unsuitable for emergency calls, although some rescues have been initiated by EPIRB with more detail provided by satellite phone.
- Satellite phones are becoming increasingly affordable – in the \$2000 area with call costs as low as \$1 per minute. However, they are unsuitable for emergencies (a VHF call is quickly broadcast to all nearby vessels) and are not water resistant. They require a line-of-sight connection to a passing satellite and so offer patchy and intermittent coverage in mountainous areas. On the open sea in a cruising vessel they are ideal. They can receive texts and email, as per a normal mobile phone.
- Mobile phones are an option for inshore recreational boats which do not have a VHF – MNZ describes them as a 'backup to a VHF'. They require cell coverage, and while this is often good in inshore marine areas near centres of population, coverage can otherwise be unreliable.
- In the future, terrestrial VHF repeaters may be replaced by satellites, meaning coverage throughout New Zealand, albeit possibly subject to the same connection limitations as satellite phones, but retaining a broadcast ship-to-ship service.
- An alternative one-way communication device is the SPOT Satellite Messenger. This operates in a similar manner to an EPIRB or PLB (personal locator beacon), but can send non-urgent messages via SMS and email, with GPS coordinates, to specified individuals. Messages are limited to: "I'm OK and at these coordinates"; "I'm OK and need to be picked up at these coordinates", and "I need emergency pick-up at these coordinates". The latter message is sent to a centralised emergency response team in the US which advises the host country. The unit cannot receive messages, much like an EPIRB or PLB (a PLB is just a smaller version of the EPIRB and does much the same job).

Figure 26: Marine Radio VHF Coverage



5 Appendix 5: Risk in recreation

Haddock (1993) refers to three types of risk in outdoor recreation: absolute risk, residual risk and perceived risk. The former is the uppermost level of risk in a situation with no safety controls (the worst possible scenario).

Residual risk is the level of risk remaining once the absolute risk has been moderated by safety controls. While an outdoor leader or a guide aims to ensure the level of residual risk is acceptable, the actual level of risk remaining is always difficult to quantify.

Perceived risk is an individual's subjective assessment of the level of risk to which they are exposed, and this will relate to their level of experience and timidity.

An outdoor leader's or a guide's job, amongst others, is to ensure that there is a good match between residual and perceived risk. This requires them to balance their safety provisions with the skills and expectations of their clients. In the case of Doubtful Sound, if tourism operators wish to retain their current clientele, they do not want to limit their customer base further by seeking only clients with more experience and less timidity. Rather, the balance in risk exposure needs to come from maintaining the current level of residual risk through increased safety provisions.

Haddock also identifies three factors which contribute to risk in a recreation setting: equipment, people and the environment. This assessment for MTAD recognises that if effects are to be minor or less, the 'people' component should remain static (their skills and experience), although the 'environment' will change. As a result, the 'equipment' factor (including information) is that which can be modified to redress the change in the risk balance.

A standard metaphor for risk management in outdoor activities relates to how incidents or accidents in the outdoors are normally the result of a multitude of factors. Each factor (such as not having a decent breakfast before skiing off-piste with a poor weather forecast) is referred to in casual parlance as a 'lemon'. One lemon by itself is rarely a problem, but if enough lemons are encountered or not eliminated, then there is an increased chance of an accident (breaking your leg skiing and dying of hypothermia). Haddock refers to a review of 11 outdoor incidents which found up to 25 factors (lemons) contributing to a bad outcome.

The existing regime and proposed MTAD discharge is one lemon. For an accident in Deep Cove or Doubtful Sound to occur, several other lemons will also need to be evident – such as ignoring or not identifying the weather forecast, having inadequate self-rescue or paddling skills, being unprepared for an additional night camping in the Sound, leaving too late in the day to arrive at Deep Cove before sunset and so on. The MTAD lemon would be not identifying that the discharge was due to increase within the next two hours when conditions were already marginal. Removing one lemon might be enough to avoid an accident.

When implementing risk reduction measures, it is worth considering the concept of risk homeostasis, as propounded by Wilde (2001). Wilde concludes that each of us adopts – largely unconsciously – a level of risk that we are happy to expose ourselves to. We adopt various activities – like mountain biking – to keep our level of risk exposure at a comfortable level. If we make any of those activities safer (by wearing helmets on mountain bikes or by developing ABS brakes), we are going to change our behaviour to maintain the same thrill level. Mountain bikers take up night riding, for example, and drivers of ABS-fitted cars accelerate and brake more heavily. By providing additional information about the MTAD setting, or making the appearance that the setting is more predictable, we may encourage the assumption that the setting is more safe. There is no guarantee that measurable reductions in accident rates will result in this case.

6 Appendix 6: Web review references

Location	Activity	Text	Reference
Crooked Arm	Accomm	The following Hotel, Bed and Breakfast and Guest House accommodation is suitable for visting Crooked Arm	http://www.bedandbreakfasts.net.nz/propertysearch.asp?location=Crooked+Arm
Crooked Arm	Boating	While motoring through Crooked Arm, we saw steep, rocky 'shoots' where mountainsides had been stripped of vegetation by tree avalanches, each triggered when a single tree became top heavy in the thin soil and dislodged high above.	http://www.newzealandatoz.com/index.php?pageid=638&NZs+Doubtful+Sound+&PHPSESSID=77076b7b57a050c357f6c77c8d17dbec
Crooked Arm	Boating	Doubtful sound in the winter time is great with the catamaran ploughing through the ice in the Crooked Arm which in itself is a wonderful waterway leading to the almost flat walk ...	http://aatravel.co.nz/101-must-dos-for-kiwis/user-comment.php?mustDold=83
Crooked Arm	Boating	Typical overnight anchorages in Doubtful Sound include Crooked Arm, First Arm, and Precipice cove in Bradshaw Sound or on the eastern tip of Secretary Island.	http://www.travellink.co.nz/media/operator.asp?UID=243
Crooked Arm	Heli flights	Dusky Sound is the largest and most spectacular of the Fiords. A landing is made at Mt Pender to view this historic area encompassing 365 Islands, we shut the helicopter down so you can experience the beauty and solitude of this special area. When airborne you overfly 3 more Fiords before descending Crooked Arm into Doubtful Sound. Flying up this Fiord we detour into a unique hanging valley know as Campbell's Kingdom, complete with its own lake & waterfall. The return journey overflies the Main Divide of the Southern Alps with a second landing at Mt Kidd, a remote alpine location with dramatic views.	http://www.southernlakeshelicopters.co.nz/Scenic-Flights/default.asp
Crooked Arm	Heli flights Wildlife	Airborne, we fly over three more fiords before descending down Crooked Arm of Doubtful Sound where you may be lucky enough to spot some dolphins!	http://www.tikana.co.nz/Experiences/Fiordland-Unplugged.asp
Crooked Arm	Heli flights	Dusky Sound is the largest and most spectacular of the Fiords. A landing is made at Mt Pender to view this historic area encompassing 365 Islands, we shut the helicopter down so you can experience the beauty and solitude of this special area. When airborne you overfly 3 more Fiords before descending Crooked Arm into Doubtful Sound.	http://www.southernlakeshelicopters.co.nz/Scenic-Flights/Dusky-Doubtful-Sounds.asp
Crooked Arm	Kayaking Wildlife	Day 1: As for the 2 day tour we begin kayaking from Deep Cove, but instead of going into Hall Arm we paddle down the main reach, passing Elizabeth Island and Olphert Cove watching for seals and penguins, stopping near Crooked Arm for lunch - a long first stint. Afternoon paddling becomes more challenging in places - time to practise new skills. As we near the entrance to Crooked Arm, the weather will decide whether we cross into the Arm or camp in a river valley opposite its entrance. Our campsite in Crooked Arm is relatively close to the entrance, in a sheltered bay beside a waterfall. Day 2: Stillness is normally the theme in the morning. The choice is to spend the day exploring Crooked Arm (30kms to its end and back to the campsite) or leaving the Arm and paddling to Hall Arm for the night (see 2 day tour). Crooked Arm is a long narrow arm with a definite turning point like an elbow and often the afternoon playground of the resident bottlenose dolphins - their presence can dictate our paddling timetable as can the weather!	http://www.fiordlandseakayak.co.nz/doubtfulsound_3-5days.html
Crooked Arm	Kayaking	. . . That's good in a way. Some time I'd like to take a kayak down Crooked Arm in Doubtful Sound, carry it across from Haulashore Cove and drop it into the . . .	http://matthewwalker.net.nz/weblog/index.cfm?fuseaction=searchResults&keyword=s=crooked

Location	Activity	Text	Reference
Crooked Arm	Kayaking	Wednesday dawned grey and overcast as the "Sound of the Gumotex" echoed out over the still waters. Shortly afterwards a blue boat and 2 hooded men glided out of the river mouth into the dark waters of the Sound. It was about 2 kilometres across to the head of the Sound to an isthmus about a kilometre long leading to Crooked Arm, a branch of Doubtful Sound. A huge rockfall occurred here several years ago in an earthquake and there is a track across it which they found straightforward. It is a long way down Crooked Arm and they were paddling towards Turn Point when suddenly a huge white Real Journeys catamaran came around the corner and stopped.	http://sskn.uniformnz.com/news.php?type=news&id=http://sskn.uniformnz.com/news.php?type=news&id=53
Crooked Arm	Kayaking	Two nights were spent at a camp site some 3km up Crooked Arm. We visited the head of the arm, but it was too cold to explore further.	http://www.nelsonkayakers.co.nz/uploads/file/Newsletter_200708.pdf
Crooked Arm	Sight seeing	Sunday we were picked up at 7am by two shuttle vans and taken to Manapouri where a chartered high speed boat (website) took us to West Arm. Their coach then took us down the underground power station for a visit, then over the Wilmot Pass to board Affinity about 11am at Deep Cove in Doubtful Sound. That day we explored Doubtful Sound visiting Hall Arm, Crooked Arm, and First Arm, staying at the end of First Arm for the night.	http://www.travel.angnz.com/nz/dusky/index.htm
Crooked Arm	Sight seeing	The early morning developed into another superb sunny day and we quietly relaxed and soaked up the beauty of the scenery while Lance motored back to Doubtful Sound. He steered Breaksea Girl into Crooked Arm and soon we sighted dolphins. The bottlenose dolphins of Fiordland are the southernmost pods in the world. Research has shown these dolphins have evolved to handle the cold water by becoming fatter and having smaller pectoral fins than other bottlenose dolphins.	http://www.divenewzealand.com/articles.asp?sid=75
Crooked Arm and Doubtful Sound	Kayaking Tramping/ walking	Voyage of the Gumotex An account of the Gumotex Expedition across southern Fiordland from Lake Hauroko to Doubtful Sound, 3-15 February 2006 by Simon Marwick and Stan Mulvany. Total distance 215 kilometres; 170 kilometres paddled; 5500 metres of ascent and descent. First traverse of this unique route in Southern Fiordland.....Wednesday dawned grey and overcast as the "Sound of the Gumotex" echoed out over the still waters. Shortly afterwards a blue boat and two hooded men glided out of the river mouth into the dark waters of the Sound. It was about two kilometres across to the head of the Sound to an isthmus about a kilometre long leading to Crooked Arm, a branch of Doubtful Sound. It is a long way down Crooked Arm and they were paddling towards Turn Point when suddenly a huge white Real Journeys catamaran came around the corner and stopped. There was a bizarre scene played out as the numerous gaily dressed tourists aboard lined the rails gaping at these two desperate fugitives paddling furiously past in a tiny blue boat.	http://www.alpineclub.org.nz/documents/stions/southland/06July.pdf
Deep Cove	Accomm Sight seeing	Lakes, views of snow capped mountains, the bush, water falls, marine life, walking tracks, or one of the engineering wonders of modern man! Anything there that is of interest to you? All of these things are easily found, most in abundance, in the Fiordland National Park, and one of the easiest areas in which they are to be found is on a visit to Deep Cove at the head of Doubtful Sound..... While the water flows through the tunnel visitors must travel again by bus over the 640 meter high Wilmot Pass before dropping down to the hostel at Deep Cove.	http://www.seniornetsouth.org.nz/visit%20DeepCove-97-pdf.pdf
Deep Cove	Accomm Outdoor Euc	In November 2006 PowerNet provided sponsorship to the Deep Cove Outdoor Education Trust for the purchase of a Nissan Safari four wheel drive vehicle. The vehicle, which is used as transport between the West Arm of Lake Manapouri and Deep Cove, is a replacement for the one provided by PowerNet in 1996.	http://www.powernet.co.nz/community/deep_cove_outdoor_ed_trust.html
Deep Cove	Accomm Outdoor Educ	Deep Cove Outdoor Education Trust..... OTHER HAPPENINGS AT DEEP COVE Three weeks ago a school group staying at the hostel had quite an experience. Swimming around in the Cove right in front of the hostel was a Right Southern Whale and her calf. They were there for an hour or so and the school group saw them again on their cruise on the sound .The resident skipper for Real Journeys said it was only the second time in twenty four years he had seen one in Doubtful Sound.	http://www.deepcovehostel.co.nz/Newsletter.pdf
Deep Cove	Accomm Wildlife Tramping/ Walking Fishing Kayaking Outdoor Educ	The Deep Cove Outdoor Education Trust is a non-profit organisation that was established in 1971. The Deep Cove Hostel is a modern 50 Bedroom building. It is established for the purpose of enabling school aged children a unique opportunity to experience life in a remote part of Fiordland National Park. While at the Hostel, visitors have the opportunity to study the variety of flora and fauna in the region, experience light to moderate tramping in virgin native Prodocarp forest, go boating on the Sound, fish, learn to interact and work as a team in one of the most remote places in New Zealand. There are an increased number of casual visitors to the hostel. These people come for the unique tramping, diving fishing in both the sea and rivers, kayaking on the Sound, or just to relax and enjoy a slower pace of life for a few days	http://www.deepcovehostel.co.nz/
Deep Cove	Boating	After 9 hours plus they arrived at West Arm. From there they were towed by an old Bedford truck over the Wilmot Pass to Deep Cove to start a 3 week cruise going right down to Dusky sound	http://www.noalex25.co.nz/index.php?option=com_cont

Location	Activity	Text	Reference
			ent&task=view&id=5&Itemid=27
Deep Cove	Deep Cove Sight seeing	Cruise the crystal clear waters of Lake Manapouri. Then it's over Wilmot Pass, on reaching Deep Cove, you will board the spacious catamaran for a luxury overnight cruise on Doubtful Sound with Real Journeys.	http://www.everythingqueerstown.com/category/Doubtful+Sound
Deep Cove	Diving	Doubtful Sound. The entranceway is guarded by Secretary Island, a favourite haunt of bottlenose dolphins. Deep Cove is blanketed by mussels, which are preyed on by carnivorous starfish and bright red corals. Bauza Island and The Gut have the most glorious red and black coral.	http://www.newzealandnz.co.nz/scuba-diving-snorkelling/fiordland.html
Deep Cove	Fishing	Fishing trip..... Paul trailored his boat and we followed him through twenty two kilometres of road through the Wilmont pass to Deep Cove. We were treated to some amazing scenery - the dense rainforest, towering rock faces with spectacular waterfalls. Our home for the next six days, the Genesis anchored in the most idyllic settings. The tranquil waters of Deep Cove and a back drop of steep, bush clad mountains that rose right out of the water and its peaks lost in the clouds.	http://www.fishingmag.co.nz/fiordland.htm
Deep Cove	Fishing	Doubtful Sound Overnight Fishing Cruise - Deep Sea Fishing outside Doubtful Sound is an overnight experience with Deep Cove Charters, excellent operators for those who would like to combine sightseeing on the famous Fiord with a bit of adventure	http://www.adventuremanapouri.co.nz/links.html
Deep Cove	Fishing	Fishing link.....Deep Cove Charters	http://www.fishfiordland.co.nz/index.cfm/fuseaction/pages.links
Deep Cove	Fishing	The Waiiau drains the large western lakes but most of its water is diverted through a power scheme to the Deep Cove in Fiordland. However a useful residual flow is discharged through the control gates just south of Lake Manapouri. The Waiiau is really two rivers. One that flows from Lake Te Anau to Lake Manapouri and the one that flows from Lake Manapouri through the Mararoa Weir, to the sea. The former is a very large river that fishes best in the late summer when caddis flies hatch. It is accessible from rough tracks that lead down to the river from the Te Anau to Manapouri road.	http://www.fishandgame.org.nz/Site/Regions/Southland/fisheries.aspx
Deep Cove	Jet skiing	Once out of there we had a good run down to the entrance of Doubtful sound. We entered the sound which is easily the most awesome place we have seen so far. We stopped under a huge waterfall for a snack As we headed up the sound we saw and played with more dolphins. These ones were big and stunningly impressive. We could feel them bumping the bottom of the skis and they frequently splashed us. Deep Cove exceeded all expectations for beauty. Time on skis 6.5 hrs	http://www.burglarbrothers.com/diary.htm
Deep Cove	Kayaking	for the 2 day tour we begin kayaking from Deep Cove, but instead of going into Hall Arm we paddle down the main reach, passing Elizabeth Island and Olphert Cove watching for seals and penguins, stopping near Crooked Arm for lunch - a long first stint	http://www.fiordlandseakayak.co.nz/doubtfulsound_3-5days.html
Deep Cove	Kayaking Wildlife	Stage 1: departing Te Anau early in the morning, your wilderness experience begins as the sun rises with a 30km boat journey across stunning Lake Manapouri and 24 kms by vehicle over Wilmot Pass to Deep Cove where as kayakers, we stop using fuel and emitting carbon, the only ones to do so. Time to change, pack kayaks and go through a safety briefing. The sea kayaking and camping...unlike anywhere else in the world Stage 2: the daytime - approximately 5 hours kayaking from Deep Cove in the midst of massive glacial landscapes, deeply faulted mountainsides, towering sea cliffs, waterfalls, past Rolla Island, a nesting place for penguins often with fur seals, sometimes dolphins, lunch on an uninhabited beach, pristine native rainforest with kea, kaka flying high,	http://www.fiordlandseakayak.co.nz/doubtfulsound_2days.html
Deep Cove	Kayaking	Start your journey by cruise across beautiful Lake Manapouri to West Arm. Travel 22 kms over the Wilmot Pass Road to Deep Cove where your paddling adventure begins	http://www.fiordlandadventure.co.nz/option_3_ds_2_day.htm
Deep Cove	Kayaking	Kayakers will enjoy a cruise across Lake Manapouri before crossing Wilmot pass to Deep Cove from where you will set out on your Kayaking adventure.	http://www.lanzend.co.nz/tours/tour_gse.htm
Deep Cove	Kayaking	Unlike Milford Sound, Doubtful Sound is hard to get to which means it's far less crowded. Just to get on the water takes three hours - a bus trip from Te Anau to Manapouri, a sunrise boat trip across Lake Manapouri, then a 4WD trek over Wilmot Pass to Deep	http://www.inzinct.com/new-zealand-adventure-

Location	Activity	Text	Reference
		Cove where our kayaks were waiting.	journalism.php
Deep Cove	Outdoor Educ	Went to Deep Cove in Fiordland where it knows how to rain. Interestingly the outdoor instructors joked about all the \$300-500 gear they see on people - and how wet they get. To keep dry they reckoned the Warehouse PVC coats were the most simple and the best. In fact the hostel at Deep Cove has these as standard equipment	http://pressf1.pcworld.co.nz/showthread.php?p=444988
Deep Cove	Outdoor Educ	Adventure Southland Ltd are specialists in fun outdoor education and recreation to schools in the Deep South.....Locations in which camps can be held include:the Southern most coast of the South Island Deep Cove, Fiordland National Park	http://www.adventuresouthland.com/?id=100034&cat=6
Deep Cove	Scenic (views over) Sight seeing	The best and most unique way to fly around the prestigious Fiordland National Park. We offer a small, personalised service with friendly staff and safe, comfortable planes to suit your budget.....Deep Cove	http://www.wingsandwater.co.nz/index.html
Deep Cove	Scenic (views over)	Air Milford.....At 421 metres deep Doubtful is the deepest of the fiords and is long and winding with three distinct 'arms'. The distance from Deep Cove to the open sea is around 40.4 kilometres.	http://www.airmilford.co.nz/doubtful-sound-flights.html
Deep Cove	Sight seeing	Deep Cove Charters.... Doubtful Sound Overnight Cruise, Fiordland....your the cruise of a lifetime...Experience a unique overnight cruise on the beautiful serene Doubtful Sound, in Fiordland, one of our the most scenic and awe inspiring sounds within the Fiordland National Park.. <i>This charter company is referred to on most recreation/tourism websites. Note that it is called Deep Cove, but the area that it operates in is Doubtful Sound.</i>	http://www.doubtful-sound.com/
Deep Cove	Sight seeing Fishing	Come and travel across beautiful Lake Manapouri, over the Wilmot Pass and into Deep Cove in Doubtful Sound. Then join us for a relaxing cruise aboard "M.V.Flyer" as it winds its way out of Doubtful Sound to the Tasman Sea on New Zealand's hospitable West Coast. Try your luck at a spot of fishing or just sit back and take in the breathtaking scenery of our World Heritage Park as "Flyer" heads back up the fiord to one of the many anchorages. Wake in the morning to the sound of silence and enjoy a two hour cruise back to Deep Cove.	http://www.travellink.co.nz/media/operator.asp?UID=239
Deep Cove	Sight seeing	Your adventure starts from your overnight accommodation in Te Anau. At approximately 8.45 am a local operator will pick you up and bring you to Affinity. The trip includes a coach to the Manapouri wharf then a cruise across Lake Manapouri where at the other side you will board another coach for the trip over the Wilmot Pass and down into Deep Cove, Doubtful Sound where Affinity will be waiting for you. You arrive at Deep Cove about 12 noon. As soon as you are settled and after a briefing on the safety aspects, we will depart and cruise down the fiord. Lunch will be served as you cruise and explore Doubtful Sound. Weather permitting; it's down the coast to Breaksea and Dusky Sounds to explore the maze of arms, channels and islands	http://www.affinitycruises.co.nz/Default.asp?Page=42
Deep Cove	Sight seeing	Today one of the most popular of all Fiordland tourist trips is the return one day excursion from Manapouri to Doubtful Sound. Modern launches leave Pearl Harbour at Manapouri (20 minutes from the holiday resort of Te Anau) and cross beautiful Lake Manapouri to West Arm. A short trip over the Wilmot Pass leads to Deep Cove at the head of Doubtful Sound	http://www.travellink.co.nz/media/category.asp?UID=117
Deep Cove	Sight seeing	Once we are in Deep Cove we load the boat, complete a welcome and safety briefing then we are on our way. Travelling out of Doubtful Sound we take in the awesome sights as we go then a short hop down the coast has us next at Dagg or Breaksea Sound.	http://www.fiordlandexpeditions.co.nz/index.php?page=itinerary
Deep Cove	Sight seeing	Following a short cruise across island-studded Lake Manapouri and a coach trip on the remote sub-alpine route over Wilmot Pass, you will board the Fiordland Navigator at Deep Cove.	http://www.realjourneys.co.nz/Main/Doubtfulovernight/
Deep Cove	Sight seeing	Doubtful Sound Cruise..... Cruise picturesque Lake Manapouri, dense rainforest of the Wilmot Pass, cruise from Deep Cove to Doubtful Sound. Chance to see bottlenose dolphins, fur seals and rare Fiordland crested penguins. Hotel pick ups included.	http://southpacifictravellers.com/activities1.asp?id=11
Deep Cove	Sight seeing	Then it's over Wilmot Pass, stopping along the way to experience some of Fiordland's densest rainforest and to view close up the colourful alpine moss gardens. On reaching Deep cove, you board a catamaran for a three hour cruise which takes you in the most dramatic scenery of Doubtful sound. Nature guides are always on hand to point out highlights. Bottlenose dolphins frequently cavort alongside your vessel; fur seals bask on the Nee Islets at the mouth of the Fiord and at times, the rarest penguins in the	http://www.ginz.com/new_zealand/otago/queenstown/accommodation/suppliers/FIORDL/itineraryitem

Location	Activity	Text	Reference
		world can be observed.	
Deep Cove	Sight seeing	The trip includes a coach to the Manapouri wharf then a cruise across Lake Manapouri where at the other side you will board another coach for the trip over the Wilmot Pass and down into Deep Cove, Doubtful Sound where Affinity will be waiting for you. You arrive at Deep Cove about 12 noon. As soon as you are settled and after a briefing on the safety aspects, we will depart and cruise down the fiord	http://www.icruise.co.nz/ideal.pl?cruise=AFF0907
Deep Cove	Sight seeing Accomm	Getting to Doubtful Sound is an adventure in itself. On the trip passengers make a complete east to west crossing of New Zealand's largest national park travelling across beautiful Lake Manapouri to West Arm and then by coach along a remote alpine road across Wilmot Pass and down into Deep Cove where they board the cruise vessel. Doubtful Sound is remote and has only one resident, the manager of the Deep Cove Hostel.	http://www.realjourneys.co.nz/Corporate/worklocations/
Deep Cove	Sight seeing	Then from the power station (at west arm) across the pass by bus on a dirt track to Deep Cove. The scenery is fantastic. Deep Cove is an arm of Milford Sound. Then by boat to tour Doubtful Sound".	http://www.goseenewzealand.co.nz/article/270/Motorhome_adventures_with_children_New_Zealand_South_Is_tour/
Deep Cove	Sight seeing	From West Arm the trip continues by coach over Wilmot Pass stopping several times to view mosses and ferns (below) and views of Doubtful Sound. Then onto Deep Cove at the head of the Sound for a 3 hour boat cruise or kayaking on un-spoilt Doubtful Sound. It is the second most accessible and second most visited fiord in Fiordland National Park	http://www.lakevista.co.nz/doubtful-sound.htm
Deep Cove	Sight seeing	Departing from Manapouri, the journey to Doubtful Sound begins with a cruise across Lake Manapouri. After disembarking at West Arm, passengers then travel over Wilmot Pass by coach through dense rainforest. At Deep Cove, visitors board the overnight cruise vessel for leisurely exploration of Doubtful Sound.	http://www.explorenewzealand.co.nz/explore/Fiordlandnavigatorovernightcruise/index.cfm/parameters
Deep Cove	Sight seeing Kayaking	At 421 metres deep, Doubtful is the deepest of the fiords and is long and winding with three distinct "arms" and several outstanding waterfalls in the area from Deep Cove to the open ocean, a distance of around 40.4 kilometres. There are many ways to experience Doubtful Sound - by kayak or cruise, as a day trip or on an overnight experience.	http://www.fiordland.org.nz/Explore-Fiordland/Places-to-visit/Doubtful-Sound.asp
Deep Cove	Sight seeing	Sandpiper departs Sunday from Deep Cove with passengers disembarking the following Saturday	http://www.sandpiper.co.nz/fiordland.htm
Deep Cove	Sight seeing	On reaching Deep Cove, you will board a spacious catamaran for a three hour cruise that takes in the most dramatic scenery of Doubtful Sound	http://www.nz.com/new-zealand/activities/te-anau/doubtful-sound-wilderness-cruise.aspx
Deep Cove	Sight seeing	This is followed by an exhilarating drive over Wilmot Pass with breathtaking views of Doubtful Sound and surrounding peaks, before descending down to the calm waters of Deep Cove.	http://www.possumlodge.co.nz/activities.html
Deep Cove	Sight seeing Wildlife	Travel to Manapouri for Doubtful Sound overnight cruise. We'll board the Fiordland Navigator at Deep Cove to view stunning land/sea-scapes and wildlife. Kayak around the shoreline or go exploring with a nature guide. We'll drop anchor at a favourite mooring for the night	http://www.driftwooddreamers.com/south_island_adventure.htm
Deep Cove	Sight seeing Accomm	Larchill accommodation....The excursion includes a boat trip across Lake Manapouri, a bus journey over Wilmot pass through lush rain forest and a visit to the underground Power Station in the West arm of Lake Manapouri. The Tail pipes from the turbines run fresh water from Lake Manapouri into Deep Cove of Doubtful Sound.	http://www.larchhill.com/todo.htm
Deep Cove	Sight seeing Accomm	Milford Lodge accommodation.....The Lake is famous for its many islands, and magnificent Rainbows. This is followed by an exhilarating drive over the Wilmot Pass with breathtaking views of Doubtful Sound, before descending down to the calm waters of Deep Cove.	http://www.milfordlodge.com/DoubtfulSound.html

Location	Activity	Text	Reference
Deep Cove	Sight seeing	bus ride from the head of the lake took us through lush rainforest, up and over Wilmot Pass and down to Deep Cove where we boarded another vessel.	http://www.capturenewzealand.co.nz/news.html
Deep Cove	Sight seeing Accommm	YHA accommodation.....Feel the power of nature." Cross beautiful Lake Manapouri and coach over Wilmot Pass to Deep Cove	http://www.yha.co.nz/NZHostelsandTravel/FindaHostel/OtagoandSouthIsland/DoubtfulSound/
Deep Cove	Wildlife Sight seeing	Dockbay lodge Accommodation.....Roger took us for a short ride up the Camelot River in the tender boat (unbelievable scenery) and then we started back down the Sound for Deep Cove. A large pod of bottlenose dolphins entertained us with their acrobatic swimming abilities and some penguins and various other birdlife flew in to check us out but failing them we felt like Captain Cook as there was no-one else to be seen.	http://dockbaylodge.co.nz/db/index.php?option=com_content&task=blogsection&id=5&Itemid=62
Doubtful Sound	Accomm Sight seeing Tramping/ Walking Eco tourism	Practically untouched by man. The physical grandeur of towering peaks descending into moody waters, outstanding waterfalls from high-up ice-age valleys and fiords clad with ancient vegetation, create a powerful atmosphere of solitude and serenity. Accommodation - listings Cruise Doubtful Sound Dusky Track Eco-Tourism - listings Manapouri Manapouri Power Station The Wilmot Pass	http://www.travellink.co.nz/media/category.asp?UID=117
Doubtful Sound	Accomm Wildlife Sight seeing	Doubtful Sound cruise tours depart just 15 minutes walk from Beechwood Lodge. The journey begins with a 30 minute catamaran trip to the Visitor Center on the opposite shore of Lake Manapouri. From catamaran to coach for the 10 mile drive over Wilmot Pass to Deep Cove where the cruise ship is moored. Marine life includes: little blue penguins, fur seals, dolphins.	http://www.beechwoodlodge.com/doubtful_sound.htm
Doubtful Sound	Accomm Wildlife Kayaking	Doubtful Sound is an overwhelming place. You can feel the power of nature here. Feel the remoteness, the wildness — the peace... There is plenty of time on your overnight cruise to enjoy the stunning views and discover the hidden arms of Doubtful Sound. Fur seals and bottlenose dolphins are often seen, and at times, rare penguins can be observed. There is also time for you to kayak around the shoreline, or go exploring in the tender craft with our nature guide. As the shadows lengthen, we'll drop anchor at a favourite mooring for the night	http://www.zqn.co.nz/doubtful/
Doubtful Sound	Accomm Sight seeing Wildlife	While Milford Sound is world famous for its towering peaks, plunging waterfalls, and hanging glaciers, Doubtful Sound is becoming revered by travelers for its wilderness and wildlife. The second largest of the fiords in Fiordland National Park, Doubtful Sound provides a unique experience with long winding waterways, spectacular mountain scenery, and playful marine life. A trip to Doubtful Sound is a full day adventure. The early morning cruise across Lake Manapouri is considered by some as the highlight of the day. The Lake is famous for its many islands, and magnificent Rainbows. This is followed by an exhilarating drive over the Wilmot Pass with breathtaking views of Doubtful Sound, before descending down to the calm waters of Deep Cove. Accommodation close to the Doubtful Sound departure point is limited. The conveniently located Possum Lodge offers a range of accommodation	http://www.milfordlodge.com/DoubtfulSound.html
Doubtful Sound	Accomm Sight seeing Kayaking Fishing	Te Anau backpackers accommodation.....Overnight Cruises FIORDLAND CRUISES offer the best value overnight cruises in Doubtful Sound Departs Te anau 9.30am, Manapouri 10am. Bring your own lunch on the first day, delicious evening meal and continental breakfast included. Fishing, sightseeing and kayaking available.	http://www.teanaubackpackers.co.nz/backpackers/DoubtfulSoundActivitiesTNUBPACK
Doubtful Sound	Accomm Wildlife Sight seeing Kayaking	YHA Accommodation...“Feel the power of nature.” Cross beautiful Lake Manapouri and coach over Wilmot Pass to Deep Cove. Explore the wilderness scenery of Doubtful Sound with a leisurely overnight cruise on board the Fiordland Navigator. Accommodation is available in quad-share bunk-style compartments (bedding provided). Private cabins with ensuite also available (extra cost). Delicious meals included.What to do Excellent wildlife viewing opportunities - seals, dolphins and penguins. With our nature guide, discover Doubtful Sound's hidden charms by kayak or tender craft	http://www.yha.co.nz/NZHostelsandTravel/FindaHostel/OtagoandSouthIsland/DoubtfulSound/
Doubtful Sound	Diving Wildlife	Diving locations.....The entranceway is guarded by Secretary Island, a favourite haunt of bottlenose dolphins. Deep Cove is blanketed by mussels, which are preyed on by carnivorous starfish and bright red corals. Bauza Island and The Gut have the most glorious red and black coral	http://www.newzealandnz.co.nz/scuba-diving-snorkelling/fiordland.html
Doubtful Sound	Fishing Diving Hunting Kayaking	Tutoko Port - Doubtful Sound Area - Southwest Day Passengers n.a. Length (m) 18 Berths 10 Speed (kn) 9 Skipped Fiordland Expeditions offer a fully self contained vessel for charters specifically tailored to meet your needs whether fishing, diving, hunting, kayaking, exploring, bush walking or just relaxing and taking in the scenery they guarantee an exceptional experience.	http://www.charterguide.co.nz/hts/1948.htm

Location	Activity	Text	Reference
	Tramping/ Walking Sight seeing		
Doubtful Sound	Fishing - trout	Has anyone fished for trout in Doubtful sound? There look to be some reasonable streams and rivers entering at various parts.A group of us are heading down mid April for 5 days and I would be keen to have a look around, especially if the ocean is a little rough for getting monster blue cod at the mouth of the sound	http://www.flyshop.co.nz/cgi-bin/forum/ikonboard.cgi?act=ST;f=1;t=846;&#top
Doubtful Sound	Kayaking	Doubtful Sound This two day trip is about allowing yourself some quality time to experience a personal adventure, a genuine kayaking and camping experience in a remote New Zealand environment, in a natural, non-intrusive way, that respects what Fiordland's wilderness is all about and expresses what real sea kayaking is all about:	http://www.fiordlandseakayak.co.nz/doubtfulsound_2days.html
Doubtful Sound	Kayaking Wildlife	The more time you give to Doubtful Sound, the greater the rewards. By taking time as we do to explore the fiord's remote waterways and the land carved by Tuterakiwhanoa, you become a part of this raw and powerful place, more likely encountering its wildlife, extending your skills and being justified in celebrating a real sense of achievement as you and the group work through the challenges and rewards that such adventure brings.	http://www.fiordlandseakayak.co.nz/doubtfulsound_3-5days.html
Doubtful Sound	Kayaking Wildlife Sight seeing	There is plenty of time on your overnight cruise to enjoy the stunning views and discover Doubtful Sound. Fur seals and bottlenose dolphins are often seen, and at times penguins can be observed. There is also time for you to kayak around the shoreline, or go exploring in the tender craft with our nature guide.	http://www.infocus.co.nz/fiordland/activities/fiordland_e_co_tourism.asp
Doubtful Sound	Kayaking	Doubtful Sound - widely regarded as the ultimate Sea Kayaking destination in Fiordland, Doubtful Sound offers kayakers a true wilderness experience, with vast waterways and secluded campsites to really get away from it all. The best way enjoy Sea Kayaking in Doubtful Sound is on a 2-5 day uided adventure. Paddle beneath towering peaks and plunging waterfalls, with occasional encounters with playful Dolphins and Seals. At certain times of the year the rare Fiordland Crested Penguin can be seen in the clear waters of the fiord or on the rocky shoreline. All transport and equipment is provided on guided trips, while self guided adventures require a lot more planning.	http://www.possumlodge.co.nz/activities.html
Doubtful Sound	Mountain biking	Deep South: Doubtful Sound MTB Rides Deep South Comment on this Ride Catch the boat across Lake Manapouri to West Arm then ride over Wilmot Pass to Doubtful Sound (18 km). The climb back is a killer even though it's on a good quality gravel road. There is a DOC hostel at Deep Cove. The scenery around here is absolutely spectacular.	http://www.downhill.co.nz/rides/mtb/deepsouth/56.html
Doubtful Sound	Scenic (flights over) Sight seeing Fishing Kayaking Hunting	For visitors wanting a true New Zealand experience and who want to get away from the crowds, our Doubtful Sound flights offer a fabulous scenic tour option. It is a fabulous wet weather option if Milford Sound is closed due to inclement weather. This is because the scenic flight, which connects with the Doubtful Sound cruise, is not as weather dependent as a flight to Milford Sound. Our Doubtful Sound flights offer a wonderful opportunity for visitors who have already seen Milford Sound and want to explore more of this unique New Zealand environment Doubtful Sound/Dusky Sound We specialise in charters from one day up to 7 days. Depending on what you are looking for in a charter, we can customize your trip to suit your timeframe. All of Fiordland is fantastic for scenery, diving, fishing, relaxing and exploring. In general, the further south you go, the more history abounds. Dusky and Breaksea Sounds are considered to be the most premium sounds to explore and this is where Fiordland Charters specialize in. All charters are personally customised to the clients and can include any or all of the following, Diving, Fishing, Hunting, Sea Kayaking, Historic Trip and just relaxing.	http://www.queenstown-vacation.com/queenstown/doubtfulsound/
Doubtful Sound	Scenic (views over)	For guests wanting a true New Zealand experience and who want to 'get away from the crowds' our Doubtful Sound flights offer a fabulous scenic tour option. It is a fabulous wet weather option if Milford Sound is closed due to inclement weather. This is because the scenic flight, which connects with the Doubtful Sound cruise, is not as weather dependent as a flight to Milford Sound. Our Doubtful Sound flights offer a wonderful opportunity for guests who have already seen Milford Sound and want to explore more of this unique New Zealand environment.	http://www.airmilford.co.nz/doubtful-sound-flights.html
Doubtful Sound	Scenic (views over)	Also, Doubtful Sound scenic flights take you to remote and spectacular inlets with dramatic views of untouched forests, alpine scenery and a landing on the shores of Doubtful Sound. Fly over Te Anau, Lake Manapouri and the Wilmot Pass into remote Doubtful Sound. Fly over George and Bligh Sounds via the Sutherland Falls.	http://www.milfordsoundflights.co.nz/

Location	Activity	Text	Reference
Doubtful Sound	Scenic (views over) Wildlife	Doubtful Sound is a more remote area of the South Island's rugged West Coast. Visitors feel humbled yet uplifted by the atmosphere of powerful solitude in the presence of superb physical grandeur of New Zealand's remote Doubtful Sound. Sometimes called "the Sound of Silence" there is a cloistered serenity within Doubtful Sound that a contrast with its near neighbour, Milford Sound. The fiord is rich in flora and fauna. Often our visitors on a scenic excursion will see New Zealand Fur Seals and in the Penguin breeding season the Fiordland Crested Penguins can be seen on many of the small islets in the entrance of the fiord.	http://www.airmilford.co.nz/doubtful-sound-flights.html
Doubtful Sound	Scenic (views over)	Views of the Iris Burn Valley and the Lake of Many Islands, known as Lake Manapouri is revealed. You have a bird's eye view of the West Arm Power Station before climbing over the Wilmot Pass into Doubtful Sound. If the weather is suitable we detour into Campbell's Kingdom, a beautiful hanging valley complete with its own lake and waterfall. Airborne again, you will glimpse Bradshaw Sound before overflying the Main Divide of the Southern Alps to Mt Kidd for a second remote landing before returning to the Helipad	http://www.southernlakeshelicopters.co.nz/Scenic-Flights/Doubtful-Sound.asp
Doubtful Sound	Sight seeing	Doubtful Sound located in a World Heritage Area, is an overwhelming place. You can feel the power of nature here - the remoteness, the wildness and the peace. Known for its wilderness and wildlife, Doubtful Sound is the second largest of the 14 fiords in Fiordland National Park and it is three times longer and 10 times larger than Milford Sound. In Maori legend, the godly figure Tu Te Raki Whanoa created this incredibly beautiful fiord with the assistance of four young sea gods who carved out its sheltered arms. Today Doubtful Sound remains an unspoilt wilderness of many moods; one minute clear blue and sun-drenched, the next mysterious and mist-cloaked. Real Journeys offers daytime and overnight cruises at Doubtful Sound	http://www.realjourneys.co.nz/Main/Doubtful/
Doubtful Sound	Sight seeing	Experience a unique overnight cruise on the beautiful serene Doubtful Sound, in Fiordland, one of our the most scenic and awe inspiring sounds within the Fiordland National Park..	http://www.doubtful-sound.com/
Doubtful Sound	Sight seeing	Doubtful Sound cruises (name of company) - Come and join us on the trip of your lifetime. Your adventure begins with a 30km cruise across the crystal clear waters of beautiful Lake Manapouri with its many bush clad islands, sandy beaches, and many coves and bays, surrounded by bush clad mountains it really is a magical part of New Zealand.	http://www.doubtfulsoundcruise.com/
Doubtful Sound	Sight seeing Kayaking Accommodation	Come and experience this special area by joining us on the water in a sea kayak. We guarantee your visit to Lake Manapouri and Doubtful Sound will be a memorable one. This rich variety of landscape makes Fiordland a popular destination for those who want to experience the sights and sounds of nature at a close, personal level. Rent one of our quality sea kayaks and explore the many islands, coves and sandy beaches that beautiful Lake Manapouri has to offer. Join in one of our popular day or two day guided kayak tours into Doubtful Sound. We cater for small, personal groups where you have time to relax and enjoy an intimate experience with nature. We invite you to be a little different and share one of our many options for an experience you will treasure. We are based in Manapouri township. It is situated close to the shore of Lake Manapouri - the lake is surrounded by magnificent bush clad mountains. A range of accommodation is available	http://www.fiordlandadventure.co.nz/
Doubtful Sound	Sight seeing Accommodation Tramping/ Walking Golf Fishing	Some of the attractions and activities that you can enjoy from your accommodation, situated near Milford and Doubtful Sounds include: Cruises Scenic flights Walking / hiking/ trekking / kayaking Fishing & hunting Golf Tours of Lord Of The Rings' locations	http://www.murrells.co.nz/activities.html
Doubtful Sound	Sight seeing	Known for its wilderness, wildlife and sheer remoteness, Doubtful Sound, located in a World Heritage Area, is the second largest of the 14 fiords in Fiordland National Park and is 3 times longer and 10 times larger than Milford Sound.....details for a day cruise and for a night cruise.	http://www.everythingqueerstown.com/category/Doubtful+Sound
Doubtful Sound	Sight seeing Wildlife	Your Doubtful Sound adventure begins as you cruise the crystal-clear waters of Lake Manapouri. After disembarking at West Arm, you travel underground by coach to see the Manapouri Power Station machine hall*. Then it's over Wilmot Pass, stopping along the way to experience some of Fiordland's most dense rainforest and to view Doubtful Sound glistening far below. On reaching Deep Cove, board our catamaran for a three-hour cruise that takes in the most dramatic scenery of Doubtful Sound. Our skippers provide a detailed commentary and point out highlights. Keep a lookout for wildlife, as bottlenose dolphins frequently come alongside our vessel, fur seals bask on the rocks around the fiord, and rare penguins can be observed at times	http://www.zqn.co.nz/doubtful/daycruise/

Location	Activity	Text	Reference
Doubtful Sound	Sight seeing Wildlife	Your Doubtful Sound adventure begins as you cruise the crystal clear waters of Lake Manapouri. Then it is over Wilmot Pass, stopping along the way to experience some of Fiordland's densest rainforest and to view the colourful alpine moss gardens. On reaching Deep Cove, you will board our spacious catamaran Patea Explorer for a three-hour cruise that takes in the most dramatic scenery of Doubtful Sound. Our skippers provide a detailed commentary and point out highlights. Keep a look out for wildlife such as bottlenose dolphins, fur seals and rare penguins	http://www.realjourneys.co.nz/Trade/DoubtfulWildernessCruises/
Doubtful Sound	Sight seeing Kayaking Wildlife	Beginning your Doubtful Sound overnight cruise with an appetiser of Rock Lobster in one hand and a glass of bubbly in the other you're on your way and the mood is set to ensure you enjoy your time aboard the MV Tutoko on your Doubtful Sound Overnight Cruise.And as if superb food and peerless scenery weren't enough, during your Doubtful Sound overnight cruise your choices of fishing, kayaking, scuba diving* or dolphin and penguin spotting add to the experience	http://www.fiordlandexpeditions.co.nz/index.php?page=overnight
Doubtful Sound	Sight seeing Kayaking Wildlife	Tucked away in one of the most remote corners of Fiordland, Doubtful Sound offers a unique wilderness experience including the chance to see one of the rarest penguins in the world - the Fiordland Crested Penguin. Less accessible than Milford Sound, one of the more popular ways to explore Doubtful Sound is on an overnight cruise. The journey involves a boat trip across Lake Manapouri (the name means 'lake of the sorrowing heart) followed by a coach trip over Wilmot Pass to Deep Cove in Doubtful Sound.Local wildlife includes a pod of approximately 60 bottlenose dolphins that rarely venture outside the comfort of this sheltered area. New Zealand fur seals can be seen on the Nee Islets, and the sound is also home to the rare Fiordland Crested Penguins.Those wanting a closer look can go kayaking from the boat or take a shoreline nature trip with a nature guide	http://www.newzealand.com/travel/media/story-angles/adventure/nature_milfordsound_storyangle.cfm
Doubtful Sound	Sight seeing Wildlife	Doubtful Sound is the second longest in Fiordland at 40km long. On a cruise down Doubtful Sound you will experience more shades of lush green than you knew existed, while you drift over 420 meter deep water. In both Milford and Doubtful Sounds, you will experience a host of wildlife; seals and crested penguins gather on the shores, and sometimes bottlenosed dolphins can be sighted playfully swimming along side the boat. Doubtful Sound is the second longest in Fiordland at 40km long. On a cruise down Doubtful Sound you will experience more shades of lush green than you knew existed, while you drift over 420 meter deep water. In both Milford and Doubtful Sounds, you will experience a host of wildlife; seals and crested penguins gather on the shores, and sometimes bottlenosed dolphins can be sighted playfully swimming along side the boat.	http://www.queenstown.nz.com/fiordland.aspx
Doubtful Sound	Sight seeing Wildlife Tramping/ Walking Fishing - general	Doubtful Sound Track Not an official track anymore. In former time there was a track from Lake Manapouri to Doubtful Sound. Now you can take a boat over Lake Manapouri and then take bus to the sound. However, part of the old track is still there, and the rest can be walked on the road (ca. 20km) via Wilmot Pass (673m). This is easily done in 4-6 hours and is more rewarding than the bus trip. You can book a place in the youth hostel at Doubtful Sound and make several day trips from there. The wardens there are extremely friendly and supplied me with freshly caught fish! The 3h cruise on the Doubtful Sound is highly recommended. After the tourist busses have left (5pm) you are almost alone! The atmosphere here is much better than at Milford Sound with heaps of wildlife around (including the infamous sandflies).	http://www.cs.auckland.ac.nz/~burkhard/Tramping/Doubtful/Doubtful.html
Doubtful Sound	Sight seeing Fishing Wildlife Kayaking Diving Tramping/ Walking	Modern launches leave Pearl Harbour at Manapouri (20 minutes from Te Anau) and cross Lake Manapouri to West Arm, where visitors can see the underground power station before heading over Wilmot Pass and on to Doubtful Sound. Increasingly popular with visitors to Fiordland are overnight cruises on Doubtful Sound, ranging from one to multiple nights.....activities: Diving/fishing charters Activity combinations: combine aerial sightseeing and a cruise trip into the Doubtful Sound region with activities such as bush walks, historic site visits and sea fishing Ecology tours: these multi-day tours include working alongside scientists Full- and half-day excursions: combine a coach journey, launch cruise, and kayaking in the Manapouri/ Doubtful Sound area Kayaking: visitors can rent fully equipped kayaks by the day or overnight, or take a guided kayaking excursion on Lake Manapouri and/or Doubtful Sound	http://www.economy.co.nz/travel-guide/milford-sound-doubtful-sound.html
Doubtful Sound	Sight seeing Wildlife	Doubtful Sound (sometimes called "The Sound of Silence") is rich in flora and fauna, fur seals, dolphins and birdlife. Unlike Milford Sound, there is no direct road access, which only enhances your experience as you travel by boat across Lake Manapouri, by coach over Wilmot Pass and down into Doubtful Sound, where you board a cruise boat and travel from Deep Cove, past majestic waterfalls out to the Tasman Sea. Doubtful Sound is the deepest of our fiords at 421 meters and a "must see" on your visit to New Zealand	http://www.newzealand-vacation.com/vacation/milford-doubtful/
Doubtful Sound	Sight seeing	Twenty minutes from Te Anau is picturesque Lake Manapouri, a beautiful lake framed by the spectacular Cathedral Mountains. Pearl Harbour, adjacent to Manapouri township, is the gateway to the variety of excursions undertaken on Lake Manapouri and	http://www.relaxingjourneys.co.nz/guide/milford.php

Location	Activity	Text	Reference
		Doubtful Sound. Launch trips on Doubtful Sound begin with a launch trip across Lake Manapouri to West Arm, a visit to the West Arm underground power station, and a bus trip over the majestic Wilmot Pass to Deep Cove.	
Doubtful Sound	Sight seeing Wildlife	Cruise across beautiful Lake Manapouri, coach across Wilmot Pass and explore the wilderness of Doubtful Sound. Bottlenose dolphins, New Zealand fur seals and rare Fiordland crested penguins are among the wildlife that may be encountered. Queenstown and Te Anau coach connections	http://www.fourcorners.co.nz/new-zealand/product/?product=doubtful-sound-wilderness-cruises-ex-manapouri-real-journeys
Doubtful Sound	Sight seeing Kayaking Diving Hunting	To me the stunning thing about the trip on Doubtful Sound comes when they turn off the boat's motors and the vessel just lolls in the gentle swells. Despite the fact that there may be a hundred or more people on board, there is utter silence. Silence that implodes on the inner ear. Silence that deafens the brain. And no wonder. With the shutting down of the engine, you are about as far away from anywhere in the world as it's reasonably possible to be without undertaking a major expedition. If you want one of the best true eco-tourism experiences take time out with Fiordland Ecology Holidays . Aboard the 20m motor sailer Breaksea Girl you can explore Fiordland, Stewart Island and down into the sub Antarctic islands like the Snares, Auckland and Campbell Islands. You could find that your shipmates are research teams or film crews that regularly use the Breaksea Girl as their floating ops base. Snorkelling and diving but definitely no fishing. Another great seagoing option on Doubtful Sound is to take an overnight cruise on the Fiordland Navigator , the newest of Real Journey's vessels, purpose built for cruising in the fiords. Fancy seeing it aboard something smaller in scale and relying on paddle power not diesel power? Then paddle your own kayak around Lake Manapouri or Doubtful Sound, one of the great adventures NZ has to offer. There are several operators to choose from:.....	http://new-zealand-travel-guide.com/fiordland.htm
Doubtful Sound	Sight seeing Wildlife Eco tourism	An eco-tourism business based in Doubtful Sound, Fiordland, New Zealand. Lance and Ruth own and operate the 20 metre motor-sailing yacht Breaksea Girl. Our live aboard cruises, which have an emphasis on nature, conservation and research, cover all of Fiordland, Stewart Island and Subantarctic Islands. Lance and Ruth, both active conservationists with maritime qualifications, offer you a true natural history, eco-tourism experience. Recognised as one of the leading eco-tourism businesses in New Zealand, our emphasis is on environmental protection, education and research funded through tourism.Included activities are: penguin watching, tramping, photography, snorkeling, diving, marine mammal watching, bird watching, research, visiting historical sites and forest walks. Fiordland Ecology Holidays have a Marine Mammal Watching permit which allows you to swim with seals if the opportunity arises. We also hold a Dept of Conservation Concession which permits us to take guided walks ashore in the National Park. Breaksea Girl has all the required marine certificates and is fully surveyed.....Our southern ocean sailing can include these areas: The World Heritage Fiordland National Park ... Milford Sound, George Sound, Doubtful Sound, Breaksea and Dusky Sounds, and Preservation Inlet. We also sail to Stewart Island, the Snares islands and the Auckland and Campbell Islands in the sub Antarctic ocean	http://www.fiordland.gen.nz/bg.htm
Doubtful Sound	Wildlife Kayaking Sight seeing Fishing Scenic (views over)	Doubtful Sound Key Points: Known as the Sound of Silence Deepest of all Fiords Doubtful Sound is practically untouched by man Outstanding waterfalls You may see Fiordland Crested Penguins, bottlenose dolphins and NZ fur seals Guided kayaking and rentals available Overnight cruise options Activity Suggestions: Boat Excursions Kayaking Ocean Fishing Scenic Flights	http://www.fiordland.org.nz/Explore-Fiordland/Places-to-visit/Doubtful-Sound.asp
Doubtful Sound	Wildlife Kayaking Sight seeing	Following a short cruise across beautiful Lake Manapouri and a coach trip over Wilmot Pass, you will board the Fiordland Navigator at Deep Cove, Doubtful Sound. There is plenty of time on your overnight cruise to enjoy the stunning views and to discover the hidden arms of Doubtful Sound. Fur seals and bottlenose dolphins are often seen and at times, rare penguins can be observed. There is also time for you to kayak around the shoreline or go exploring in the tender craft with our nature guide.	http://www.designzontravel.co.nz/activities/doubtonight/doubtonight.htm
Doubtful Sound	Wildlife	Bottlenose dolphins, fur seals, Fiordland crested penguins and little blue penguins are resident in the fiords. The fiord underwater environment is not included in the national park although two small marine reserves, in which all life is totally protected, have been established in Milford and Doubtful Sounds.	http://www.doubtful-sound.com/Fiordland/default.asp
Doubtful Sound	Wildlife Sight seeing	Doubtful Sound has three distinct inlets each with spectacularly steep mountains soaring from the coastal edge. More than 8 metres of annual rainfall are the source of numerous waterfalls cascading into the sound which cause light refraction (fresh water floating on top while heavier salt water at the bottom). Light refraction makes it difficult for light to penetrate the depths and allows	http://www.ausemade.co.nz/destinations/si/d/doubtful-sound-information.htm

Location	Activity	Text	Reference
		many deep sea species and black coral to thrive in the chilly waters. Pods of dolphins live here too and often enjoy playing in the wake of tour boats. Doubtful Sound is reached by cruise boat whose interesting commentaries will bring life to the still waters of the sound. The silent beauty will bewitch you and promises to be a highlight of your holiday	
Hall Arm	Boating	Boat cruise..... There is plenty of time on your overnight cruise to soak up the stunning surrounds and to discover the hidden arms of Doubtful Sound – Hall, Crooked and First.	http://www.realjourneys.co.nz/Main/DoubtfulSoundOvernightCruise/
Hall Arm	Boating Wildlife	Our last night was spent at the head of First Arm where other boats joined us. After several days of being alone, three boats definitely felt like a crowd. We made our way slowly back to Deep Arm via Cooked Arm (stopping to see tree daisies and extremely friendly dolphins) and Hall Arm. Farewells were made to Lance and Essie before we retraced our steps to Manapouri and the party disbanded	http://pages.quicksilver.net.nz/jcr/~nzjournal4.html
Hall Arm	Boating Wildlife	So, now we are at Deep Cove, at the opening of Hall Arm, getting ready to board another boat, which will take us all the way down to the mouth of Doubtful Sound. Along with the breathtaking scenery, we encountered a pod of dolphins.	http://www.meekernz.net/yv2007/blog.htm
Hall Arm	Kayaking	Stage 2: the daytime - approximately 5 hours kayaking from Deep Cove in the midst of massive glacial landscapes, deeply faulted mountainsides, towering sea cliffs, waterfalls, past Rolla Island, a nesting place for penguins often with fur seals, sometimes dolphins, lunch on an uninhabited beach, pristine native rainforest with kea, kaka flying high, to Mt Danae at the head of Hall Arm	http://www.fiordlandseakayak.co.nz/doubtfulsound_2days.html
Hall Arm	Kayaking	Guided kayak tour..... drift alongside the towering mountains and waterfalls under Commander Peak close to the impressive entrance of Hall Arm.	http://www.travellink.co.nz/media/operator.asp?UID=127
Hall Arm	Kayaking	Guided kayak tour..... Under towering Commander Peak, at the entrance to Hall Arm take time out for a lunch break with a complimentary hot soup or cuppa.	http://www.fiordlandadventure.co.nz/option_1_ds_fullday.htm
Hall Arm	Sight seeing	Doubtful Sound is the deepest of all the fiords at 420 metres, and is the second longest fiord at 40 kilometres long. There are three distinct arms off the main fiord and several outstanding waterfalls including the Browne Falls, cascading 619 metres to the fiord near the beautiful Hall Arm, and the Helena Falls at Deep Cove. The soaring 900 metres sea cliff of Commander Peak is an imposing sight at the entrance to Hall Arm.	http://www.tourism.net.nz/new-zealand/about-new-zealand/attractions/natural-phenomena/doubtful-sound.html
Hall Arm	Sight seeing Wildlife	Doubtful Sound..... Three times longer than Milford Sound and with a surface area 10 times larger, this is an unspoiled wilderness of many moods. Browne Falls cascades 619m to the fiord near Hall Arm and Helena Falls is an attractive feature of Deep Cove. Seals and dolphins are frequently seen, as well as the occasional penquin.	http://www.travellink.co.nz/media/category.asp?UID=117
Hall Arm	Sightseeing Wildlife	Doubtful Sound has some splendid waterfalls, particularly during the wetter seasons. In the Hall Arm, the Browne Falls cascades 619 metres; Helena Falls at Deep Cove tumbles 220 metres. Wildlife is another reason to visit this fiord - keep an eye out for bottlenose dolphins, fur seals and penguins.	http://www.newzealand.com/travel/sights-activities/scenic-highlights/natural-phenomena/scenic-highlight-details.cfm/businessid/63611/highlightcategoryid/2/startrow/6/endrow/0/seed/0.html
Hall Arm	Tramping/Walking	Then up over Mt Nantes and north past Mt Crowfoot - didn't quite manage to climb that one due to snow conditions on the final bit – then on to Hall Arm via Mt Danae and Jaquiere Pass. A few hideous scrub thrashes where the ridge dropped below treeline – but worth it for the fantastic evening light at my camps.	http://www.alpineclub.org.nz/documents/stions/otago/04Feb.pdf
Lake Manapouri	Accomm Tramping/Walking Sight seeing Wildlife	Cathedral Peaks Accommodation homepage link to activities.....A gate way into one of the most beautiful World Heritage National Parks. The rugged interior of Fiordland, its fiords and mountains, its fast running rivers, beech rain forests, flora and mountain birds certainly make it a place to experience and to explore. Lake Manapouri - described as New Zealand's most beautiful lake, is edged by beaches just waiting to be walked on and explored. Walk the old coach road just up from the beach, wander a little through small trees then enjoy the smell of the moss and beech trees while pondering some of the past names the Maoris called this place.....Circle Track.....Kepler Track	http://www.cathedralpeaks.com/attractions.html

Location	Activity	Text	Reference
Lake Manapouri	Accomm Tramping/ Walking Fishing Kayaking Sight seeing Heli flights Scenic (views over) Watersports general Farm tours Wildlife	Beechwood lodge accommodation.....activities.....Manapouri is the gateway to Doubtful Sound tours and the starting point for Hiking Trails and fishing accesses. Activities / Kayaking..... walking tracks to suit all levels of fitness, with a sandy lakeshore to stroll, jog or run. Manapouri Views. Lake Manapouri is just a few minutes walk from Beechwood Lodge. The excursion to Doubtful Sound departs from the Manapouri Marina. ...The Circle Track offers a 4 hour hike, access is located across the Waiau River via motor or row boat hire.....Guided kayaking tours suitable for people who have never kayaked before or groups with limited kayaking skills, Also popular with experienced kayakers seeking a guide's knowledge of the area.....Guided fly fishing: trout rivers are located 10mins to 1hr drive from Beechwood Lodge.	
Lake Manapouri	Accomm	Our two apartments are fully self contained,private, and comfortable, offering panoramic views of Lake Manapouri and the circle of mountains we call Home	http://www.newzealandstays.co.nz/161/Fiordland_(S)/Lake_Manapouri_Accommodation/
Lake Manapouri	Accomm Sight seeing	The Manapouri Lakeview Motor Inn overlooks beautiful Lake Manapouri. Situated 20kms from Te Anau, Lake Manapouri is the departure point for trips to Doubtful Sound. We have 55 rooms catering for budget travellers/backpackers through to serviced hotel rooms and self-catering family units. We have a cafe/bar and bottlestore on site. Our staff can assist with booking any local sightseeing activities....Manapouri Holiday Houses are Lake Manapouri the perfect base for a Fiordland stay. Enjoy the numerous activities on offer in the region and experience the magnificent Fiordland National Park at close hand. Stay in one of our relaxing, sunny houses surrounded by spectacular scenery and savour the tranquillity of the many acres of native bush and bird life of this World Heritage area.	http://www.travelbug.co.nz/visit/22755
Lake Manapouri	Accomm Sight seeing	Accommodation.....has 360 degree views of mountains and lake. It's quiet, it's warm, it's all under one wee roof. Tui View Cottage is your 'Home away from Home'. it is in a beautiful, quiet section surrounded by native trees and bounding the National Park and Waiau River	http://www.holidayhomes.co.nz/for-rent/new-zealand/south-island/southern-lakes-otago-southland/lake-manapouri
Lake Manapouri	Accomm Sight seeing Scenic (views) Kayaking Tramping/ Walking Fishing Hunting	Murrell House.....Manapouri is the gateway to Milford and Doubtful Sounds and lies on the doorstep of the Fiordland National Park. From this Fiordland bed and breakfast, you can: Enjoy a tradition of warm Southland hospitality, beautiful home cooked breakfasts and dinners Explore the coves, bays and islands of one of New Zealand's loveliest lakes Visit Milford Sound, Doubtful Sound and Te Anau Discover Fiordland on scenic flights, walking tours or kayaking trips Enjoy prime local fishing and hunting grounds	http://www.murrells.co.nz/
Lake Manapouri	Accomm Sight seeing Tramping/ Walking	Milford Sound Lodge..... trip to Doubtful Sound is a full day adventure. The early morning cruise across Lake Manapouri is considered by some as the highlight of the day. The Lake is famous for its many islands, and magnificent Rainbows. This is followed by an exhilarating drive over the Wilmot Pass with breathtaking views of Doubtful Sound, before descending down to the calm waters of Deep Cove. Accommodation close to the Doubtful Sound departure point is limited. The conveniently located Possum Lodge offers a range of accommodation from riverside Campervan and Tent sites, to self-contained Motels units and Backpacker cabins. Possum Lodge is bordered by the Waiau River on one side, and Lake Manapouri on the other. Enjoy a sunset looking out over Lake Manapouri with a nice NZ bottle of wine. The Doubtful Sound departure point is a simple walk along the riverside trail under a beautiful canopy of Beech trees. Spend time exploring the walks around Manapouri, some short, some more demanding.	http://www.milfordlodge.com/DoubtfulSound.html
Lake Manapouri	Accomm Sight seeing Fishing Kayaking Tramping/ Walking	Motel accommodation & activities in Fiordland....The Manapouri Township, bordered by the spectacular Cathedral Mountains, sits at the edge of one of New Zealand's loveliest lakes, Lake Manapouri. About a 20-minute drive from Te Anau, Fiordland, this holiday destination is ideal for both adventure travellers and those simply looking for a quiet holiday away from the crowds and noise of the city. Adjacent to the town, is the beautiful Pearl Harbour, a gateway to Doubtful Sound, and a fine base for exploring the holiday activities in the region, the most popular among them being- trips to the Manapouri Power Station on the West arm,	http://www.goldenchain.co.nz/motels/gc-manapouri/

Location	Activity	Text	Reference
		one of the largest hydro-electric power stations in the Southern Hemisphere. Other holiday activities in Manapouri include fly fishing, kayaking, boating, eco tours, wilderness cruises and bush walking. Popular day and overnight walks in the region include the walk along Circle Track (approximately 4 hours), the Hope Arm and Mt Titiroa tracks (overnight), and more remote walks such as the Waterfall Walk, the Kepler and Dusky Tracks and the walk to Percy's Pass. The tranquil surroundings, affordable accommodation options, classy restaurants & cafés in and around town, and wide range of holiday activities, make Manapouri one of New Zealand's best-loved holiday destinations.	
Lake Manapouri	Accomm Tramping/ Walking Jet boating Kayaking	Overlooking Lake Manapouri with 360' views of mountains and Lake, Captain's Lookout units "A" and "B" are built with our retirement in mind. Both are completely selfcontained, and spacious. "A" has a wood fire; "B" has airconditioning.;bcontinental breakfast supplied.. Both have sunny decks, and o.s.p. and are within 15 minutes walk of departures for Doubtful Sound trips and a few minutes walk from beach, groceries and cafes Captain's Lookout is a perfect base for trips to Milford, Doubtful Sounds and an ideal fishing, tramping , jet boating, and kayaking base. Allow at least 2 nights	http://www.bookabach.co.n z/cf_RentalSearch/dsp_listi ng.cfm?bachId=459
Lake Manapouri	Accomm Tramping Walking Sightseeing	The location of "The Cottage" Homestay B&B accommodation is beside the lower Waiau River in Manapouri. It is quiet and tranquil. Our home is surrounded by trees and cottage garden. We offer lovely views through the trees of the Fiordland Mountains, Waiau River and a little of Lake Manapouri. Sit outside and enjoy the view as well as the birdsong. A 2 min walk beside the river to where the boat departs for Doubtful Sound.	http://www.thecottagefiordl and.co.nz/thecottage/default.aspx?page=location
Lake Manapouri	Accomm Sight seeing Heli flight Jet boating	Accommodation at Fiordland lodge.....Experience scenery on an epic scale in the Fiordland National Park, New Zealand's very own land of sheer granite mountains, with spectacular fiords reaching ever inland. View Doubtful and Dusky Sounds from the air, Milford Sound from the water, and NZ's most beautiful lake, Lake Manapouri, by jet boat down the Waiau River. Included is:* four nights accommodation for two people, with dinner and breakfast, * plus a helicopter flight to the remote Doubtful and Dusky Sounds * plus a coach and cruise to Milford Sound * plus a jet boat trip down the Waiau River to Lake Manapouri	http://www.fiordlandlodge.c o.nz/
Lake Manapouri	Accomm Sight seeing Kayaking Tramping/ Walking Swimming Fishing	A great place to stay for a few day's, use as a base and also to relax and enjoy Fiordlands stunning scenery without leaving the house.Home comes complete with an extensive music library, reading material and games & barbeque on the deck. This home has drive on access with plenty of parking amidst a very private well established garden area incorporating natives along with ornamentals.Manapouri is a small village with a population of 300 and has a general store, cafe, petrol station & restaurant, 20km's away is Te Anau with a variety of cafe's, supermarkets, banks etc.Manapouri is the starting point for cruises and kayaking on Doubtful Sound, the Power Station & Day walks. Swimming in the Lake, fishing & kayak rentals are a also a great option for enjoying the area.	http://www.holidayhouses.c o.nz/properties/3274.asp
Lake Manapouri	Accomm Tramping/ Walking	Website for back packers accommodation.....activities.....From Luxmoore Hut you can check the weather before undertaking the walk across the exposed alpine slopes and the steep descent to the Iris Burn Hut. The remaining one or two days involve a pleasant walk down the Iris Burn Valley and around the shores of Lake Manapouri, then through beech forest to either the Rainbow Reach swingbridge or the control gates at Lake Te Anau.	http://www.teanaubackpack ers.co.nz/backpackers/Fior dITrackInformation
Lake Manapouri	Accomm Sight seeing Tramping Walking Fishing Kayaking	Situated on the shores of spectacular Lake Manapouri, New Zealand most scenic lake, and only a stones throw from the Fiordland National / Te Wahipounamu - South West New Zealand World Heritage Area, Possum Lodge is an ideal setting to spend time enjoying some of New Zealand's most inspiring scenery.True lakefront accommodation in Fiordland, Possum Lodge offers guests a unique opportunity to wander from their accommodation to the shores of Lake Manapouri or the Waiau River without having to cross a road.....The views across Lake Manapouri sweep from the imposing Hunter Mountains, with the spectacular Monument in the foreground, to the snow capped Cathedral Peaks, and further north to the renowned tramping destination, the Kepler Mountains. The Waiau River offers sheltered waters for kayakers and canoeists, and has a healthy population of trout for keen fisher people.	
Lake Manapouri	Accomm Sight seeing Kayaking Fishing Tramping/ Walking	Manapouri Lakeview motor inn.....Situated in the Fiordland National Park we are the ideal location to stay to vist all the local attractions. We are 2 minutes drive to the departure point for Doubtful Sound trips. Milford Sound is 2 and a half hours drive. Te Anau is 15 minutes drive. Kayaking activities on lake Manapouri & Doubtful Sound. Scenic Jet Boat trips- taking in Lord of the Rings Locations. Close to many world renowned walking tracks. Fishing on lakes and rivers, boat charters available. All these activities can be booked through us when available.	http://www.nzmotels.co.nz/ Fiordland/ManapouriLakevi ew.aspx
Lake Manapouri	Accomm Sight seeing	Accommodation and activities available.....Wilderness Cruise on the Patea Explorer – this trip includes the Lake Manapouri cruise, a visit to the Underground Power Station (to be confirmed at time of booking), a coach over Wilmot Pass and a 3 hour cruise on Doubtful Sound.	http://www.bluemountaincot tages.co.nz/activities.html

Location	Activity	Text	Reference
Lake Manapouri	Accomm	True lakeside, budget accommodation in beautiful Manapouri. Surrounded by leafy beech forest on the shores of Lake Manapouri and the Waiau River, Possum Lodge Motels & Holiday Park offers a truly relaxing experience for those wanting a leisurely break from their travels.	http://www.milfordlodge.com/Links.html
Lake Manapouri	Fishing	Fiordland National Park, located to the west, is home to two large lakes, Te Anau and Manapouri. Fishing is very good in Lake Manapouri and extremely good in the rivers north and south of Lake Te Anau. The northern Eglinton River can be accessed from the Te Anau-Milford Sound road (Highway 94) and boasts magnificent fishing at Knobs Flat, located 62kms from Te Anau. The southern Waiau River links Lake Te Anau to Lake Manapouri. Four vehicle tracks lead to the river from the Te Anau-Manapouri road and the area is well signposted. The Milford Track allows access to other attractive rivers. Both rivers are open for fishing from the 1st of November until the 31st of May.	http://www.newzealandnz.co.nz/fishing/central-south-island.html
Lake Manapouri	Fishing Sight seeing	Come travel across beautiful Lake Manapouri, over the Wilmot Pass and into Deep Cove. Then join us on a relaxing cruise aboard MV Flyer as it winds its way out of Doubtful Sound to the Tasman Sea on New Zealand's hospitable West Coast. Try your luck at a spot of fishing or just sit back and take in the breathtaking scenery of our world heritage park as Flyer heads back up the fiord to one of the many anchorages. Wake in the morning to the sound of silence and enjoy a 2 hour cruise back to Deep Cove	http://www.queenstown-vacation.com/queenstown/doubtfulsound/
Lake Manapouri	Fishing	Welcome to Fish Fiordland and our new website! We have been experiencing the joys of Lake Manapouri for over 40 years. Every day spent on the Lake provides a myriad of experiences and changing landscapes - from the clear calm sunny days where the Lake provides a mirror image of surrounding mountains, to times of mist clinging to rocky outcrops and rainbows reaching into the distance. It's like entering another world. This is Lake Manapouri, with its 33 islands and deserved reputation as one of the most beautiful Lakes in the world.....Trout Trolling is cruising along at a sedate speed, towing the fishing line along in the water and reeling in the fish when they bite. Both brown trout and rainbow trout are caught.	http://www.fishfiordland.co.nz/
Lake Manapouri	Fishing Fishing - trout	Lake Manapouri, whilst somewhat smaller at 142 sq. km, is still a very large body of water. It has a shoreline of 170 km. Renowned for its many islands and the magnificent mountain backdrop, Manapouri is regarded by some as New Zealand's most beautiful lake. The fishery of Lakes Te Anau and Manapouri is dominated by brown trout, however the greater catchability of the rainbow ensures it is taken almost as readily. The size of trout caught in Lakes Te Anau and Manapouri range between 1 - 3 kg. The few Atlantic salmon tend to be at the lower end of this range.	http://www.frontierfishing.co.nz/lakes_manapouri_te_anau.html
Lake Manapouri	Fishing - trout	For all trout fishing in New Zealand, be sure to make Fiordland a destination with its remote wild beauty, crystal clear rivers, the tranquil waters of Lake Manapouri and a back drop of some of the worlds most magical scenery provides the setting for an experience you'll never forget.	http://www.adventuremanapouri.co.nz/fishing.html
Lake Manapouri	Fishing – trout Sight seeing Jet boating Mountain biking Wildlife Tramping/ Walking Heli flights	Accommodation..... 1 minute drive to Manapouri township. Activities include: Trout fishing - trolling and flyfishing Sight seeing - Doubtful Sound/Milford Sound Kayaking Jet Boating Biking Glow Worm Caves Short walks around Lake Manapouri lakefront Hiking/Tramping Helicopter sight seeing 12 minute drive to Te Anau On Southern Scenic Route	http://www.bluecastle.co.nz/accommodation-1822.htm
Lake Manapouri	Heli flights	Follow the mighty Upper Waiau River (River Anduin) flowing from Lake Te Anau to Lake Manapouri. Part way down the River Anduin we reach the Brown Lands, the desolate and treeless area between Mirkwood and the Eryn Mull where the Ent Wives made their gardens. Passing through the Hurricane Passage you ascend to Middle Earth south of Rivendell where we land and give you time to take in the magnificence of the Norwest Lakes looking out across Lake Manapouri. Leave the views of Te Anau and Lake Manapouri behind as we climb the beech forested slopes of the Cathedral Peaks to the apex of the Kepler Mountains. A high alpine landing is made for breathtaking views and photo shots of Doubtful Sound as a backdrop. On your return journey we overfly the Norwest Lakes with the deep glacial valley and rugged granite rock resembling Middle Earth. This filming location for Lord of the Rings is revealed as you fly onto our own Lake Victoria Falls before descending the Kepler Mountains to return you to reality	http://www.southernlakeshelicopters.co.nz/Scenic-Flights/default.asp
Lake Manapouri	Heli flights	Excellent views can be obtained of the forest where Lurtz fought his final battle against Aragon, Boromir, Legolas and Gimli. We also see the site of the Ilithien camp where Frodo and Sam hid from the battle and first saw the Oliphants. Continuing South, and	http://www.heliworks.co.nz/Heli-Experience/Lord-of-

Location	Activity	Text	Reference
		after skirting the Fangorn Forest and Nen Hithoel, we fly over the Midgewater Marshes and on to Lake Te Anau before following the River Anduin to Lake Manapouri. The Misty Mountains beckon us and we ascend the broken slopes to arrive at the Norwest Lakes, scene of the Fellowship heading South from Rivendell.	the-Rings-Flights.asp
Lake Manapouri	Jet boating Kayaking Tramping/ walking Accomm	Luxmore Jet operates jet boat tours on the Upper Waiau River, which flows between Lake Te Anau and Lake Manapouri. A great way to explore the untouched wilderness of Fiordland National Park, a World Heritage listed area. A ten minute drive out of Manapouri will bring you to Queens Reach on the Upper Waiau River, the launch site.Adventure Kayak & Cruise is a Manapouri based business offering quality sea kayak adventure tours. Come and experience this special area with Adventure Kayak & Cruise. This rich variety of landscape makes Fiordland a popular destination for those who want to experience the sights and sounds of nature at a close, personal level.....The Circle, Kepler and Dusty tracks are popular local walking and hiking routes in the Manapouri area, which can be done with or without a tour guide/group.	http://www.totaltravel.co.nz/travel/south-island/queenstown-fiordland/fiordland/directory/adventuresport
Lake Manapouri	Jet boating	Luxmore Jet operates jetboat tours on the Upper Waiau River which flows between Lake Te Anau and Lake Manapouri. Our jetboat excursions explore the untouched wilderness of Fiordland National Park a World Heritage Area in the South Island of New Zealand. The jetboat tour allows you to view 3 actual Lord of the Rings film locations of the River Anduin. The Luxmore Jet adventure will take you out onto beautiful Lake Manapouri to view the lake and magnificent snowcapped mountains	http://www.nzonline.org.nz/luxmorejetboatingteanau.htm
Lake Manapouri	Kayaking Fishing Sight seeing Tramping/ walking Accomm Wildlife	Lake Manapouri is often described as the "loveliest" of all lakes with its array of 33 small islands, back drop of the majestic Cathedral Mountain range, and native bush clad edges with a variety of sandy beaches and coves..... Nestled next to the shores of Lake Manapouri and the banks of the Waiau River lies the peaceful township of Manapouri (population 300).Nowadays, Manapouri is known as the departure point for Doubtful Sound excursions and trips to the West Arm Power Station, the largest underground power generation in the Southern Hemisphere.....Manapouri has also become popular for its variety of day and overnight walks on the Manapouri Track. This track provides a 4 hr walk on the Circle Track and overnight walks to Hope Arm and Mt Titiroa. A highlight of these walks is that access to the start of the track is across the river. Row boat hire and water taxis are available to transport you over. This track boasts great bird life and stunning views.....Fishing has always been a popular pastime, both for the experienced fly fisherman or for the inexperienced who would like to catch a fish. Trolling on the lake is a wonderful way to experience the area and enjoy the excitement of 'the catch'.....Kayaking on the lake, although weather dependant, is a wonderful way to experience all the remote bays and sandy beaches, the only sounds the song of birds and splash of water.....Manapouri provides visitors to the area with a variety of accommodation and with 2 cafe's, a restaurant, a garage and hotel, we have all the amenities for those who enjoy peaceful surroundings. Unhurried and picturesque Manapouri is a visit you will enjoy	http://www.fiordland.org.nz/Explore-Fiordland/Places-to-visit/Manapouri.asp
Lake Manapouri	Kayaking	Enjoy a weekend away experiencing the wilderness of Lake Manapouri by sea kayak. On this guided trip you'll visit hidden coves accessible only by the lake, be surrounded by dense native beech forest and steep rugged mountains and rest at stunning sandy beaches. This trip caters for people of all paddling abilities.	http://www.otago.ac.nz/recreation/adventures/sea_kayak_manapouri.html
Lake Manapouri	Kayaking Accomm Tramping/ Walking Sight seeing Fishing	Tourism and recreation activities.....Welcome to Fiordland.Come and experience this special area by joining us on the water in a sea kayak.We look forward to meeting you and sharing Fiordland with you.....We offer a range of accommodation from Family self catering,Hotel studios to Budget.All units over look stunning lake Manapouri, which is the Departure point for all Doubtful Sound excursions. Family friendly Cafe & bar on site.....Captains Lookout 360 degree panoramic views overlooking Lake Manapouri and the surrounding mountain ranges. Enjoy a wine as the sun sets or wake to the morning light shimmering across the lake.....Manapouri Township is a 20 minutes drive from Te Anau. It is the gateway to both Doubtful and Dusky Sounds and the starting point for local walking tracks. Manapouri is a popular destination during the summer months when visitors come to soak up the sunshine and enjoy Lake Manapouri's crystal clear waters.....Manapouri, with a population of 400, is situated on the shores of it's namesake, Lake Manapouri. It is a beautiful lake with many bush clad islands scattered throughout, framed by the spectacular Cathedral Mountains.It is the gateway to such scenic wonders of Doubtful Sound and Dusky Sound and the starting point for many walking tracks, hunting and fishing trips.	http://www.travellink.co.nz/media/page.asp?UID=63
Lake Manapouri	Kayaking	Welcome to Fiordland Adventure - the website for our Manapouri based business namely 'Adventure Kayak & Cruise'. Come and experience this special area by joining us on the water in a sea kayak. We guarantee your visit to Lake Manapouri and Doubtful Sound will be a memorable one. This rich variety of landscape makes Fiordland a popular destination for those who want to experience the sights and sounds of nature at a close, personal level. Rent one of our quality sea kayaks and explore the many	http://www.fiordlandadventure.co.nz/

Location	Activity	Text	Reference
		islands, coves and sandy beaches that beautiful Lake Manapouri has to offer.	
Lake Manapouri	Kayaking Tramping/ Walking Sight seeing Accommm	Backpacker accommodatin.....Local activities: Doubtful and Milford Sound cruises, kayaking, Kepler track 8km away, great local tracks.....Spectacularly set in rain forest right on lakeshore, perfect base for Doubtful Sound adventure, only 400m to Doubtful Sound cruise departure. Small, clean, relaxing. WALKING TRACKS start at Possum Lodge and an ideal base for walking the Kepler and Dusky Tracks. KAYAKING on Lake Manapouri and Doubtful Sound and we can assist in arranging your nature based activities in Fiordland	http://www.bbh.co.nz/listing.s.aspx?bbh=detail&aid=227&hid=14465
Lake Manapouri	Kayaking	Kayak trip.....A threatening murk descended into full-on torrential rain as 15 hardy kayakers headed to Te Anau for two days paddling on Lake Manapouri in late November 2003. Trip Leader Mike Brettell tried to look on the bright side as the van's windscreen wipers struggled to keep up with the deluge, but the prospect of two days of heavy precipitation didn't fill anyone with great joy. But... as so often happens with the unpredictable weather of Fiordland, the next morning dawned sunny and still and the thought of two days on the water was a much more enticing prospect.	http://www.otmc.co.nz/archives/TripReports/Reports/kayak/trkayak002.html
Lake Manapouri	Kayaking	Much underrated because of their close proximity to the fiords, the glacial lakes are a real guided or rental alternative to the fiords for wilderness kayaking, camping and exploring - no one lives out there, it's all National Park. Take time out for one or more days on either of these beautiful lakes, clear, deep water, edged with sandy beaches, coves and cliffs, designed with islands, glaciated valleys, intertwined ridges, fed by waterfalls, pure mountain streams, cradled by classic Fiordland native bush and mountain scenery.LAKE MANAPOURI NEW ZEALAND'S MOST BEAUTIFUL LAKE 190 km of uninhabited shoreline and 34 islands, isolated North Arm, rugged Cathedral Peaks, Hurricane Passage, sandy beaches, clear water coves - an accessible wilderness carved for exploring by sea kayak.	http://www.fiordlandseakayak.co.nz/awesomelakes.html
Lake Manapouri	Kayaking Wildlife	Lake Manapouri: Lake Manapouri is dotted with thirty five islands and dozens of secluded bays, and with some 157 km of shoreline it is an ideal lake to explore by kayak. The lake is deep and clear and edged with sandy beaches which are great for camping. Drift past sheer cliffs, paddling silently close to the shore to view birds and other wildlife. Or cruise down the slow-moving Waiau River to the Mararoa Weir passing through beech forest along the way. Venture out on a day trip or consider an extended excursion. There is a range of kayaks for hire, from fully equipped kayaks to more basic models. Canoes and rowboats are also available for hire. Lake Manapouri connects with the Dusky Track. You do not need any prior experience to kayak Lake Manapouri and it is ideal for family groups because of the less challenging conditions.	http://www.southernscenicroute.co.nz/Activities/Kayaking.asp
Lake Manapouri	Kayaking	FIORDLAND - New Zealand's largest national park and one of the largest in the world bordered on its eastern flank by the stunning glacially carved lakes of Te Anau and Manapouri and on the western shores by the 14 fiords (incorrectly called sounds) which give the park its name.a sea kayaker's wilderness.Sea kayaking is the natural way to experience the essential spirit of this stunning, primeval, intense wilderness and we want to take you on a real sea kayaking adventure into this wilderness as we personally do it - in a small group, with friends exploring in our kayaks, experiencing its wildness, working with nature, becoming a part of the sea and landscape on its terms. We avoid modifying it or noisily intruding into it. We respect it as it is and keep on discovering	http://www.fiordlandseakayak.co.nz/index.html
Lake Manapouri	Kayaking	Kayaking trip..... The journey begins with a cruise up the north side of Lake Manapouri to West Arm at the head of the lake. Lake Manapouri is very beautiful with its many wooded islands, coves, sandy beaches and mountainous surround. Stopover at the informative West Arm Visitor Centre before travelling 22km by coach over the Wilmot Pass Road. Stops allow you to take in the many spectacular views, including a view (weather permitting) of the sound 670 metres above sea level. At Deep Cove, enjoy a cuppa and cookies before gearing up to paddle this remote fiord. Lake Manapouri - New Zealand's "loveliest" Lake. Lake Manapouri is dotted with thirty five islands and dozens of secluded bays, and with some 157 km of shoreline it is an ideal lake to explore by kayak. The lake is deep and clear and edged with sandy beaches which are great for camping. Drift past sheer cliffs, paddling silently close to the shore to view birds and other wildlife. Or cruise down the slow-moving Waiau River to the Mararoa Weir passing through beech forest along the way.	http://www.travellink.co.nz/media/page.asp?UID=47
Lake Manapouri	Kayaking	RENTAL KAYAKING LAKES TE ANAU & MANAPOURI DOUBTFUL SOUND Lake Te Anau for 1 or more days Lake Manapouri for 2 or more days	http://www.fiordlandseakayak.co.nz/rental_kayaking.html

Location	Activity	Text	Reference
Lake Manapouri	Kayaking	The journey is packed with adventure and scenery all the way. Start with a 30km cruise aboard our vessel 'Adventurer 1' across Lake Manapouri to West Arm at the head of the lake. Lake Manapouri is very beautiful with its many wooded islands, coves, sandy beaches and mountainous surround. Stopover at the informative West Arm Visitor Centre before travelling 22 km by coach over the Wilmot Pass Road.	http://www.fiordlandadventure.co.nz/option_1_ds_fullday.htm
Lake Manapouri	Kayaking	Kayaking 1 Day Trip (lake te anau/ manap.) Fiordland Wilderness Experiences specialise in real sea kayaking, New Zealand style, in real Fiordland wilderness - Milford Sound, Doubtful Sound, Dusky and Breaksea Sounds, Lake Manapouri and Lake Te Anau.	http://www.ginz.com/new_zealand/southland/tours/teanau/suppliers/Fiordland_Wilderness_Experiences
Lake Manapouri	Sight seeing	Cruise the crystal clear waters of Lake Manapouri and coach over remote Wilmot Pass to Deep Cove before boarding your vessel for one of our two cruise options:	http://www.experiencequeerstown.co.nz/the-experience/water/cruises/real-journeys-doubtful-sound/
Lake Manapouri	Sight seeing Tramping/ Walking	Beautiful Lake Manapouri is within the boundaries of Fiordland National Park and the Te Wahipounamu World Heritage site. The lake is framed by the spectacular Cathedral Mountains and has four arms - North, South, West and Hope..... Several tracks start on the eastern shores of Lake Manapouri. These are ideal for day trips and easy two or three day hikes. From Pearl Harbour, which is adjacent to Manapouri township, you can organise a lake cruise or a tour of the West Arm underground power station.....This region was chosen as a filming location for the Lord of the Rings movie trilogy. The Norwest Lakes were used to show the Fellowship travelling south from Rivendell; sections of the Waiau River, which flows between Lakes Te Anau and Manapouri, were used for scenes of the River Anduin	http://www.newzealand.com/travel/sights-activities/scenic-highlights/lakes/scenic-highlight-details.cfm/businessid/63613/highlightcategoryid/5/startrow/7/endrow/0/seed/0.html
Lake Manapouri	Sight seeing Tramping/ Walking Hunting	Manapouri is the fifth largest and second deepest lake in New Zealand. It is also one of the most beautiful..... Tracks and hunting.....Several tracks start on the eastern shores of Lake Manapouri. These are suited to day trips and easy two or three day tramps. Tracks in the Garnock Burn catchment, to the south of the lake, can be walked as a loop and have several side trips. All are at low altitude.....There are also several more demanding routes suitable for experienced parties..... There is good trout fishing in Lake Manapouri and its tributary streams and Lake Rakatu. Anglers need a current fishing licence.	http://www.doc.govt.nz/templates/ActivitiesSummary.aspx?id=35715
Lake Manapouri	Sight seeing	This small township in the South Island enjoys a spectacular setting on the shores of Lake Manapouri. Wooded islands, a bush-covered shoreline and the backdrop of the Kepler Mountains make the lake particularly beautiful. Manapouri's economy is based on tourism and hydro-electric power generation, and the huge Manapouri Power Station makes an interesting excursion. The town is an ideal base for trips into the magnificent wilderness of Fiordland. Day and overnight excursions to Doubtful Sound depart from Manapouri	http://www.jasons.com/New-Zealand/Manapouri/
Lake Manapouri	Sight seeing Kayaking Tramping/ Walking Watersports general Wildlife	Lake Manapouri, one of New Zealand's most beautiful lakes, its blue waters studded with more than 30 small islands, is the gateway to the serene Doubtful Sound, the deepest of the 14 fiords.The Manapouri township (population 300) lies on the edge of the lake beside the outlet of the Waiau River, 19 kilometres south of Te Anau. Manapouri was used as a base during filming of the Lord of the Rings, when the Waiau River between Lake Te Anau and Lake Manapouri was used to portray the River Anduin.....You can explore the lake's sandy beaches and sheltered coves on a boat or kayak trip, or take one of the walking tracks around its shores. The Pearl Harbour to Frasers Beach track is an easy 45 minute walk through the forest, where fantails dart back and forth, to the beach just along the lakeshore. Hire a rowboat or jump aboard a water taxi across the river to the start of the Circle Track, a three hour walk around the lake and up to a ridge for stunning views across the lake.Many tour operators offer lake cruises which take in tours of the underground power station and bus trips across Wilmot Pass to Deep Cove, from where you can kayak or cruise around pristine Doubtful Sound, its rainforest-covered mountains providing a habitat for rare native birds, its clear waters inhabited by bottlenose dolphins and fur seals.	http://www.exploring.co.nz/South_Island/Southland/Fiordland/Lake_Manapouri/
Lake Manapouri	Sight seeing Tramping/ Walking Fishing	Lake Manapouri is renowned for its beauty and the small peaceful town of Manapouri sits on the lakeshore, with a population of around 300-400. These numbers increase dramatically during the summer due to the number of holiday homes in the area. Facilities in the town include a pub, dairy, service station and even a covered swimming pool. The town serves as a great base for tramping and fishing. The larger town of Te Anau, with all its amenities, is 20km away. Visitors to Doubtful Sound or the Manapouri	http://www.realjourneys.co.nz/Corporate/Ourlocations/

Location	Activity	Text	Reference
		power station on the West Arm of the lake, depart from the Real Journeys Visitor Centre, which has its own café, at Pearl Harbour, Manapouri.	
Lake Manapouri	Sight seeing	Towards the end of this stretch of the journey be sure to take the turnoff to Lake Manapouri. It adds only 21km (13 miles) to your journey and you will be wonderfully rewarded for the extra travelling.Conservationists waged a long and very active campaign from 1959 to 1972 to prevent the raising of Lake Manapouri and Lake Te Anau as part of the hydro-electric development. We can thank their efforts for the beauty of the lakes today. The campaigners in the Save Manapouri Campaign are remembered in a memorial plaque on the shore of the lake.While you are there do take time to look at beautiful Pearl Harbour. There is accommodation at Lake Manapouri and if time permits the a combined cruise and bus trip to view Doubtful Sound gives a view of the natural beauty and isolation of that area while a trip to the underground power station shows	http://www.nzine.co.nz/features/lake_pukaki_to_te_anau_scenic_highlights.html
Lake Manapouri	Sight seeing	The best base for exploring the Fiordland region is the attractive resort town of Te Anau. From here it is just twenty minutes drive to the picturesque Lake Manapouri. Te Anau and Lake Manapouri, New Zealand, offer a great selection of nature and eco tours perfect for taking in Fiordland's breathtaking scenery. Select eco and nature tours in Te Anau or Lake Manapouri, Fiordland, New Zealand, from the list below. Alternatively select a different Fiordland area.	http://www.tourism.net.nz/region/fiordland/fiordland---te-anau-and-manapouri/tours/eco-and-nature-tours/
Lake Manapouri	Sight seeing Tramping/ Walking Kayaking Wildlife	An 11 day adventure tour.....Day 7: Manapouri - Doubtful Sound or Green Lake Kayakers will enjoy a cruise across Lake Manapouri before crossing Wilmot pass to Deep Cove from where you will set out on your Kayaking adventure. Depending on the will of the wild you may get to encounter seals, penguins, and bottle nosed dolphins.....Trampers will take a short drive to the Borland Saddle from where we will walk up the valley to tranquility of Green Lake. We'll spend the evening camped out near the lake shore admiring the views of the surrounding beech forest covered mountains.	http://www.lanzend.co.nz/tours/tour_gse.htm
Lake Manapouri	Sight seeing	Lake Manapouri has four arms, North, South, West and Hope, and some 33 islands, 22 of which are wooded. The Waiau River is its natural outlet. The township of Manapouri lies at the edge of Fiordland National Park on the eastern shore of Lake Manapouri, close to its outflow into the Waiau River. Manapouri is a 20 minutes drive from Te Anau. It is the gateway to both Doubtful and Dusky Sounds and the starting point for local walking tracks. Manapouri is a popular destination during the summer months when visitors come to soak up the sunshine and enjoy Lake Manapouri's clear waters.	http://dockbaylodge.co.nz/db/index.php?option=com_content&task=view&id=52&Itemid=52
Lake Manapouri	Sight seeing	Lake Manapouri – departure point for cruises on Lake Manapouri and Doubtful Sound.....A boat cruise on Lake Te Anau or Lake Manapouri – pure pleasure in astonishingly wild and beautiful scenery	http://www.newzealandtravelmanual.com/fiordland-r34/map.html
Lake Manapouri	Sight seeing	Queenstown - Doubtful Sound - Queenstown optional sightseeing 6.45am depart Queenstown by Real Journeys, travel along the shores of Lake Wakatipu Cruise across picturesque Lake Manapouri to West Arm 10.30am depart by coach over the Wilmot Pass, see dense rainforest on the Wilmot Pass 11.45am depart Deep Cove for your three hour cruise on beautiful Doubtful Sound, waterfalls, rainforest and mountains, chance to spot bottlenose dolphins, fur seals, and rare Fiordland crested penguins visit the Manapouri Underground Power Station by coach 5.30pm return to Pearl Harbour, Manapouri and reboard coach 7.30pm arrive Queenstown	http://www.newzealandvacation.com/vacation/fromQueenstown/index.cfm/
Lake Manapouri	Sight seeing	The trip to Doubtful sound involves a short trip (21km), a boat trip across Lake Manapouri, a coach trip underground into the power station (whenever possible), and then over the Wilmot Pass, followed by the boat trip on Doubtful sound.	http://www.designzontravel.co.nz/itinerary_day.htm
Lake Manapouri	Sight seeing	A visit to the hostel starts at the township of Manapouri on the banks of the Lower Waiau River where the journey is made by warm and comfortable boats some 25 miles across New Zealand's 2nd deepest and 5th largest lake, Lake Manapouri. Mountains covered in bush right down to the waters edge and for most of the year capped with snow, line both sides of the lake providing enjoyment and wonderment for those making the trip and providing many photographic opportunities.	http://www.seniornet.org.nz/WhatsNew-Sept07-VisitDeepCove.pdf
Lake Manapouri	Sight seeing Kayaking Wildlife	Cruise across Lake Manapouri, coach across Wilmot Pass and board the Fiordland Navigator. Enjoy a unique overnight cruise amidst remote wilderness scenery. Kayaking, exploring by tender craft, wildlife viewing, and delicious meals included	http://www.traveldealsnz.com/new-zealand/product/?product=doubtful-sound-overnight-cruises-ex-te-anau-real-journeys

Location	Activity	Text	Reference
Lake Manapouri	Sight seeing Kayaking	Manapouri is the more beautiful of the two lakes. Take Real Journeys Doubtful Sound Trip -- it's one of the tourist highlights of NZ, and well worth the extra day. Cruise across Lake Manapouri, take a bus ride down the 2km long access tunnel into a hydro-electric power station 700ft underground, hewn from solid granite beneath the mountains. Then a bus trip over Wilmot Pass before cruising Doubtful Sound.....Fancy seeing it aboard something smaller in scale and relying on paddle power not diesel power? Then paddle your own kayak around Lake Manapouri or Doubtful Sound, one of the great adventures NZ has to offer. There are several operators to choose from	http://new-zealand-travel-guide.com/fiordland.htm
Lake Manapouri	Sight seeing	Sample itinerary.....Doubtful Sound to Manapouri to Queenstown.....A cooked breakfast is enjoyed before disembarking off the Navigator and make return journey over the Wilmot Pass and across Lake Manapouri to complete your wilderness experience. Collect your rental car and make your way via Te Anau to Queenstown and your accommodation for the next two nights.	http://www.nzholidays.co.nz/itinerary5.php
Lake Manapouri	Sight seeing	Your day adventure to Doubtful Sound begins as you cruise the crystal clear waters of Lake Manapouri. After disembarking at West Arm, you travel underground by coach to see the Manapouri Power Station machine hall. Then it's over Wilmot Pass, stopping along the way to experience some of Fiordland's densest rainforest and to view close up the colourful alpine moss gardens	http://www.ginz.com/new_zealand/southland/tours/teanau/suppliers/Real_Journeys/285519/itineraryitem
Lake Manapouri	Sight seeing Accommm	The Manapouri Lakeview Motor Inn overlooks beautiful Lake Manapouri. Situated 20kms from Te Anau, Lake Manapouri is the departure point for trips to Doubtful Sound.	http://www.travelbug.co.nz/visit/21947
Lake Manapouri	Sight seeing Wildlife	Manapouri: Preserved through public protest at proposals to raise the level for hydroelectric purposes, Manapouri is surrounded by dense bush and scattered with wooded islands, with the Kepler Mountains rising in the background. Some claim that it is New Zealand's most beautiful lake. The Monument viewpoint and hiking on tracks such as the Pearl Harbour Circle are among the attractions. Activities include fishing, tramping, kayaking and cruising. Guided tours are available of New Zealand's largest underground power plant, which shares the name of the lake. The boat trip across the lake to the power station and the bus tour over the mountains to Doubtful Sound are both spectacular. The daytime and overnight cruise excursions from Manapouri to Doubtful Sound take in three distinct worlds: the lake, the high Wilmot Pass drive (about an hour of careful driving by bus plus stops for photographs), and the wild beauty of Doubtful Sound from a cruise vessel. Bottlenose dolphins from Doubtful Sound's resident pod are frequently seen in the fiord.	http://www.aatravel.co.nz/new-zealand/Manapouri_Tours.html
Lake Manapouri	Sight seeing Jet boating Scenic (views over)	Tour itineraries.....Combination of Floatplane flight and Jetboat ride on Lake Manapouri and the Waiau River. Duration: 1 hour including minimum 12 minutes flight time Adult: \$205.00 Child: \$105.00 Norwest Lake Fly 'n' Boat Combination of Floatplane flight over the Nor West Lakes and Jetboat ride on Lake Manapouri and the Waiau River. Duration: 1 hour 15 minutes including minimum 20 minutes flight time Adult: \$255.00 Child: \$145.00 Doubtful Sound Fly 'n' Boat Combination of Floatplane flight to Doubtful Sound and Jetboat ride on Lake Manapouri and the Waiau River. Duration: 1.5 hours including minimum 40 minutes flight time Adult: \$355.00 Child: \$190.00	http://www.wingsandwater.co.nz/otherscenic.html
Lake Manapouri	Sight seeing Tramping/ Walking Kayaking Sailing	Lake Manapouri is the second deepest lake in New Zealand and has a large hydro power station at the end of its west arm. The creation of the power station in 1959 improved access to Doubtful Sound (a fiord), which you can explore by sea kayak or cruise boat. Some guided tours involve a bit of everything – hiking, kayaking and sailing. Power station tours can be arranged. You can also explore Lake Manapouri by kayak or take to the hiking trails – the Circle Track, Kepler Track and remote Dusky Track are local favourites.	http://www.newzealand.com/travel/destinations/regions/fiordland/towns.cfm/nodeid/119.html
Lake Manapouri	Sight seeing	Characterised by the region's unrelenting rain (on average 6 metres a year), Lake Manapouri captivates with its morose green tones and thickly forested surrounds. Located south of Te Anau, Lake Manapouri is the second deepest lake in New Zealand, falling to depths of 440 feet in some areas. Regarded by many as the loveliest of all Fiordland's lakes, moody Manapouri is scattered with over 30 small islands, and is truly idyllic.	http://www.fourcorners.co.nz/new-zealand/fiordland/
Lake Manapouri	Sight seeing Wildlife	Doubtful Sound Cruises; Wilderness Cruise on the 'Patea Explorer'. This trip includes the crossing of Lake Manapouri, a coach ride over Wilmot Pass and a 3 hour cruise of the Doubtful Sound. During spring there is an abundance of wildlife. Bottlenose dolphins frequently swim at the bow of the boat, fur seals bask in the sun on the Nee islets at the mouth of the fiord. During spring the rare Fiordland Crested Penguin breeds on the islets. On your return to Lake Manapouri you usually visit the underground Power Station to view the turbine hall from an elevated platform.	http://www.larchhill.com/todo.htm

Location	Activity	Text	Reference
Lake Manapouri	Sight seeing Scenic (views over)	Fiordland Navigator, Doubtful Sound - start your day by cruising across Lake Manapouri before boarding a coach for the ride over the scenic Wilmot Pass. Board the vessel and cruise through the picturesque Fiord. Witness a nature's paradise on this Fiordland sightseeing experience	http://www.houseoftravel.co.nz/destinations/New+Zealand/Southern+Lakes+and+Fiordland/Te+Anau+and+Fiordland/Sightseeing/fiordland-navigator.htm
Lake Manapouri	Sight seeing Jet boating Scenic (views over)	Fiordland has only two roads finding their way into its heart. One is of course the Milford and the other is the Wilmot Pass Road. The Wilmot Pass is not a public road as it's on the western side of Lake Manapouri, but it does take people by bus into Doubtful Sound after a boat trip across the lake from Pearl Harbour close to the township of Manapouri.....Take a journey with Luxmore Jet, deep into the Fiordland National Park and a World Heritage area. With a pinch of adrenalin and a heap of natural beauty makes this the best jetboat ride ever. Enjoy the unspoilt scenery, while travelling the crystal clear waters of the Upper Waiau River which runs between Lake Te Anau and Lake Manapouri. You will see three actual Lord of the Rings sites and possibly a brown or rainbow trout. When arriving on Lake Manapouri, enjoy the breathtaking scenery of the spectacular snow-capped mountains. Luxmore Jet also offers a FLY & BOAT option with the Wings and Water floatplane, or a LORD of the RINGS flight with Southern Lakes Helicopters. Duration is 1 hour in the boat, allow 90 minutes including transfers. Please wear warm clothing, bring sun glasses and a camera. Luxmore Jet is locally owned and operated by Lex and Shirly Mouat	http://fiordlandlocalnz.com/activities/boatingfiordlandnationalpark.aspx
Lake Manapouri	Sight seeing Fishing Scenic (views over) Kayaking Tramping/ Walking	Today one of the most popular of all Fiordland excursions is the return one-day trip from Manapouri to Doubtful Sound. Modern launches leave Pearl Harbour at Manapouri (20 minutes from Te Anau) and cross Lake Manapouri to West Arm, where visitors can see the underground power station before heading over Wilmot Pass and on to Doubtful Sound. Increasingly popular with visitors to Fiordland are overnight cruises on Doubtful Sound, ranging from one to multiple nights. Additional days in the Doubtful Sound/Manapouri area would be required for the following activities: Diving/fishing charters; Activity combinations: combine aerial sightseeing and a cruise trip into the Doubtful Sound region with activities such as bush walks, historic site visits and sea fishing; Ecology tours: these multi-day tours include working alongside scientists ; Full- and half-day excursions: combine a coach journey, launch cruise, and kayaking in the Manapouri/ Doubtful Sound area; Kayaking: visitors can rent fully equipped kayaks by the day or overnight, or take a guided kayaking excursion on Lake Manapouri and/or Doubtful Sound	http://www.economy.co.nz/travel-guide/milford-sound-doubtful-sound.html
Lake Manapouri	Sight seeing	Your Doubtful Sound Overnight Cruise starts in Manapouri, where Diane will welcome you and guide you onto the vessel that will take you on a 45 minute boat ride across Lake Manapouri, New Zealand's most scenic lake, to West Arm at the head of the Lake..	http://www.doubtful-sound.com/Cruises/default.asp
Lake Manapouri	Sight seeing	Retrace our path from Doubtful Sound back across Wilmot Pass and over Lake Manapouri and drive on to Te Anau. Accommodation at Luxmore Hotel. Optional evening cruise across Lake Te Anau to the Te Anau limestone and glowworm 'caves of rushing waters' - extra expense	http://www.world-discovery.com/region_indices/nz/grand%20nz%20discovey.php
Lake Manapouri	Sight seeing	Day 3 - Dunedin / Lake Manapouri / Te AnauVisit historic Olveston House, then cross rich farmlands to the agricultural towns of Gore and Lumsden. Visit Lake Manapouri before arriving at Lake Te Anau. Your overnight accommodation will be at the Fiordland National Park Hotel	http://www.southpacifictravellers.co.nz/coachtour-b.asp
Lake Manapouri	Sight seeing	Dunedin / Lake Manapouri / Te Anau Visit historic Olveston House, then cross rich farmlands to the agricultural towns of Gore and Lumsden. Visit Lake Manapouri before arriving at Lake Te Anau.	http://www.newmanstravel.co.nz/9daysouthernexplore.r.htm
Lake Manapouri	Sight seeing	Dunedin to Manapouri....We stayed overnight in Dunedin then, after meeting up with my youngest son Nils, my eldest son Hadyn and his two children, Katie and Sam, we drove by two hire cars to Lake Te Anau where we had to drop off the cars..... Incidentally, the tour operators could do a lot better with their information on how to get to Manapouri, especially for overseas tourists who are not familiar with the location of certain places and especially of travel arrangements and alternatives.....Manapouri to Deep Cove.....We stayed overnight at a motel at Manapouri and the next morning were taken by small boat to the Power Station at the end of the Lake. A landrover then took us over the Wilmott Pass to Deep Cove on Doubtful Sound where our charter boat was waiting	http://www.nzine.co.nz/features/dusky.html

Location	Activity	Text	Reference
Lake Manapouri	Sight seeing Kayaking Wildlife	Doubtful Sound Overnight Cruise Description.....Following a short cruise across beautiful Lake Manapouri and a coach trip over Wilmot Pass, you will board the Fiordland Navigator at Deep Cove, Doubtful Sound. There is plenty of time on your Real Journeys overnight cruise to enjoy the stunning views and to discover the hidden arms of Doubtful Sound. Fur seals and bottlenose dolphins are often seen and at times, rare penguins can be observed. There is also time for you to kayak around the shoreline or go exploring in the tender craft with our nature guide. As the shadows lengthen we'll drop anchor at a favourite mooring for the night. After the days activities, enjoy a delicious evening buffet meal in the spacious dining saloon.	http://www.everythingqueestown.com/item/96/Doubtful+Sound+Overnight+Cruise
Lake Manapouri	Sight seeing	The adventure began in Manapouri where we parked the rental car and boarded a large, enclosed catamaran operated by Fiordland Travel, the only commercial day-tour operator on Doubtful Sound. After a 45-minute cruise the length of Lake Manapouri, a shuttle bus was waiting to take us on a unique side trip before continuing to our vessel. In low gear all the way, the bus descended a spiraling, 1.2-mile tunnel to a granite-walled cavern deep inside a mountain - the West Arm hydroelectric power station's generator hall. Virtually all underground, the station uses lake water to drive its seven immense turbines, producing power for an aluminum smelter 100 miles away.	http://www.newzealandatoz.com/index.php?pageid=638&NZs+Doubtful+Sound+&PHPSESSID=864
Lake Manapouri	Sight seeing	Come and join us on the trip of your lifetime. Your adventure begins with a 30km cruise across the crystal clear waters of beautiful Lake Manapouri with its many bush clad islands, sandy beaches, and many coves and bays, surrounded by bush clad mountains it really is a magical part of New Zealand.	http://www.doubtfulsoundcruise.com/
Lake Manapouri	Sight seeing	If time allows, allocate at least 3 days here to fully experience Fiordland including Milford Sound, Doubtful Sound and Lake Manapouri. Flowing from Lake Te Anau to Lake Manapouri, the Waiarau River was used to portray parts of the River Anduin. The high mountain tops above Lake Manapouri by Freeman Burn are the Northwest lakes, accessible only by Helicopter and are the locations for the Fellowship heading south from Rivendell.	http://www.guestnewzealand.com/new-zealand/lotr-north-south/
Lake Manapouri	Sight seeing Kayaking Wildlife	Day 9: Wanaka–Doubtful Sound (Fiordland National Park) In the morning we take you passed the Queenstown basin to Lake Manapouri to join an overnight cruise on Doubtful Sound which is located in a World Heritage Area. It is an overwhelming place! You can feel the power of nature here - the remoteness, the wildness and the peace. Known for its wilderness and wild life, Doubtful Sound is the second largest of the 14 fiords in Fiordland National Park and it is three times longer and 10 times larger than Milford Sound. Following a short cruise across beautiful Lake Manapouri and a coach trip over Wilmot Pass, you will board the Fiordland Navigator at Deep Cove, Doubtful Sound. There is plenty of time on your overnight cruise to enjoy the stunning views and to discover the hidden arms of Doubtful Sound. Fur seals and bottlenose dolphins are often seen and at times, rare penguins can be observed. There is also time for you to kayak around the shoreline or go exploring in the tender craft with our nature guide.	http://www.arohatours.co.nz/Presentation/Presentation1.aspx?ID=7181
Lake Manapouri	Sight seeing	We take the ferry back to the mainland and drive inland to Lake Manapouri, one of the prettiest and deepest lakes in the country, flanked by high mountain ranges and fringed with native beech forest	http://www.puretrailsnewzealand.co.nz/southern-lakes.htm
Lake Manapouri	Tramping/ Walking Accomm Sight seeing	The Circle TrackThis track can be a one day trip or a few days. It is called the Circle Track as it can be walked in a loop, but also has several side trips. There is no bridge over the lower Waiarau, so access is by a hired dingy or by a boat on the lake. The Kepler TrackThe Kepler Track is 67km walking track that takes about three to four days to complete. A reasonable degree of fitness is required to complete the track and trampers/hikers must be equipped well. During winter and spring the high alpine section can be closed by snow, but some parts of the track will still be suitable for day walks. The LakeBy boat a large number of coves and thirty-five islands, dot this 142 square kilometre lake can be explored. The Borland AreaThis area contains a system of roads and tracks that give access to the heart of Fiordland. The Borland area can be reached from the road to Lake Monowai. The road is only open during the summer months, but is still possible to be covered on foot or mountain bikes. There are a few shelters as well if the weather gets bad	http://homepages.ihug.co.nz/~bobm/manapouri/Page-2.html
Lake Manapouri	Tramping/ Walking Sight seeing	Manapouri is a township of about 500 people nestled on the eastern shores of Lake Manapouri. Twenty minutes from Te Anau Lake Manapouri is a beautiful lake framed by the spectacular Cathedral Mountains. Being located in the middle of Fiordland with many walking tracks close by such as the Kepler, one of the newest tracks in Fiordland. It is a 67km walking track that takes about three to four days to complete and starts and finishes at Manapouri. Pearl Harbour, adjacent to Manapouri township, is the gateway to the variety of excursions undertaken on Lake Manapouri and Doubtful Sound. Launch trips on Doubtful Sound begin with a launch trip across Lake Manapouri to West Arm, a visit to the West Arm underground power station, and a bus trip over the	http://www.kiwi.co.nz/Manapouri.htm

Location	Activity	Text	Reference
		majestic Wilmot Pass to Deep Cove. (Photo courtesy of 100% Pure New Zealand)	
Lake Manapouri	Tramping/ Walking	Dusky Track a nine day tramp.....Upper Spey, West Arm of Lake Manapouri Walk 4 - 5 hours Follow the Spey river to the track end and the West Arm of Lake Manapouri. Catch the boat (3 to 5 a day depending on time of year) to Manapouri and the completion of your epic trip.	http://www.hikesouth.com/dusky-freedom-plus.htm
Lake Manapouri	Tramping/ Walking Sight seeing	Walking tracks of international renown are features in this region, The Kepler Track which circuits an area situated between Lakes Te Anau and Manapouri. The Milford Track which connects the head of Lake Te Anau with Milford Sound. The Routeburn Track which connects the head of Lake Wakatipu with the Milford Road. And The Hollyford Track from the Hollyford Valley near the Milford Road to either Lake McKerrow and Martins Bay or via Lake Alabaster to Big Bay.	http://www.cottagestays.co.nz/regions/southernlakesinfo.htm
Lake Manapouri	Tramping/ Walking Sight seeing	Manapouri - only 15 minutes drive from Te Anau, the township nestles beside what is renowned as New Zealand's most beautiful lake. The lake's dotted with over 30 small islands, covered in native bush and accessible by boat. Lake Manapouri, or 'Lake of the Sorrowing Heart', is the gateway to Doubtful Sound and home to part of the famous Kepler Track.	http://www.kidzgo.co.nz/queenstown-and-southern-lakes/fiordland/fiordland-home.html
Lake Manapouri	Tramping/ Walking	Detailed route guide for walking the Kepler track	http://www.backcountrynz.com/new-zealand-kepler-track-route-guide.htm
Lake Manapouri	Tramping/ Walking	Tramping trip report – Christchurch tramping club	http://www.ctc.org.nz/index.php?option=com_content&task=view&id=2165&Itemid=42
Lake Manapouri	Tramping/ Walking Kayaking	Day Seven - 7th December - Walked out from Upper Spey Hut to the West Arm of Lake Manapouri and Paddled across Lake Manapouri in four hours to Shallow Bay Hut, Big big thanks to Phil for changing his plans and dropping the kayaks off early.	http://www.manawahinewalk.com/index.pl?when
Lake Manapouri	Tramping/ Walking	Kepler Track.....The track starts on the shores of Lake Te Anau and winds up above the bushline to Mount Luxmore, through the glacier-carved Hanging Valley to Lake Manapouri, before following the Waiau River through some of the country's finest stands of red beech back to its starting point	http://www.exploring.co.nz/kepler-track.html
Lake Te Anau	Accomm Sight seeing Jet boating Tramping/ Walking Fishing Jet boating Scenic (views over) Heli flights	The serene deep waters of Lake Te Anau make up the largest lake in the South Island and second largest in NZ, and are bordered on its western shore by lush virgin forest. The attractive town of Te Anau lies nestled on the edge of this beautiful lake, with a spectacular backdrop of Mt Luxmore and the Murchison mountains. Te Anau provides a full range of services to visitors, and is the closest service base to Milford Sound, with a scenic 2 1/2 hour drive from Te Anau to Milford. A wide range of accommodation within Te Anau offers over 4000 beds to weary travellers.There is a growing range of activities ensuring visitors can find plenty of things to do while enjoying the relaxed atmosphere and picturesque surroundings. Guided tours depart from Te Anau daily to visit the fiords or to explore other features within the National Park. Visitors can view outstanding vistas of the lake, mountains and farmland while exploring the diverse terrain of the area on 4 wheel farm bikes, on horseback, or by foot on one of the many short walks. Boat trips are available on the lake for a memorable scenic cruise and provide excellent fishing opportunities. Jet boating on the beautiful Waiau or Wairarahiri Rivers are options for those who like a bit of excitement mixed in with the scenery. Scenic flights via fixed wing, floatplane and helicopters provide magnificent overviews of the mountain ranges and remote wilderness of the Fiordland National Park. The international reputation as the "walking capital of the world" is well earned, with Te Anau being the departure point for many excellent walking tracks. Te Anau makes a great start and end point for these trips.	http://www.fiordland.org.nz/Explore-Fiordland/Places-to-visit/Te-Anau.asp
Lake Te Anau	Boating Water skiing Swimming Glow worms	During the summer months the lake is used for boating, water-skiing and swimming and the fishing season lasts all year round.....Take a cruise on Lake Te Anau to the Glow Worm Caves. You will be taken through the caves and witness the glow worms lighting up the caves with their tiny lights. Tours depart from Te Anau several times daily	http://www.alpenhornmotel.co.nz/localactivities.html
Lake Te Anau	Fishing – general	Fully guided golf tours of Southland and Otago are available golf tours, as are fly fishing, horse trekking and 4-wheel motorbiking to name a few. A small sample of other activities include sea or lake kayaking, hiking, nature walks, alpine flower tours in the	http://www.nz-holiday.co.nz/fiordlandlodg

Location	Activity	Text	Reference
	Kayaking Tramping/ walking Glow worms	summer, bird watching and glow worm caves	e/
Lake Te Anau	Fishing – salmon Fishing - general	Lake Te Anau's extensive eastern shore offers boat ramps and shoreline access for both spin and flyfishing and excellent boat fishing for a good population of trout and a few small salmon. Fish type Brown trout, rainbow trout and a few landlocked salmon. Situation The South Island's largest lake, Te Anau extends 60km from its southern outlet near Lake Manapouri to its northern tip at the famed Milford Track. The lake's western shore is rugged and bush-covered, with two fiords extending into the Fiordland mountains, while the farmed eastern side is straighter, drier and grass covered	http://www.nzfishing.com/FishingWaters/Southland/STHFishingWaters/STHTeAnau.htm
Lake Te Anau	Glow worms	This fascinating caves system on the western shore of Lake Te Anau offers an underground adventure that charms visitors of all ages. Following a scenic cruise across Lake Te Anau to Cavern House. Upon arrival join an informative talk about the life cycle of the glow worms, the history of the caves, their development and operation. Next your friendly guide will take you on an exploration of the caves by path and small punt. Observe how the rushing water sculpts the rock formations, before gliding through silent darkness to the glowworm grotto. The delicate incandescence of thousands of tiny glowworms is a magical sight. Return to Te Anau by boat across the lake, reflecting on this amazing experience of nature.	http://www.affiliate.viator.com/brochure/product_show.jsp?sessionId=acbD2bvYsbmSJhD9Dq6Jr?ID=1010&PRODUCTID=1016&CODE=2264RJ400&AUID=3134
Lake Te Anau	Glow worms	An illuminating adventure....Fiordland Travel takes you on a fascination underground adventure through the Te Anau- au Glow Worm Caves, situated on the western shores of Lake Te Anau. This exciting excursion will open up a new world for visitors of all ages. Our launch will take you across the lake to Cavern House set amongst native rainforest. Here you will be given an informative commentary by our guides, before going on your underground adventure. By path, follow alongside the Tunnel Burn passing the whirlpool and waterfalls and, by small boat, glide through the silent darkness of the enchanting glow worm grotto. There's time for complimentary tea or coffee, while viewing the displays at Cavern House and you may care to take a short nature walk through the rainforest. Glow worms are found throughout the caves and are most spectacular in the darkness of the grotto at the end of the caves system. Glow worms are the larvae of small flies called fungus gnats. They live on insects which are attracted by their light and then captured on sticky threads they produce. The actual cause of the 'glow' is the oxidisation of a chemical called 'luciferin' present inside the glow worm. The glow worm light shines as a blue/green colour and the hungrier the glow worm, the more brightly it glows. The light of a glow worm can be switched on and off at will then disturbed by sound or light, humidity or temperature. This is the reason for the restrictions on the use of flashlights within the caves, and the necessity for silence in the glow worm grotto.	http://www.oztravel.com.au/travel_mall/tours/Te_Anau_Glow_WoTANAUGW.html
Lake Te Anau	Glow worms Scenic (views over) Water sports Boating Walking/ tramping Fishing	Te Anau is also the entrance to the famous Milford Sound and Fiordland Park. Local attractions include the Glow Worm caves, the Wildlife Park, home to the uncommon native bird- Takahē, and the Hydro-Electric power station on Lake Manapouri. Holiday activities include mountain biking, scenic flights, scuba diving, river rafting, boating, game-fishing and bush walking	http://www.goldenchain.co.nz/motels/gc-te-anau/
Lake Te Anau	Glow worms	Have you ever seen limestone passages sculpted by water up close? Have you drifted in silent darkness beneath the luminous blue-green shimmer of thousands of glowworms? A visit to the Te Anau Glowworm Caves with Real Journeys on the isolated western shores of Lake Te Anau is a must-see. Located on the isolated western shores of Lake Te Anau, these caves were lost in legend for many years. Their ancient Maori name 'Te Ana-au' means 'caves with a current of swirling water' and it was this that led to their rediscovery in 1948. After three years searching, explorer Lawson Burrows discovered a stream emerging from under a rock structure. He squeezed underwater through the entrance and surfaced into a cavern shimmering with thousands of glowworms. Today we know that these magical caves are the lower section of a much larger cave system which extends deep under Fiordland National Park	http://realjourneys2.thrive.net.nz/Main/TeAnau/
Lake Te Anau	Jet boating	The Luxmore Jet adventure will take you out onto beautiful Lake Manapouri to view the lake and magnificent snowcapped mountains	http://www.luxmorejet.co.nz/

Location	Activity	Text	Reference
Lake Te Anau	Jet boating Scenic (views over)	Luxmore Jet operates jetboat tours on the Upper Waiau River which flows between Lake Te Anau and Lake Manapouri. Luxmore Jet is based in Te Anau the gateway to both Milford Sound and Doubtful Sound. Our jetboat excursions explore the untouched wilderness of Fiordland National Park a World Heritage Area in the South Island of New Zealand. The Luxmore Jet tour allows you to view 3 actual Lord of the Rings film locations of the River Anduin. The Luxmore Jet adventure will take you out onto beautiful Lake Manapouri to view the lake and magnificent snowcapped mountains. Luxmore Jet also offers a Fly & Boat option with the Wings and Water floatplane and a LORD OF THE RINGS Helijet with Southern Lakes Helicopters	http://www.luxmorejet.co.nz/
Lake Te Anau	Sight seeing Glow worms Fishing – trout Sailing Kayaking Scenic (view over)	A great place to relax and enjoy your holiday, or as a base for full day trips to Doubtful Sound and Milford Sound, walking tracks to experience nature at its best in the walking capital of the world - the Milford, Routeburn, Greenstone and Kepler Tracks all have guided walks but can also be done independently, and of course Te Anau's unique Glow Worm Caves is a must to see. Other outdoor activities available are horse riding, farm visits, trout fishing, hunting, sailing, kayaking, Scenic helicopter or airplane/floatplane flights and the attractive 18 hole Te Anau Golf Course	http://www.fiordlandhotel.co.nz/
Lake Te Anau	Sight seeing Glow worms	Your Te Anau Glowworm Cave adventure begins with a cruise across beautiful Lake Te Anau on board the catamaran Luminosa to the western side of the lake. On arrival there is time to view the interesting displays at Cavern House before our friendly guides accompany you underground in small groups. As you explore by path and small boat, your senses will be overwhelmed. In this mysterious underground world discover fossils and rock formations, and view rushing waterfalls and whirlpools. Learn how the caves are still being carved out by the incredible and relentless power of nature, before gliding through silent darkness to the glowworm grotto. The delicate incandescence of thousands of tiny glowworms is a magical sight.	http://www.realjourneys.co.nz/Main/GlowwormCaves/
Lake Te Anau	Sight seeing Kayaking Glow worms	Most of Lake Te Anau is within the boundaries of Fiordland National Park and the Te Wahipounamu World Heritage site. Of the two settlements on the shores of the lake, the township of Te Anau is the largest. Here you'll find operators who can take you cruising or kayaking on the lake. You can also visit the Te Ana-au glowworm caves, which are still geologically active.	http://www.newzealand.com/travel/sights-activities/scenic-highlights/lakes/scenic-highlight-details.cfm/businessid/68715/highlightcategoryid/5/startrow/2/endrow/0/seed/040408.html
Lake Te Anau	Sight seeing Fishing Glow worms	The waters of Lake Te Anau, the largest lake in the South Island, are deep and calm. Mount Luxmore and the Murchison mountains provide a backdrop to this serene setting. On the lake, scenic cruises and fishing trips are offered, while those looking for the thrill of a jet boat ride can experience it on the Waiau and Wairarahiri Rivers. Other activities in the area include quad bike tours, horse treks and walks, all with views of the lake and mountain surrounds. The Te Anau glow worm caves are full of waterfalls, whirlpools and rapids. The journey to see these unique caves begins with a 35 minute boat trip across Lake Te Anau and culminates with a tour of the cave and the glow worm grotto.	
Lake Te Anau	Sight seeing Glow worms Tramping/ walking Kayaking Jet boating	Cruise Te Anau - Relax on a boutique cruise to the South Fiord of Lake Te Anau. Join Peter, your personal Skipper/Guide, on a gentle bush/nature walk to discover the Hidden Lakes. Te Ana-Au Caves - A boat trip and guided tour lets visitors see stalagmites, stalactites and glow-worms. Lake Marrion - Off the hollyford road on the way to milford lies one of the most beautiful places on earth. Gordon Kane's art gallery - On the lakefront, paintings of the deer hunting glory days. Any of the many tracks located in the area. Te Anau isn't called the walking capital of the world for no reason! Don't miss out on going to milford, taking a cruise, and enjoying the scenic wonderland. For once its probably better to take a bus, they don't rush it and you get good quality commentary. Take a day walk somewhere - Lake Marrion for example. If you don't have gear you can hire it from Bev's Tramping Gear Hire. Adventure sports!!! Kayaking, climbing, skydiving, jetboating + lots more is all in Te Anau	http://wikitravel.org/en/Te_Anau
Lake Te Anau	Sight seeing Fishing Jet boating Tramping/ walking Glow	The waters of Lake Te Anau, the largest lake in the South Island, are deep and calm. Mount Luxmore and the Murchison mountains provide a backdrop to this serene setting. On the lake, scenic cruises and fishing trips are offered, while those looking for the thrill of a jet boat ride can experience it on the Waiau and Wairarahiri Rivers. Other activities in the area include quad bike tours, horse treks and walks, all with views of the lake and mountain surrounds. The Te Anau glow worm caves are full of waterfalls, whirlpools and rapids. The journey to see these unique caves begins with a 35 minute boat trip across Lake Te Anau	http://www.nzs.com/region/fiordland/te-anau/

Location	Activity	Text	Reference
	worms	and culminates with a tour of the cave and the glow worm grotto	
Lake Te Anau	Sight seeing Glow worms Scenic (views over) Fishing Tramping/ walking	Te Anau is a small town of less than 1000 people on a large alpine lake. The lake is popular for fishing and boating. There are cruises to see glowworm caves and ferrying hikers across to start trails beginning on the other side. There are also floatplanes and helicopters providing aerials tours of the area for tourists. There are also frequent tours to Doubtful Sound and Lake Manapouri.	http://www.globosapiens.net/travel-information/Te+Anau-1151.html
Lake Te Anau	Sight seeing Boating Kayaking Watersports general Glow worms	The second largest in the country, several scenic cruises operate on the lake, and there are also opportunities to hire rowing boats, motor boats, kayaks and jet-skis. Perhaps the most popular and well-known excursion on offer is the cruise to the Te Ana-au caves. Located on the western side of the lake, these are impressive limestone caverns of underground waterfalls, whirlpools and a magical glow-worm grotto.	http://www.discover-newzealand.co.uk/anau/index.htm
Lake Te Anau	Sight seeing Tramping/ Walking Glow worm Wildlife Swimming	The emphasis is on eco-tourism and soft adventure here with heaps of options for sightseeing as follows:- Walk along the lakefront esplanade to Blue Gum Point Enjoy the stillness and serenity of the South Island's largest lake and the primeval ambience of the Murchison Mountains (home of the rare takahe bird). Walk around the lakeshore to the Wildlife Park View endangered native birds and continue on to the Lake Outlet and Dock Bay, a popular picnic and swimming spot. Consider an all day walk on the nearby Kepler Track Drive to Rainbow Reach on the Lower Waiau River and walk 3 hours through pure pristine wilderness back to the lakeshore. Take a night cruise on Lake Te Anau to the Te Ana-au Caves Experience the beautiful glow-worm grotto, waterfalls and limestone formations. Drive down to Lake Manapouri for a walk or cruise Walk options are Stockyard Cove and The Monument and the more challenging Cone Peak. Cruises take in the 35 islands and tentacle-like arms of the lake	http://www.newzealandnz.co.nz/free-low-cost-activities/te-anau.html
Lake Te Anau	Sight seeing Accomm Glow worms Scenic (views over) Fishing Fishing – trout Tramping/ walking	A short trip takes you to Te Anau on the shore of Lake Te Anau. The settlement is at the edge of Fiordland National Park, one of the largest national parks in the world and a World Heritage area. To find out what the area offers start at the Fiordland Information Centre and find out about the different types of accommodation, the varied restaurants and the many activities offered. You can choose among cruises, especially the famous trip to the Te Ana-au Glowworm Caves, scenic flights, water sports, mountain biking, fly-fishing or trolling for trout, short walks, and longer walks like the circular three or four day Kepler Track which begins and ends at Te Anau	http://www.nzine.co.nz/features/lake_pukaki_to_te_anau_scenic_highlights.html
Lake Te Anau	Tramping/ walking Glow worms Kayaking Swimming Water sports Sight seeing Boating Scenic (views over)	Lake Te Anau is the South Island's largest lake and shows considerable contrast between the dense forest of the western shore and the sparser cover of the east – for which a difference in rainfall is responsible. Te Anau is a glacier lake. Its outflow, the Waiau River, is controlled as part of the Manapouri power scheme as it flows into Lake Manapouri. Te Anau is the ideal base from which to explore Milford and Doubtful Sounds; it is a holiday resort with amenities for visitors including the Fiordland National Park Visitor Centre and Museum. It is known as the Walking Capital of the world – the Milford, Hollyford, Routeburn, Greenstone, Caples, Kepler and remote and difficult Dusky Track (as well as several other excellent walks) are all nearby. The Te Anau Glow-worm Caves, famous for their beautiful water-formed sculpture and magical glow-worms, lie across the lake. Swimming, water skiing and boating at Blue Gum Point, trout and salmon fishing, float plane and helicopter flights, kayaking, lake trips, mountain biking, horse trekking, underground trout observatory, the Wildlife Bird Reserve, Ivon Wilson Park, and yachting are also attractions. Milford is two hours' drive from Te Anau, and Manapouri is just a 20-minute drive away	http://www.teanau-milfordsound.co.nz/location.htm
Lake Te Anau	Water skiing Swimming Fishing Kayaking	Lake Te Anau sprawls at the feet of high rugged mountains, and during the summer the hot dry weather encourages water skiing, swimming, fishing and kayaking on the lake. During the winter, days are crisp and clear with frosty mornings and sunny days	http://www.travellink.co.nz/media/category.asp?UID=110
Manapouri power station	Accomm	The Underground Manapouri Power Station....This is the largest hydro electric power plant in New Zealand....It is housed underground in the Fiordland National Park in a cavern carved from rock 200 metres below the West Arm of Lake Manapouri. Unlike other hydro power stations, Manapouri does not have a high dam. It uses the natural 178 metre height difference between Lake Manapouri and the sea at Deep Cove in Doubtful Sound to generate electricity.	http://www.lakevista.co.nz/manapouri_power_station.htm

Location	Activity	Text	Reference
Manapouri power station	Accomm	Motel accommodation and activities in Fiordland.....Adjacent to the town, is the beautiful Pearl Harbour, a gateway to Doubtful Sound, and a fine base for exploring the holiday activities in the region, the most popular among them being- trips to the Manapouri Power Station on the West arm, one of the largest hydro-electric power stations in the Southern Hemisphere.	http://www.goldenchain.co.nz/motels/gc-manapouri/
Manapouri power station	Accomm	Manapouri Lakeview Motor Inn.....We are situated 20kms from Te Anau. Lake Manapouri is the departure point for trips to the Manapouri Power Station and Doubtful Sound as well as sightseeing and guided fishing trips on the Lake itself	http://www.newzealand.com/travel/accommodation/accommodation-options/operator-details.cfm/businessactivityid/180943/regionid/7/startrow/2/endrow/0/qualmarkcategory/2/activitycategoryid/2/seed/0.html
Manapouri power station	Accomm	Manapouri is one of New Zealand's most beautiful lakes and home to the country's biggest underground power station. The Monument viewpoint, a guided tour of the power station, fishing, tramping or kayaking are just some of the attractions. Take a day trip to Doubtful Sound which includes a lake cruise, the Manapouri Power Station, a drive over the Wilmot Pass and the wild beauty of Doubtful Sound. Further south (on State Highway 95) you will enjoy the isolation of Lake Monowai, Borland Lodge and New Zealand's deepest lake, Lake Hauroko.	http://www.hostaccommodation.co.nz/teanau-info
Manapouri power station	Accomm	The Cottage" is ideally situated to visit all of Fiordland's scenic wonders, Doubtful Sound, Milford Sound, Te Anau and the many walks in the area including a wonderful easy walk at Rainbow Reach, (part of the Kepler Track). We can also advise on arranging other activities including kayaking, fishing, cruises and scenic trips.....A two-minute walk through the Mountain Beech Trees will take you to the wharf where the boats depart for the Majestic Doubtful Sound, Fiordland and the remarkable Manapouri Power Station.	http://www.thecottagefiordland.co.nz/thecottage/default.aspx
Manapouri power station	Accomm	We are situated 20kms from Te Anau. Lake Manapouri is the departure point for trips to the Manapouri Power Station and Doubtful Sound as well as sightseeing and guided fishing trips on the Lake itself. We are local sightseeing booking agents.	http://www.newzealand.com/travel/accommodation/accommodation-options/
Manapouri power station	Accomm	The lake provides hydro-electric power via Manapouri Power Station, in the West arm, which discharges water through two 10-km tailrace tunnels to Doubtful Sound and the sea. In 1960 it was proposed to raise the lake by up to 30 metres for the power station but a strong nationwide protest prevented this from happening. The lake levels are carefully controlled to be close to natural fluctuations.	http://dockbaylodge.co.nz/db/index.php?option=com_content&task=view&id=52&Itemid=52
Manapouri power station	Mountain biking	Fit mountain bikers can get from the Manapouri Power Station to Borland Lodge in a long day for a welcome hot shower and comfortable accommodation. Families who enjoy getting out of town for a weekend, weddings, conferences and other functions can be accommodated at Borland Lodge	http://www.borlandlodge.co.nz/thingstodo.aspx
Manapouri power station	Sight seeing	The Manapouri Underground Power Station, at West Arm, is considered New Zealand's greatest engineering feat. It is the country's largest hydroelectric power station and is unique in that nearly all of it is built underground. The only external signs are the above-ground control building, a switchyard and two sets of transmission lines that loop across the head of the arm on their way to join the national grid.....A visit to the Manapouri Underground Power Station is normally part of the Doubtful Sound daytime excursion. However, access may not always be possible.	http://www.realjourneys.co.nz/Main/Powerstation/
Manapouri power station	Sight seeing	First commissioned in 1969, the Manapouri Power Station is an impressive engineering feat. Defying the harsh Fiordland conditions, the power station machine hall and tailrace discharge tunnels were blasted out of solid granite rock deep beneath the Fiordland Mountains. An awesome monument to the men who worked and died to build the Power Station.	http://www.travellink.co.nz/media/page.asp?UID=64
Manapouri power station	Sight seeing	Day out.....Manapouri Underground Power StationLake Manapouri, West ArmThe Manapouri Underground Power Station, at West Arm, is unique in that nearly all of it is built underground. Commercial tours are available from Manapouri and Te Anau.	http://www.dayout.co.nz/attachment-subject-results.asp?subject=underground+power&x=12&y=6
Manapouri power station	Sight seeing	Lake Manapouri is the womb of the now-powerful NZ green movement. Back in the 60s the government of the day decided to pump up the pressure on the penstocks of the Manapouri power station hidden in the very roots of the mountains themselves. Lake Manapouri boat cruise.....The power station was a clever idea - instead of letting the overflow water from Lake Manapouri run	http://new-zealand-travel-guide.com/fiordland.htm

Location	Activity	Text	Reference
		"uselessly" down the Waiau River to the sea near Invercargill, they carved out a tunnel from the lake to Milford Sound, several hundred feet below the lake's natural level, using the thus-trapped water pressure to drive the turbines. If the lake's level could, on the other hand, be raised, the pressure would be greater and the power output increased.To do so, however, would ruin the lakeshore. The drowned, dead trees would remain for decades as a monument to "progress". The locals rose up in revolt. "Damn The Dams" was the slogan. A pop song of the same name made the top of the charts. Under withering public pressure the government backed down. But for the protesters came the realisation that the pristine wilderness was badly depleted and if they wanted to stop the rot they had to fight for it. The eco-movement was born.	
Manapouri power station	Sight seeing	Your Doubtful Sound adventure begins as you cruise the crystal-clear waters of Lake Manapouri. After disembarking at West Arm, you travel underground by coach to see the Manapouri Power Station machine hall*. Then it's over Wilmot Pass, stopping along the way to experience some of Fiordland's most dense rainforest and to view Doubtful Sound glistening far below. *Access to the Manapouri Power Station may not always be possible.	http://www.zqn.co.nz/doubtful/daycruise/
Manapouri power station	Sight seeing	the ALL NEW Jasons Manapouri Destination Travel Guide is your complete visitor guide for Manapouri. This small township in the South Island enjoys a spectacular setting on the shores of Lake Manapouri. Wooded islands, a bush-covered shoreline and the backdrop of the Kepler Mountains make the lake particularly beautiful. Manapouri's economy is based on tourism and hydro-electric power generation, and the huge Manapouri Power Station makes an interesting excursion. ...	http://www.jasons.com/New-Zealand/Manapouri/
Manapouri power station	Sight seeing	Today is your final day with us on your magnificent cruise, so we take it easy and slowly make our way up the sound while investigating the arms. We end up back at Deep Cove at approx. 2.00pm to meet up with the coach for your return journey. At West Arm, your bus will take you to visit the unique Manapouri Power Station. The Manapouri Power Station is located deep underground in the south-western arm of Lake Manapouri. Unlike many power stations, Manapouri does not rely on a high dam to provide water - it takes advantage of the natural 178-metre height difference between Lake Manapouri and the sea at Deep Cove in Doubtful Sound, your tour here will entail the history and the great achievement of building in this remote area.	http://www.affinitycruises.co.nz/Default.asp?Page=42
Manapouri power station	Sight seeing Accomm	Deep Cove – Doubtful Sound.....Lakes, views of snow capped mountains, the bush, water falls, marine life, walking tracks, or one of the engineering wonders of modern man! Anything there that is of interest to you?With considerable foresight, at the completion of the underground Manapouri Power project in the late 60's a two storey accommodation building was left to the Department of Conservation and the Southland Education Board for the use of year 8 and 9 school children. Since that time thousands of school children have had a unique and often once in a life time opportunity, to visit this remote area in the heart of Fiordland, to study and experience both the bush and marine life that exists in the area during school camps.	http://www.seniornet.org.nz/WhatsNew-Sept07-VisitDeepCove.pdf
Manapouri power station	Sight seeing	The highlight of a 3-week tour of the South Island was my visit to Manapouri Power Station. The bus ride down the 2km descending un-lined underground tunnel was awesome and inside the power station itself it was amazing to note that the walls of the station also were unlined and consisted only of undisturbed original mountain rock. It was hard to believe this power complex was all located deep inside a mountain. I would have very much liked to have seen something of the turbines in operation and to have gone down from the viewing platform to walk on the floor of the "generator" room.	http://www.travellink.co.nz/tools/readcomments.asp?type=2&UID=64
Manapouri power station	Sight seeing	Your day adventure to Doubtful Sound begins as you cruise the crystal clear waters of Lake Manapouri. After disembarking at West Arm, you travel underground by coach to see the Manapouri Power Station machine hall. Then it's over Wilmot Pass, stopping along the way to experience some of Fiordland's densest rainforest and to view close up the colourful alpine moss gardens.	http://www.ginz.com/new_zealand/southland/tours/teanau/suppliers/Real_Journeys/285519/itineraryitem
Manapouri power station	Sight seeing	Travel across beautiful Lake Manapouri and over the Wilmot Pass to Deep Cove. Board our bottom boat Ocean Opal for a three hour cruise amidst the unspoilt scenery and wildlife of Doubtful Sound. Combine your excursion with a visit to the Manapouri Power Station , suitable for all age groups, with a maximum of 12 people on tour with daily departures	http://www.queenstown-vacation.com/queenstown/doubtfulsound/
Manapouri power station	Sight seeing	Once at West Arm a visit is made to the underground Manapouri Power Station some 200 meters down inside a mountain. Here the opportunities for learning are further enhanced with audio and visual displays which explain the building and operation of this man made wonder. Return is by way of a 2 ¼ mile road which turns a full 360 0 inside the mountain until West Arm is again reached. Here the road leads over 20 kilometers of road across the 640 meter high Wilmot Pass to take in the first view of Doubtful Sound and Deep Cove on the West Coast.	http://www.seniornetsouth.org.nz/Article%20for%20SenNet%20website.pdf

Location	Activity	Text	Reference
Manapouri power station	Sight seeing	Doubtful Sound cruise.....Your adventure begins with a 30km cruise across the crystal clear waters of beautiful Lake Manapouri with its many bush clad islands, sandy beaches, and many coves and bays, surrounded by bush clad mountains it really is a magical part of New Zealand. On your arrival at West Arm you spend some time at the Department of Conservation Visitor Centre viewing the information displays. Before boarding our coach for the 2km journey underground into the machine hall of the amazing Manapouri Power Station. Spend some time viewing displays and the power station before boarding our coach for the spectacular 22km, journey over the 670 metre high Wilmot Pass road to Deep Cove in Doubtful Sound	http://www.doubtfulsoundcruise.com/
Manapouri power station	Sight seeing	Lake Manapouri.....Manapouri Power Station. To visit the power station, visitors cross the lake to West Arm, where a bus whisks them down a steep, spiraling tunnel to the powerhouse, 213 meters/700 feet below ground. Hewn from solid rock, it houses seven turbines, each driving a powerful generator. Water from the lake enters vertical penstocks, plunges through the turbines, and then is channeled through a 10 km/6 mile long tailrace tunnel for release into the sea at Doubtful Sound, located on the other side of the mountains. The station furnishes power for the aluminum smelter at Bluff.	http://www.newzealandtravel-info.com/lake-manapouri.html
Manapouri power station	Sight seeing	Lake Manapouri, especially the West Arm and Manapouri Power Station - Take a bus trip over the Wilmot Pass to Deep Cove. The power station, one of New Zealand's largest, has been carved out of solid rock below the lake and two tailrace tunnels take the water that passes through the power station to Deep Cove, 10 km away. The only evidence that there is a power station nearby is the power lines that disappear into the ground!	http://www.queenstown.net.nz/index.php?title=Fiordland_National_Park
Manapouri power station	Sight seeing	Travel by motor home.....vast range of other activities available, and they are all simply mind-boggling – launch, float plane, helicopter and fishing trips, kayaking and sky diving, swimming and waterskiing in season, golfing and biking, nature walks and glow worm caves, horsetrekking and farm tours, 4WD motorbikes, diving in Milford Sound, and in summer, even tours of the underground Manapouri Power Station, which has a colourful and controversial history.	http://www.motorhomesandcaravans.co.nz/Reviews/ReviewsArticle/tabid/166/ArticleID/110/Default.aspx
Manapouri power station	Sight seeing	Travel by motor home..... Lachie (Lachlan) and I are going on a boys day out tour of Doubtful Sound". We go from Manapouri across Lake Manapouri to Manapouri power station by boat. "Then from the power station (at west arm) across the pass by bus on a dirt track to Deep Cove. The scenery is fantastic. Deep Cove is an arm of Milford Sound. Then by boat to tour Doubtful Sound".	http://www.goseenewzealand.co.nz/article/270/Motorhome_adventures_with_children_New_Zealand_South_Is_tour/
Manapouri power station	Sight seeing	Lake Manapouri is renowned for its beauty and the small peaceful town of Manapouri sits on the lakeshore, with a population of around 300-400. These numbers increase dramatically during the summer due to the number of holiday homes in the area. Facilities in the town include a pub, dairy, service station and even a covered swimming pool. The town serves as a great base for tramping and fishing. The larger town of Te Anau, with all its amenities, is 20km away.....Visitors to Doubtful Sound or the Manapouri power station on the West Arm of the lake, depart from the Real Journeys Visitor Centre, which has its own café, at Pearl Harbour, Manapouri.	http://www.realjourneys.co.nz/Corporate/Ourlocations/
Manapouri power station	Sight seeing	Mosaic Travel is a New Zealand based travel company specialising in tailor-made itineraries for discerning travellers.....The Manapouri power station in the largest hydro power station in New Zealand and is located 220m underground within Fiordland National Park . The powerhouse cavern is cut from solid rock and is 111m long, 18m wide and 39m high. (a visit to the Manapouri power station is included on certain trips to Doubtful Sound).	http://www.mosaictravel.co.nz/newsletter/OCT06.htm
Manapouri power station	Sight seeing	Top 10 Travel Destinations in NZ – at No. 2 - This tranquil haven is usually accessed via Lake Manapouri. The journey involves a boat trip from Manapouri up the lake and then transferring to a bus to travel over the Wilmot Pass to Doubtful Sound....On the way, the bus will detour to the engineering marvel that is the Manapouri Power Station. It will descend many metres to the heart of the hydro electric power station.	http://www.babyboomersguide.co.nz/Articles/Travel/New+Zealand+Travel/Top+10+NZ+Travel+Destinations.html
Manapouri power station	Sight seeing	At West Arm, your bus will take you to visit the unique Manapouri Power Station. The Manapouri Power Station is located deep underground in the south-western arm of Lake Manapouri. Unlike many power stations, Manapouri does not rely on a high dam to provide water - it takes advantage of the natural 178-metre height difference between Lake Manapouri and the sea at Deep Cove in Doubtful Sound, your tour here will entail the history and the great achievement of building in this remote area.	http://www.icruise.co.nz/ideal.pl?cruise=AFF0907
Manapouri	Sight seeing	There is no public road access into Doubtful Sound. Access is restricted to protect this very special area of Fiordland. The blue line	http://www.beechwoodlodge.com/doubtful_sound.htm

Location	Activity	Text	Reference
power station		in the map above connecting Deep Cove with West Arm, is the underground tail-race tunnel from the Manapouri Power Station	
Manapouri power station	Sight seeing	Fiordland is well known for its rainy climate so there's no use denying it! More than anything else we recommend coming to the region prepared for rain with appropriate clothing and attitude to enable you to enjoy the sights, sounds and smells that a rainy day in Fiordland offers.....visit the Manapouri Power Station and view the turbines within the massive underground cavern	http://destinationfiordland.org/Explore-Fiordland/Things-to-do/Rainy-Day-Activities.asp
Manapouri power station	Sight seeing	A trip to the Manapouri power station was a good way of orientating to the lake. The power station is the largest hydro scheme in the country and one of the least visible having no dam. There is a 2km spiral tunnel that winds down to the generator room carved out of the mountain 170 metres below the lake surface. The tailrace exits in Dusky Cove about 10 km away. Quite an interesting engineering feat.	http://beveridge-nz.com/copp/thumbnails-3.html
Manapouri power station	Sight seeing	Once at West Arm a visit is made to the underground Manapouri Power Station..... see above reference	http://www.seniornetsouth.org.nz/Article%20for%20SenNet%20website.pdf
Manapouri power station	Sight seeing	Doubtful Sound is a most remarkable part of New Zealand's Fiordland region. It is remote, wild and imposing. We began our day by driving to Manapouri from Te Anau (about 20 minutes away) where we started our journey; first taking a smaller power boat across beautiful Lake Manapouri and disembarking at the power station on the other side of the lake. The Manapouri Power Station brings electricity generated by hydro power to the region. We were happy to note that there are strict controls on lake levels which were imposed by local efforts in the 1960's to preserve the lake's eco system. From the power station we traveled by bus (about 45 minutes on a dirt road) through the dense rainforest over Wilmot Pass to Deep Cove, where we would board the Ship.	http://www.franciebomer.com/?p=108
Manapouri power station	Sight seeing	Doubtful Sound Cruises..... Your adventure begins with a 30km cruise across the crystal clear waters of beautiful Lake Manapouri with its many bush clad islands, sandy beaches, and many coves and bays, surrounded by bush clad mountains it really is a magical part of New Zealand....On your arrival at West Arm you spend some time at the Department of Conservation Visitor Centre viewing the information displays. Before boarding our coach for the 2km journey underground into the machine hall of the amazing Manapouri Power Station. Spend some time viewing displays and the power station before boarding our coach for the spectacular 22km, journey over the 670 metre high Wilmot Pass road to Deep Cove in Doubtful Sound.	http://www.doubtfulsoundcruise.com/
Manapouri power station	Sight seeing	Continuing from the last post, here are a couple of places to definitely visit...Most Interesting Trip to a Power Plant Ever Manapouri power station tour & cruise, Manapouri, S. Island.....Manapouri Power Station is a hydro-electric power plant deep inside a mountain. Yes, a mountain. And you have to cruise across the gorgeous Lake Manapouri to get to it. It pretty much consists of large hall you can see in the photo with all the turbines harnessing the power of the lake and utilising tailrace tunnels to pump the water out into Doubtful Sound. Great scenery, education and chilling out on a lake cruise all rolled into one. Definitely recommended.	http://www.ournz.com/?m=200703
Manapouri power station	Sight seeing	There's no way to get to Doubtful Sound on your own. Real Journeys transports visitors from Manapouri, then takes a launch trip to the West Arm, followed by a 20km (12-mile) coach trip to Deep Cove in Doubtful Sound. The coach takes you up and over Wilmot Pass, 662m (2,171 ft.) above sea level, stopping on the way to visit Manapouri Power Station, where you spiral 225 eerie meters (750 ft.) downward to view the seven immense underground turbines.	http://www.frommers.com/destinations/teanau/2738010029.html
Manapouri power station	Sight seeing	We then got our exercise with a walk from Fraser Beach (opposite the cabins) round the Glade to Pearl Harbour where the trip boats depart for Manapouri Power Station and on to Doubtful Sound, another excellent trip we have done in the past.	http://www.uniquelynz.com/nz04-p6.htm
Manapouri power station	Sight seeing	From Pearl Harbour you will board the PATEA, a fast vessel which will take you across New Zealand's most beautiful lake, Lake Manapouri. Once at West Arm drive by coach over the Wilmot Pass, here we may stop to capture views of Doubtful Sound stretching to the West. Continue down into Deep Cove and visit the tail race outlet of the Manapouri power station.	http://www.doubtfulsound.com/fiordlandcruises/WhereWeGoFC
Manapouri power station	Sight seeing	As part of a group or ten or so, I boarded a large cruiser and headed off at about 18 knots to the west arm of Lake Manapouri....Here we saw a large switchyard perhaps the size of a football field. There were 220,000 volt cables suspended high above the lake and leading off to the south.We walked through the rain to a big Volvo bus. The bus drove off to a tunnel carved	http://www.travel-library.com/pacific/new_zealand/trip.clarke.www/nzjournal+4.html

Location	Activity	Text	Reference
		in the granite hillside. We descended the tunnel, which looked a lot like the Homer tunnel. It wound in a huge loop about two kilometers long. We reached a side tunnel, where we got out and walked about 100 meters past the parts store room. We then entered the 'machine hall,' a room big enough to hold twenty large buses. Here we could see the tops of seven huge (geez, there's that adjective again) turbine shafts for the generators. The station outputs 590 megawatts, and supplies 18% of NZ's electricity. ...We got back in the bus and rode up to the surface.	
Manapouri power station	Sight seeing	Its gray in Manapouri as the Fiordland Flyer makes its way across the lake to the West Arm Power Station. The power station is a monumental engineering achievement. It uses the lakes 178m (540ft) elevation to generate the massive amounts of electricity required to run the Bluff Aluminium smelter. The high temperatures required to extract aluminium from the ore require large amounts of energy. The cost of the energy required to separate the ore is so large that aluminium is one of the few non-organic waste products that is actually cheaper to recycle. Nevertheless nearly all of the power generated by the Manapouri Power Station is used to smelt Australian alumina ore.	http://soylentfuschia.blogspot.com/2006/08/doubtful-sound.html
Manapouri power station	Sight seeing	We sped along Lake Manapouri as the sun rose above the mountain peaks around us. This is one of the wettest places in the world but it looked like today would be sunny and cloudless - a rarity indeed. Forty-five minutes later we docked at the impressive Lake Manapouri Power Station - although we couldn't see it because it's buried in the mountain - and then drove along Wilmot's Pass to Deep Cove at the end of the sound	http://www.helium.com/items/624892-still-picked-hostel-other
Manapouri power station	Sight seeing	On the way we saw the (top of the) Manapouri Power Station which is the largest hydroelectric generating station in New Zealand. The stretch of road between the power station and Deep Cove (where the water exits the station) was built specifically for the construction of the power station and is not actually connected to any other roads in New Zealand.	http://ghewgill.livejournal.com/
Manapouri power station	Sight seeing	Take a day trip from Manapouri (a short drive from Te Anau) through the Doubtful Sound. It is a wonderful trip. Getting to Doubtful Sound is an "adventure" in itself. You take a boat from Manapouri across the lake to catch a coach. This takes you along the Wilmot Pass Road. This road is 22 kilometres long and was completed in 1965. It joins the Manapouri Power Station to Deep Cove.	http://www.virtualtourist.com/travel/Australia_and_Oceania/New_Zealand/South_Island/Southland/Te_Anau-1881583/Things_To_Do-Te_Anau-BR-1.html
Manapouri power station	Sight seeing	After breakfast, rode cruise boat to explore Doubtful Sound (fjord). Visited underground hydro electric power station. The Manapouri Power Station is New Zealand's largest hydro electric power station	http://www.lorece.com/travels/australia/
Manapouri power station	Sight seeing	The road to Deep Cove was built as part of the construction of the underground Manapouri Power Station. Only public transport is allowed, and as a result the sound is quieter and more peaceful than Milford Sound.	http://www.natureandco.com/travel_and_adventure/sightsee/coastal/fiordland.php3
Manapouri power station	Sight seeing	During the expedition you will be looked after by our dive guide, cook, skipper and 1 other boat crew. All meals, diving, transport into and out of Doubtful Sound, included, plus a tour through the Manapouri Power Station, where you will go 300 metres (1000ft) underground to witness this engineering marvel, an experience in its self.	http://www.godive.co.nz/fiordland.html
Manapouri power station	Sight seeing	The prices vary with the season. To give some examples, we paid (per person) for the Waitomo Caves 25 NZ\$, for the Hell's Gate Thermal Resort (Rotorua) 20 NZ\$, for a visit to the Manapouri Power Station (including a cruise on Lake Manapouri) 55 NZ\$. A scenic cruise on the Milford Sound costs at least 46 NZ\$.	http://trips.knorn.org/nz/index.php?nav=finance&language=en
Manapouri power station	Sight seeing	Your journey to Doubtful Sound begins as you cruise the crystal clear water of beautiful island - Studed Lake Manapouri. After disembarking at the West Arm of the lake, you travel by coach down a 2 km. spiral tunnel to the Manapouri Power Station machine hall, an extraordinary engineering feat located deep beneath the mountain.	http://www.regaltourism.com/australiannewzealandprogrammes.htm
Manapouri power station	Sight seeing	The Manapouri Underground Power Station, at West Arm, is considered New Zealand's greatest engineering feat. It is the country's largest hydroelectric power station and is unique in that nearly all of it is built underground. The only external signs are the above-ground control building, a switchyard and two sets of transmission lines that loop across the head of the arm on their way to join the national grid.A visit to the Manapouri Underground Power Station begins with a coach trip down the 2 kilometre (1.2 miles) underground spiral tunnel to the immense machine hall. Here you will learn how the Manapouri Power Station, located	http://realjourneys2.thrive.net.nz/Main/Powerstation/

Location	Activity	Text	Reference
		deep in the heart of the mountain, harnesses the energy of rushing water to generate electricity. 2	
Manapouri power station	Sight seeing	Except for electricity generation (at the Manapouri Power Station) and some agriculture, tourism is the only other major economic factor of the region. Most tourists head to the Milford Sound, though tramping in the more accessible eastern parts of the alps is also popular. Nonetheless, the remoteness of the region limits even tourism, and after relatively short visits to the major sites, most tourists tend to return to other areas, such as Queenstown.	http://www.queenstown.net.nz/index.php?title=Fiordland
Manapouri power station	Sight seeing	The Manapouri Underground Power Station, at West Arm, is New Zealand's largest electric power station and is unique in that nearly all of it is built underground. Your visit to the Manapouri Underground Power Station includes travel by coach 2km down the spiral tunnel, hewn from solid granite, to the immense machine hall. Here you will learn how the Manapouri Power Station, located deep in the heart of the mountain, harnesses the energy of rushing water to generate electricity.	http://www.newzealandtours.net.nz/queenstown/manapouripowertour.html
Mararoa	4WD	Looking up the Mararoa Valley, Head of Mavora..... From there, it was planned to back-track a little way to a Y junction, from where we would follow another track (known to be rough) to Fork Hut. At the junction, Brent decided to try his hand at fishing in the Mararoa River while Sandra, and Diane Auld took a break and a rest in the sun. I was grateful to join John as his passenger. After two easy fords of the Mararoa River the track of clay and rock got progressively rougher.	http://www.4wdnz.net/index.php?set_albumName=sisafari06&option=com_gallery&Itemid=&include=view_album.php
Mararoa	Accomm	Located on the Mararoa River with the Oreti River and Mavora Lakes nearby, ensure great fishing opportunities, great scenery and a great base from which to explore Fiordland. Day trips to Milford Sound, Doubtful Sound, Te Anau Glowworm Caves and tramping on the many walking tracks are well within easy reach.	http://www.fiordland.org.nz/Mini-Sites/Davaar.asp
Mararoa	Accomm	Davaar Holiday home..... Located on the Mararoa River with the Oreti River and Mavora Lakes nearby ensures great fishing opportunities, great scenery and a great base from which to explore Milford Sound, Doubtful Sound and the many other Fiordland attractions.	http://www.newzealand.com/travel/accommodation/accommodation-options/operator-details.cfm/businessactivityid/168084/regionid/7/startrow/1/endrow/0/qualmarkcategory/8/activitycategoryid/2/seed/0.html
Mararoa	Accomm	Christies Cottage Bed and Breakfast Homestay Accommodation Te Anau Fiordland New Zealand. Self contained cottage accommodation, self-catering, 15 minutes from Te Anau, 5 minutes from Manapouri, superb fly fishing with access to Mararoa River a 5 minute walk away	http://www.bbnz.com/listingview.php?listingID=42
Mararoa	Fishing	Fish and Game open season details..... Mararoa River upstream of The Key Bridge including upper Mararoa and tributaries 1 Oct – 30 Apr FS 2 Mararoa River downstream of The Key Bridge 1 Oct – 30 Apr FSB 4	http://www.fishandgame.org.nz/Site/Regions/Southland/fishingRegulations.aspx
Mararoa	Fishing	Mararoa River upstream of The Key Bridge including upper Mararoa and and tributaries Trout: 1 Oct-30 Apr Salmon: Closed No limit Total: 2 Salmon: 0 Artificial fly, spinner Mararoa River downstream of The Key Bridge Trout: 1 Oct-30 Apr Salmon: Closed No limit Total: 4 Salmon: 0 Artificial fly, spinner, bait Those portions of the Mararoa River that are within 100m of the control gates on the Manapouri Lake Control structure, also known as the Mararoa Weir. Closed	http://www.nzfishing.com/Regulations/RegulationsSouthland.htm
Mararoa	Fishing	Waiau Trust's objectives are public access for recreational and educational activity.....Princhester Creek SH 94, 28 km east of Te Anau Princhester Creek & Mararoa River 0.5km gravel road, then grassed walkway to river Anglers, general recreation	http://www.waiautrust.org.nz/access_projects.htm?shwsubh=0
Mararoa	Fishing	Southland Regional Council River Flow Charts - Mataura, Waikaia, Waimea, Waikaka, Mokoreta, Oreti, Aparima, Waiau and Mararoa river flows	http://www.wildangler.com/river-flows.htm
Mararoa	Fishing	Nokomai is well positioned as a base for fly-fishing anglers with at least 27 different rivers and streams within an hours drive. These include: Oreti River Mararoa River Whitestone River Aparima River Waikaia River Nevis River	http://www.nokomai.co.nz/home.php
Mararoa	Fishing	Other strips to consider for fishing are Mt Nicholas Station (S 45 05 32 / E 168 25 13) and walk down to fish the outlet of the Von River at Lake Wakatipu or the one beside the road up in the Von Valley itself about three miles up from the lake or the one above	http://www.180185club.co.n

Location	Activity	Text	Reference
		the top of North Mavora Lake beside the Mararoa River.	z/Makarora07/Mak08.asp
Mararoa	Fishing	The Mararoa River (01 Oct to 30 Apr) should prove worthwhile and is crossed by State Highway 94, down stream is Rainbow country whilst venturing into the upper reaches you are more likely to strike Browns.	http://www.designztravel.co.nz/activities/flyfishing/flyfishingpage.htm
Mararoa	Fishing	Photo of Fly Fishing Fishing on Mararoa River	http://www.travellink.co.nz/media/page.asp?UID=37
Mararoa	Fishing - general	Environment Southland has given the green light to a trial in Southland next year of a compound that could control didymo...Environment Southland consents manager John Engel confirmed that consents had been granted for two sites in the Waiau catchment – a tributary of the Mararoa River and a tributary of the Waiau River, the main river immediately east of Fiordland National Park. Both were infected with didymo.....Biosecurity New Zealand has now lifted the controlled-area status from the Waiau and Mararoa Rivers, arguing that personal responsibility by river users is the key to halting the spread.	http://www.nzfishing.com/IntheNews2006.htm
Mararoa	Fishing - general	The settled weather also allowed, Robert, the station owner and I to get in a bit of fishing and both the Oreti and Mararoa Rivers proved successful and the long summer evenings provided an ideal opportunity to watch the wild deer with their new fawns.	http://www.mtrnicholaslodge.co.nz/News---Links/default.asp
Mararoa	Fishing - trout	The Mararoa, Whitestone and Upukerora Rivers offer good fishing for brown and rainbow trout. The Upukerora is fly fishing only. A current fishing licence is required and anglers must adhere to its regulations. Ask owners before crossing private land and avoid disturbing stock.	http://www.doc.govt.nz/upload/documents/parks-and-recreation/tracks-and-walks/southland/snowdonforest.pdf
Mararoa	Fishing - trout	Quick question, I'd like to go on a nice hike (tramp) for 3 to 5 days somewhere in the South Island. My wife and two boys (5 and 6) will go with me, so it can't be too terribly demanding. Though my boys are quite capable hikers for their age (they've been doing it since they could walk). Can you recommend a beautiful, not-too-demanding trip that would include some great "backcountry" fishing opportunities? I've looked at a tramp called the "Mavora Walkway" which begins at the south end of North Mavora lake and hugs the east shore for the length of the lake then follows (roughly) the Mararoa River up to the Greenstone River. I am not married to this one at all, just looked interesting.	http://www.flyshop.co.nz/cgi-bin/forum/ikonboard.cgi?act=ST;f=10;t=777;&#top
Mararoa	Fishing - trout	Of all the rivers in Southland the Mararoa offers the greatest diversity of fishing opportunities. Its headwaters flow over a tussock plain. The water is as clear as glass. The trout population is fairly sparse, but it improves as the river approaches the North Lake. This lake is a good fishery in itself, both for anglers trolling in the middle, and those stalking the shore..... The best part of the Mararoa begins at the outlet of the South Lake. The water leaves the lake confidently enough but then becomes uncertain of its journey as it dallies in a huge pool overhung with ancient beeches frilled with lichens. It then plunges headlong on a sleigh ride to the Waiau. At first, over waterfalls, then through rapids that occasionally slow into deeper runs where the worlds brightest rainbows live. It travels down beside developed pasture and slows a little where big brown trout lurk. When Manapouri's Cathedral Peaks come into view it is wide and braided in places. Its banks of tussock and matagouri replaced by gorse and willow. Unlike the open vistas upstream the lower reaches are hemmed in and passage along its banks is a trial of scratchiness and perilous river crossings. Some say this is where the best fishing is, but most like it farther upstream.	http://www.frontierfishing.co.nz/html/maurice-04-jan-02.htm
Mararoa	Kayaking	Mararoa River Off Limits Author: Rich (---.dialup.xtra.co.nz) Date: 7:56pm, 9 Jan 05 And Lower Waiau. See 'Access' forum for details	http://rivers.org.nz/forums/read.php?f=5&i=174&t=174
Mararoa	Kayaking Fishing – trout Tramping/ Walking	The Mararoa River between the lakes and below the South Mavora Lake provides good canoeing. Brown and rainbow trout are found in the Mararoa River and both of the lakes. Anglers must have a current fishing licence for the season. The season is open from October 1 - April 30 for the Mararoa River and year round for the lakes. Greenstone-Mavora walkwayFrom the hut cross the swingbridge and follow marker posts on the true right of the Mararoa River. The track sidles up along the toe of the hill and the true right of the valley and continues onto Taipo Hut..... area. It follows the Mararoa River downstream and around the shores of the South Mavora Lake to the swingbridge at its outlet..... The next segment of the track to the Kiwi Burn Hut (12 bunks) takes about 1 1/2 hours, following the Mararoa River downstream then branching to the hut.	http://www.conservation.co.nz/upload/documents/parks-and-recreation/tracks-and-walks/southland/mavora-lakes-park.pdf

Location	Activity	Text	Reference
Mararoa	Kayaking	New Zealand Whitewater (2002), Table of Contents Table of contents for New Zealand Whitewater: 125 great kayaking runs, Revised Edition (2002) by Graham Charles. Mararoa River 275	http://rivers.org.nz/article/NZWWTOC2002
Mararoa	Sight seeing	Lord of the Rings movie locations..... The bridge spans the outlet of South Mavora Lake where the lake water flows into the Mararoa River. This watery junction is portrayed as the Silverlode and as the Fellowship left Lothlorien.	http://www.beechwoodlodge.com/lotr.htm
Mararoa	Sight seeing	Lord of the Rings movie locations..... The junction of the Silverlode and Anduin Rivers was also filmed at Mavora, near the swingbridge where the Mararoa River leaves the South Mavora.	http://www.jasons.com/New-Zealand/Te-Anau/the-lord-of-the-rings-location-te-anau
Mararoa	Sight seeing	From Mossburn the road crosses a plain, passes over the Mararoa River and then climbs into the rainshadow area of the eastern foothills of the alps to the once rabbit-infested plain called the Wilderness.	http://www.ecotours.co.nz/Brian/wildlife/fiordland/index.htm
Mararoa	Tramping/ Walking	Trail story.....There was tension between hunters and trampers, between jet-boaters who'd come all the way up the Mararoa River and penned their adventure into the hut book and those who overprinted the feat - Well so what that you jetboated 200 metres past the hut?..... We crossed the Mararoa River on a swing bridge, saw an eel, came on down the valley, splashed across steep streams, and tramped cattle country..... We'd walked 25 kilometres already that day, and were tired. I planned to walk the marginal strip on the Mararoa River down to Princhester Creek ready for the next leg through the Takitimu Mountains, but come to that - if we managed to get a ride, both of us would do it, and I'd come back and pick up my mark	http://www.teararua.org.nz/tail_stories.php?story_id=65
Mararoa	Tramping/ Walking	The Kiwi Burn flows into the Mararoa River below the smaller South Mavora Lake and provides an easy valley to visit for trampers. If you access the valley from the swingbridge over the Mararoa River you only have about a three km walk to Kiwi Burn Hut.	http://www.otmc.co.nz/files/bulletin_pdf_files/2007/may2007.pdf
Mararoa	Tramping/ Walking	Kiwi Burn Tramp.... This has to be one of the best trips for introducing people to the great outdoors. There is a choice of two tracks to get you to the hut. One runs parallel to the Mararoa river and then veers off to the right and travels a short distance up the Kiwi burn to the hut. This takes about 1 ½ hr on flat to undulating ground through beautiful beech forest and a tussock covered valley floor	http://southernoutdoors.co.nz/index.php?pr=Kiwi_Burn
Mararoa	Tramping/ Walking	Mavora Lakes route description..... Careys Hut - Boundary Hut: 2hr 6km: From Carey's Hut the walkway climbs above the hut, then branches in two. The left branch is a very rough 4WD track, crossing the confluence of the Mararoa River and the Windon Burn.	http://tramper.co.nz/?1982
Mararoa	Tramping/ Walking	The Greenstone track and hut were among the most impressively developed I'd seen, while helicopters and small planes to and from Milford repeatedly droned overhead. The Mararoa river valley and Mavora Lakes were peaceful, isolated, and calming. "Could you follow the markers?" asked a DOC worker I passed after tramping the newly re-marked and re-routed Mavora Walkway. "The track will be worn in after the first few hundred trampers" he assured me, but my ankles complained of being the first to traverse the tussock hillsides without benefit of a worn-in track	http://www.martinot-nz.info/nztrek/summary.htm
Mararoa	Tramping/ Walking	The Kiwi Burn flows into the Mararoa River below the smaller South Mavora Lake and provides an easy valley to visit for trampers. If you access the valley from the swing bridge over the Mararoa River you only have about a three km walk to Kiwi Burn Hut.	http://otmc.co.nz/files/bulletin_pdf_files/2007/april2007.PDF
Mararoa	Tramping/ Walking	Alternate routes: (1) Metalled roads from Dart River road-end at Chinaman's Bluff to Routeburn Track, to north end of Greenstone Track, Greenstone Track to Greenstone Hut.footbridge across water between North and South Mavora Lakes by picnicground. (2) From Mavora Walkway road-end, track along west side of South Mavora Lake and west bank of Mararoa River to footbridge crossing to Mavora Lakes Road.	http://www.martinot-nz.info/nztrek/m_data.htm
Mararoa River	Fishing - trout	The Mararoa is a medium-sized, fast flowing river with deceptive water depth and velocity. It rises in an area between the Livingstone and Thomson Mountains and flows through flat tussock country to enter North Mavora Lake. Emerging from this lake it flows 3 to 4 km through bsh and tussock lands to enter the smaller South Lake Mavora. Leaving this lake on its journey to the Waiau River, it flows through some 3 km of beautiful native bush to again emerge into open country, through which it flows 32 km. The Mararoa River contains rainbow and brown trout of good quality and fighting spirit, ranging up to 4 kg. These good conditioned fish, with the swift flowing water to assist them, will give the fly angler thrill upon thrill, as the line sings off the reel, and the minnow	http://www.frontierfishing.co.nz/mararoa_river.html

Location	Activity	Text	Reference
		and threadline anglers do not have things all their own way. Under low conditions the water is very clear and anglers, especially with the aid of polarized glasses, are often able to spot fish lying in wait for passing insects.	
Te Waewae Bay	Tramping	New Zealand's new frontier in tramping experiences. Coastal, Bush and sub alpine scenery wrapped in one, with history and wildlife to top it all off. From Te Waewae Bay, the track climbs high on the Hump Ridge amidst a moonscape of tors and tarns, descending back to the Southern Ocean through pristine forest in the Fiordland National Park, along ancient tram lines and across the mighty Percy Burn viaduct. Stay in modern backcountry huts with gas heating, full kitchen equipment and more. Guided walk, freedom plus and freedom walk options available	http://www.queenstown-nz.co.nz/german/productde/?product=tuatapere-hump-ridge-track
Te Waewae Bay	Tramping	1600 kilometres, 84 days, 850 hours, 6 national parks and 21 alpine passes later.....Three women walked from Te Waewae Bay on the South Coast (kayaking three lakes in Fiordland) to Farewell Spit. Through rain, snow, hail, sleet and glorious sunshine, we've walked the length of the South Island to raise awareness for Youthline.	http://www.manawahinewalk.com/index.pl?pics&64
Te Waewae Bay	Accomm	Warm southern country hospitality, great traditional cooking fare, comfortable and cosy accommodation, isolation and location – that's the magic of the Waiiau Hotel.....Visitors enjoy the majesty of Te Waewae Bay – nothing lies between it and Antarctica. Dolphins and whales frequently swim at Bluecliffs Beach.	http://www.waiiauhotel.co.nz/tuatapere.htm
Te Waewae Bay	Accomm	The following Hotel, Bed and Breakfast and Guest House accommodation is suitable for visiting Te Waewae Bay	http://www.bedandbreakfasts.net.nz/propertysearch.asp?location=Te+Waewae+Bay
Te Waewae Bay	Fishing - trout	The Waiiau River is the largest of the Southland rivers, well stocked with both rainbow and brown trout offering a range of options for all forms of trout fishing..... The Waiiau drains Lake Te Anau into Lake Manapouri, from where electricity is hydro generated. This clear, deep river then flows down to the sea, through Tuatapere, at Te Waewae Bay.	http://www.nzfishing.com/FishingWaters/Southland/STHFishingWaters/STHWaiiau.htm
Te Waewae Bay	Jet boating Wildlife	Approaching the mouth of the river at Te Waewae bay, we came across dozens of caravans and cribs. These were, to some, permanent homes right there on the banks of the river! The residents of these makeshift houses were down on the riverbanks enjoying beer and casting their nets into the fast moving river in hope of snaring some fresh whitebait for dinner, and for the local takeaway! Murray obviously knew some of them, because we did a couple of 360-degree turns and soaked them where they stood! There was a long stony bar between us, and the roaring surf of Te Waewae bay, as we whizzed along the river the smell of salt filled our nostrils, so I asked Murray to stop. He did just that, and we all got out on the bar and walked over to the other side to get an eye full of the monstrous swell of Te Waewae bay. The ocean was big; it is a very dangerous area, not only for large waves, but also the marine life. Apparently there are numerous sharks in these waters. On a good day you might just see one basking in the sun. There are also known sightings of Hector's Dolphins and Southern Right Wales.	http://www.nzreview.co.nz/index.php?option=com_content&task=view&id=170&Itemid=42
Te Waewae Bay	Kayaking	It was the first time I had looked at the surf in Te Waewae Bay, well really looked at the size and power of it.... On the way home we took a detour to look at the coastline of Te Waewae Bay and the vicious bar at the Waiiau river mouth.	http://www.kayakotago.org/stories/tewaewae.html
Te Waewae Bay	Kayaking	With a shore-based support crew following, including the ship dog Ben, Paul completed the first 1,550 mile kayak South Island circumnavigation back at Te Waewae Bay in late April 1978	http://boatbooks.co.nz/cano e3.html
Te Waewae Bay	Kayaking	Kayaking along Te Waewae Bay. – Tom had kayaked on his own across lake Hauroko and down the Wairaurahiri River. We met in Southland and helped paddle his kayak across Te Waewae Bay. What an adventure to have done on his own.	http://www.tom-barnfield.co.nz/tom-barnfield/leave-a-message/
Te Waewae Bay	Kayaking	Preservation Sound Kayaking Expedition 2005I preferred to stand on the rear deck and focus on the dark horizon to settle my stomach. When we were crossing Te Waewae Bay false dawn appeared and then we could see mollymauks gliding in our wake. It seemed ages before we were closer to land cruising several miles south of the south coast. Eventually Green Isles appeared and then excitement as the Puysegur Lighthouse came into view.	http://sskn.uniformnz.com/news.php?type=news&id=16
Te Waewae Bay	Kayaking	Around the South Island in 70 days.....NEW RECORD: German Freya Hoffmeister celebrates at the end of her voyage, successfully becoming the first woman to paddle around the South Island.German kayaker Freya Hoffmeister has become the first woman to paddle around the South Island. The most dangerous was battling 3m swells, with the crests breaking off Te Waewae Bay off Fiordland	http://www.rugbyheaven.co.nz/4343171a11.html

Location	Activity	Text	Reference
Te Waewae Bay	Kayaking	Kakaing at Lake Haurok.....At the southern end of the lake the Wairaurahre river leaves for the south coast about thirty kilometres away. The river is canoeable but the sea conditions to the road end in Te Waewae Bay are less predictable. It is possible to walk along the beach or the remains of the forestry tramway.	http://www.kayakotago.org/stories/lesrick.html
Te Waewae Bay	Mountain biking	Mountain Biking Te Waewae Bay, By Alistair Child - 20 October 06 . The south coast, it has a bit of a ring to it, telling something of its geographical location I guess.....On through town and south to the mouth of the something river (couldn't find the name in Google map) and the eastern entrance of Te Waewae Bay.	http://fiordlandlocalnz.com/articles/mid/86/blog/1/mountain-biking-te-waewae-bay.aspx
Te Waewae Bay	Mountain biking	Deep South: Te Waewae Bay Home MTB Rides Deep South Comment on this Ride This is a 1-2 hour scenic coastal ride 60 km west of Invercargill. You can only get along the coast 2 hours either side of low tide. At the end of the coast you can run a few more kilometres to Port Craig.	http://www.downhill.co.nz/rides/mtb/deepsouth/60.html
Te Waewae Bay	Mountain biking	Deep South Te waewae bay.....This is a 1-2 hour scenic coastal ride 60 km west of Invercargill. You can only get along the coast 2 hours either side of low tide. At the end of the coast you can run a few more kilometres to Port Craig.	http://www.downhill.co.nz/rides/mtb/deepsouth/60.html
Te Waewae Bay	Scenic (views over)	Scenic flight....Sounds Spectacular Fiordland.....When over Doubtful Sound we will try and find Browne Falls, a flood-fed waterfall which when 'operating' is 619 metres (2,031 feet) high, challenging the title of its illustrious neighbour, Sutherland Falls. We reach Puysegur Point Lighthouse at the south-west corner of New Zealand, before heading east over Lake Hauroko (New Zealand's deepest lake at 443 metres / 1,453 feet), Te Waewae Bay with views over Foveaux Strait to Rakiura Stewart Island, and the city of Invercargill.	http://www.mainlandair.com/sounds.php
Te Waewae Bay	Sight seeing	Solander Islands.....Five rocky outcrops from the islands 70 kms south west of Te Waewae Bay. They can be seen on a clear day from McCracken's Rest lookout along the Southern Scenic Route. In 1809 five sealers were placed on the main rock to kill seals. Their ship sailed away leaving the men marooned for four years until the ship 'Perseverance' noticed their signals and picked them up.	http://www.gyrosgarage.com/Nearby%20Attraction.php
Te Waewae Bay	Sight seeing	Dunedin to Te Waewae Bay. Go through the Southern Scenic Route:Now the route curves south beneath the Longwood range, hugging the coast for most of the way, before you reach the beautiful Te Waewae Bay	http://www.aa.co.nz/travel/travelling-in-new-zealand/road-trips/Pages/Otago-southland-road-trip.aspx
Te Waewae Bay	Sight seeing	Another good detour is to pop down to Te Waewae Bay. Turn off at Tuatapere, the road passes through farmland nestled between the stoney bed of the Waiiau River and the lush Rowallan Forest. Huge southern ocean swells come pounding in, unopposed all the way from Antarctica, smashing their watery bulk against the clawed battered coastline.	http://www.acerentalcars.co.nz/Touring_South_South_Island_Te_Anau_Invercargill.htm
Te Waewae Bay	Sight seeing	Take a day to drive along the Southland coast from Riverton to Te Waewae, and get a history lessonThe highway pushes inland at Te Waewae Bay where Waiiau River meets the sea. Before heading that way I drive down the potholed Camp Road for one last look at this magnificent coast.	http://unlimited.co.nz/unlimited.nsf/default/880B026588497E9CCC257354000E8456
Te Waewae Bay	Sight seeing	Dunedin to Te Waewae BayThis is the great circle road of the south otherwise known as the Southern Scenic Route..... Now the route curves south beneath the Longwood range, hugging the coast for most of the way, before you reach the beautiful Te Waewae Bay.	http://www.coastshop.co.nz/dunedin/activities/Dunedin_road_trips.htm
Te Waewae Bay	Sight seeing	With its rich history and beautiful landscape, the area is a perfect place for a heritage trail. The trail meanders over 80 kilometres of spectacular coastal and rural scenery between Waimatuku, on the Southern Scenic Route on State Highway 99, to Orepuki on the eastern shore of Te Waewae Bay. The trail includes historic buildings, pa sites, monuments, scenic lookouts and idyllic beaches.	http://www.historic.org.nz/magazine/features/2003summer/2003_summer_riverton.htm
Te Waewae Bay	Sight seeing	Monkey Island is a fun stopping point for picnicing, camping, or sightseeing along the Southern Scenic Route near Orepuki. It is known by Ngai Tahu as Te Puka o Takitimu, or the anchor stone of the legendary Takitimu waka/canoe that was wrecked in Te Waewae Bay.	http://nztri.aut.ac.nz/southland/pages/viewentity.php?entity=198

Location	Activity	Text	Reference
Te Waewae Bay	Sight seeing	The views from Te Waewae Bay took my breath away	http://aatravel.co.nz/101-must-dos-for-kiwis/user-comment.php?mustDold=94&offset=30&search_id=
Te Waewae Bay	Sight seeing	Tuatapere.....The town populates about 650 people and forestry and farming are the main industries as well as tourism. The Waiau River flows through the town and on to Te Waewae Bay where it enters the mighty Foveaux Strait.	http://www.visit-newzealand.co.nz/southern-coast/html/tuatapere.html
Te Waewae Bay	Sight seeing	Orepuki is situated next to Te Waewae Bay (Pictured above), with sandy beaches and high cliffs with tunnels and caves in them. Orepuki means Crumbling Cliffs. To the east is the Longwood Range, which is covered in dense forest. Great for hunting and tramping. There are many farms surrounding Orepuki.	http://www.gyrosgarage.com/Orepuki.php
Te Waewae Bay	Sight seeing	Te Waewae Bay is the westernmost of three large bays lying on the Foveaux Strait coast of Southland, New Zealand, the others being Oreti Beach and Toetoes Bay. Twenty-seven kilometres in length, the western end of the bay is mountainous, with the southern terminus of the Southern Alps and Fiordland National Park.	http://www.wises.co.nz/info/Southland,_New_Zealand/Te_Waewae_Bay/
Te Waewae Bay	Sight seeing	Te Waewae Bay is the westernmost of three large bays lying on the Foveaux Strait coast of Southland, New Zealand, the others being Oreti Beach and Toetoes Bay. Twenty-seven kilometres in length, the western end of the bay is mountainous, with the southern terminus of the Southern Alps and Fiordland National Park.	http://www.wises.co.nz/info/Southland,_New_Zealand/Te_Waewae_Bay/
Te Waewae Bay	Tramping/walking	The Waitutu Tracks are challenging tramping tracks, providing access into the south west corner of New Zealand. Track begins at Rarakau Farm carpark on Te Waewae Bay and extends west to Big River. Four days are required to reach Big River. The track gives access to an area rich in human and natural history. The Teal Bay Route links Te Waewae Bay with Lake Hauroko in Fiordland National Park. The three day/two night Hump Ridge Track is managed and operated by the Tuatapere Hump Ridge Trust.	http://www.fiordland.org.nz/Explore-Fiordland/Things-to-do/Walking---Hiking/Hiking-Tracks/Waitutu-South-Coast-Track.asp
Te Waewae Bay	Tramping/walking	The breathtaking scenery takes in views of the South Coast, Stewart Island, Lake Poteriteri, Lake Hauroko and mountain ranges deep in Fiordland National Park. The Hump Ridge dominates the landscape from Lake Hauroko to Te Waewae BayKey features of the track include the chance to see Hector's dolphins in Te Waewae Bay, marine terraces with pristine Beech and Podocarp forests, moonscapes of tors and tarns and historic viaducts	http://www.meridianenergy.co.nz/AboutUs/News/Discover+a+hidden+corner+of+New+Zealand+with+the+Meridian+Energy+Celebrity+Walk+Week.htm
Te Waewae Bay	Tramping/Walking	A scenic loop track amidst sandstone tors and mountain tarns offers 360 degree panoramic views of Stewart Island, the Southern Ocean and the wilderness of Southwest Fiordland. The track then descends along the Hump Ridge to the South Coast track, along old tramlines and across mighty wooden viaducts to historic Port Craig. Bush and beach tracks following Te Waewae Bay complete the circuit.Key features of the track include; coastal, bush and alpine terrain , the chance to see Hector's dolphins in Te Waewae Bay.....	http://www.humpridgetrack.co.nz/the-track.html
Te Waewae Bay	Tramping/Walking	Port works, sawmill remnants, ghost town remnants (baker's oven, fireplaces), part of an old steam hauler. Surviving school house. Operated from 1918 - 28..... This is for serious hikers. Start at Te Waewae Bay, 20 km on a track to Port Craig. At the right tide part can be walked along a beach. There is a hut at Port Craig but it needs to be booked. Guided tours are available.	http://www.nzarchaeology.org/cantotagsouth.htm
Te Waewae Bay	Tramping/Walking	Tuatapere Hump Ridge Track has all the qualities of a great walk..... It climbs high on to the Hump Ridge and Okaka Hut at 890 metres (2 920 feet). A scenic loop track amidst sandstone tors and mountain tarns offers 360 degree panoramic views of Stewart Island, the Southern Ocean and the wilderness of Southwest Fiordland. The track then descends along the Hump Ridge to the South Coast track, along old tramlines and across mighty wooden viaducts to historic Port Craig. Bush and beach tracks following Te Waewae Bay complete the circuit.	http://www.southlandtodaytonight.co.nz/s_activitiesattractions.asp
Te Waewae Bay	Tramping/Walking Wildlife	Waitutu Track.....Up for an early breakfast departing Tuatapere at 7.30am for Bluecliffs Beach and the Track Burn on the edge of Fiordland National Park. The walk from Bluecliffs Beach follows the beach and coastal tracks. Fiordland crested penguins, Hector dolphins, New Zealand fur seals, and whales can occasionally be seen as we follow the sweeping Te Waewae Bay to Port Craig Village. Explore the remains of this once bustling milling town with a Heritage Trail and brochure	http://www.nzwalk.com/subpage/waitutu-itinerary.html

Location	Activity	Text	Reference
Te Waewae Bay	Tramping/ Walking	The southern coast to the west of Invercargill is another world of wild landscapes. There's heaps of history to be discovered at Riverton, one of New Zealand's oldest settlements. I also love Te Waewae Bay and Gemstone Beach - true wilderness coast. To get the full effect of this area, hike the Tuatapere Hump Ridge Track - it's one of New Zealand's newest walks	http://www.newzealand.co.nz/travel/about-nz/features/gourmets-garden/lifestyles/southland/southland-nature.cfm
Te Waewae Bay	Tramping/ Walking	Things to do in Fiordland Southland..... Tuatapere Hump Ridge TrackA 57km 3-day hiking track to Hump Ridge with stunning views across to Te Waewae Bay, Waiau Valley and Longwoods.	http://www.jasons.com/New-Zealand/Southland-Fiordland/things-to-do
Te Waewae Bay	Tramping/ Walking	Takitimu mountains climbing and tramping trip.....From Windy creek we climbed up a spur eventually reaching the ridgeline and after a stop for lunch, crampons were fitted before continuing up to the first of the peaks. The views were spectacular, being able to see Te Waewae Bay to the south, the Fiordland Mountains and Manapouri to the west and the snow-capped Eyre mountains and beyond to the north.	http://www.alpineclub.org.nz/documents/stions/southland/06Oct.pdf
Te Waewae Bay	Tramping/ Walking	The Tuatapere Hump Ridge Track is a 3 day / 2 night circuit tramp. It climbs high on to the Hump Ridge and Okaka Hut at 890 metres (2 920 feet). A scenic loop track amidst sandstone tors and mountain tarns offers 360 degree panoramic views of Stewart Island, the Southern Ocean and the wilderness of Southwest Fiordland. The track then descends along the Hump Ridge to the South Coast track, along old tramlines and across mighty wooden viaducts to the historic Port Craig. Bush and beach tracks following Te Waewae Bay complete the circuit.	http://nztri.aut.ac.nz/southland/pages/viewentity.php?entity=206
Te Waewae Bay	Tramping/ Walking	We drove to Tuatapere and the next day started walking the coast at Te Waewae Bay to Port Craig. Along the way it was obvious throughout this trip we were never far from pigs and deer. Fresh prints in mud or sand and rooting of pigs always evident. A good track to the historic sawmilling site and a night in the old school house and nearby the upmarket lodge used for the Hump Track.	http://www.alpineclub.org.nz/documents/stions/south_canterbury/07Jun.pdf
Te Waewae Bay	Tramping/ Walking	TUATAPERE HUMP RIDGE TRACK With views of Southland, Te Waewae Bay, Lakes Poteriteri and Hauroko this track provides a wide variety of scenery passing through landscapes that include coastline, the world famous Waitutu coastal marine terraces, podocarp and beech forest, to sub alpine settings and spectacular sandstone outcrops.	http://www.fiordland.org.nz/Explore-Fiordland/Things-to-do/Walking---Hiking/Hiking-Tracks/default.asp
Te Waewae Bay	Tramping/ Walking	Humpridge Track.....A scenic loop track amidst sandstone tors and mountain tarns offers 360 degree panoramic views of Stewart Island, the Southern Ocean and the wilderness of southwest Fiordland. The track then descends along the Hump Ridge to the South Coast track, along old tramlines and across mighty wooden viaducts to the historic Port Craig. Bush and beach tracks following Te Waewae Bay complete the circuit.	http://www.organicexplorer.co.nz/View+Directory/Otago++Southland/Tuatapere+Hump+Ridge+Track.html
Te Waewae Bay	Tramping/ Walking Wildlife	Waitutu Track.....Track Transport departs Tuatapere 7.30am for Bluecliffs Beach and the Track Burn. The track follows the coast through bush trails and on to the beach. There is a chance to see Hector's dolphins, penguins and occasionally whales as you follow the sweeping Te Waewae Bay to Port Craig Village. Explore the remains on this once bustling milling town.	http://www.hikesouth.com/waitutu-freedom-plus.htm
Te Waewae Bay	Tramping/ Walking	Humpridge track.....New Zealand's new frontier in tramping experiences. Coastal, Bush and sub alpine scenery wrapped in one, with history and wildlife to top it all off. From Te Waewae Bay, the track climbs high on the Hump Ridge amidst a moonscape of tors and tarns, descending back to the Southern Ocean through pristine forest in the Fiordland National Park, along ancient tram lines and across the mighty Percy Burn viaduct. Stay in modern backcountry huts with gas heating, full kitchen equipment and more. Guided walk, freedom plus and freedom walk options available	http://www.queenstown-nz.co.nz/information/product/?product=tuatapere-hump-ridge-track
Te Waewae Bay	Walking/ tramping	The Teal Bay Route links Te Waewae Bay with Lake Hauroko in Fiordland National Park	http://www.doc.govt.nz/templates/ActivitiesSummary.aspx?id=35655
Te Waewae Bay	Walking/ Tramping	And so begins the tramping. Four of us farewell the vehicles carrying the rest of our party and begin an optional 6km trek along the wild Te Waewae Bay. Had we known what was ahead, we might have chosen to be deposited closer to our destination..... Some make the trek around the aforementioned loop track and take in a view that encompasses the long sweep of Te Waewae Bay and beyond to Bluff Hill in the east, Stewart Island to the south and the mountains of Fiordland to the north and west, where rain offers an embrace common to these parts.	http://www.hikesouth.com/news/dolphins-at-dusk.htm

Location	Activity	Text	Reference
Te Waewae Bay	Walking/ Tramping	Today we are driving down to camp at Te Waewae Bay on the South coast, to meet Youthline volunteers. We intend to start very early tomorrow morning. The weather forecast is for rain/snow?	http://www.manawahinewalk.com/index.pl?pics&54
Te Waewae Bay	Wildlife	Sandflies convinced me not to camp at Te Waewae Bay so I pushed on east to Porpoise Bay. If you're lucky you may see dolphins in the surf	http://www.experiencebmw.co.nz/pages/documentlibrary/KRJune07BobZ.pdf
Te Waewae Bay	Wildlife	Top Southland and Fiordland wildlife attractions.....Hector's Dolphins are particularly social and can often be spotted bow riding alongside boats or surfing in the waves at Te Waewae Bay (Riverton) or Curio Bay (Catlins).	http://www.southlandtodaytonight.co.nz/s_topwildlifeattractions.asp
Te Waewae Bay	Wildlife	Wildlife and wilderness itinerary.....In the afternoon, return to Bluff and continue your drive through Invercargill and on to Riverton. McCracken's Rest is an exceptional viewing point for Te Waewae Bay and often pods of Hector's dolphins can be spotted.	http://www.southlandnz.com/visit/testarea/travelinfo/1501/
Tuatapere	Camping Tramping Mountain biking Fishing – trout Boating Hunting Caving	The 200 kilometre drive via Tuatapere takes approx 2.5 hours by car and is sealed for the entire distance between these centres. The road skirts the eastern boundary of Fiordland National Park and the rugged south coast, providing an introduction to southern parts of Te Wahipounamu World Heritage Area. There are many points of natural and historic interest along the route, and varied opportunities for recreation – camping, tramping, mountain biking, trout fishing, hunting, boating and caving.	http://www.destinationfiordland.org.nz/Explore-Fiordland/Places-to-visit/Southern-Scenic-Route.asp
Tuatapere	Farm tour	Waiau Downs Farm AdventuresWe have 4500 sheep, ponies, a horse, donkeys, pet lambs, cattle, deer and many dogs. Waiau Downs Farm Adventures is a unique farm experience that has several tours available. We offer; - Sheep Shearing - Wool Handling - Dogs Working - Cow Milking- Deer Farming - Fishing & plenty more	http://www.farmadventures.co.nz/
Tuatapere	Fishing	Tuatapere accommodation.....Regardless of age, whether you are on a family holiday, domestic or international visitor, walking the Hump Ridge track, on business, fishing, hunting or having a break, whatever your reason you will always find a warm welcome and great southern hospitality while staying at Hollyburn Lodge.	http://www.tuatapereaccommodation.com/index.htm
Tuatapere	Fishing Jet boating	What is there to do in Tuatapere?.....In less than one hour..... Fishing in the Waiau - Equipment, licence from Barry at Tuatapere Service Station.....one to two hours..... Jet boat to Clifden Suspension Bridge with Waiau Jet Tours Jet boat to Wairaki, Motu with Waiau Jet Tours.....two to six hours..... Jetboat with Waiau Jet Tours on Waiau River to see Dean Forest and large totara trees; Jet boat to Monowai Powerhouse with Waiau Jet Tours.....one day..... Wairaki River horse ride with Beaumont High Country Experience ; Jetboat day trip on the Wairaurahiri River to Waitutu Lodge with either Hump Ridge Jets, South Coast Jets or Wairaurahiri Jets	http://tuatapere.com/forum/viewtopic.php?p=84&sid=5046da1d86232e94ac611374c4422843
Tuatapere	Fishing Sight seeing	West along the coast lies the town of Tuatapere. Along the road to Riverton and Tuatapere you will notice the trees growing at irregular angles due to being exposed to the gales that come direct from the Antarctic ice shelf. Tuatapere stands on the banks of one of the great rivers within New Zealand the Waiau. This is where fishing for brown trout can be found from the mouth of the river to its source in Fiordland	http://www.newzealandatoz.com/index.php?pageid=269&Southland&PHPSESSID=864
Tuatapere	Hunting Tramping Fishing Kayaking Jet boating Tramping	Tuatapere, located on the banks of the Wairau River (sic) is known as the 'Sausage Capital of the World'. Tuatapere offers a variety of hunting, tramping, fishing, kayaking and jet boating. The Clifden Limestone Caves, historic Percy Burn Viaduct, Lake Hauroko, Bluecliffs Beach and Te Waewae Bay are all popular with visitors. Tuatapere is also the departure point for the Hump Ridge walking track.	http://www.holidayguide.co.nz/Southland/Southland.aspx?Action=LocationOverview
Tuatapere	Hunting Tramping Fishing Kayaking Jet boating	Tuatapere, located on the banks of the Wairau River (sic) is known as the 'Sausage Capital of the World'. Tuatapere offers a variety of hunting, tramping, fishing, kayaking and jet boating	http://www.holidayguide.co.nz/Southland/Southland.aspx?Action=LocationOverview
Tuatapere	Jet boating	Need some adventure? Come and Jet Boat along the mighty Wairaurahiri River. You spend Day 1 on an unguided walking tour to the river and on Day 2 the excitement begins. Travel the full length of the river; 27 kilometres to Lake Hauroko. Guaranteed to get	http://www.redballoondays.co.nz/experience/HRJ991

Location	Activity	Text	Reference
		the blood pumping!	
Tuatapere	Jet boating	Waiiau Jet 73 Main Street Tuatapere New Zealand	http://www.jasons.com/New-Zealand/Tuatapere/Waiiau-Jet
Tuatapere	Sight seeing	The town populates about 650 people and forestry and farming are the main industries as well as tourism. The Waiiau River flows through the town and on to Te Waewae Bay where it enters the mighty Foveaux Strait.	http://www.visit-newzealand.co.nz/southern-coast/html/tuatapere.html
Tuatapere	Tramping/ Walking	Waitutu walk.....The track gives access to an area rich in human and natural history. The Teal Bay Route links Te Waewae Bay with Lake Hauroko in Fiordland National Park. The three day/two night Hump Ridge Track is managed and operated by the Tuatapere Hump Ridge Trust. The Waitutu area was visited by early Maori in search of food from the sea, rivers and forests. Kaika or hunting camps were sited on the banks of the Waiiau River near Tuatapere, and the river crossed by mokihī or rafts. The coastal track was first cut by government workers in 1896 to provide an alternative to the unreliable shipping service to Cromarty and Te Oneroa, gold mining settlements in Preservation Inlet.	http://www.fiordland.org.nz/Explore-Fiordland/Things-to-do/Walking---Hiking/Hiking-Tracks/Waitutu-South-Coast-Track.asp
Tuatapere	Tramping/ Walking	Okaka Track - This is a Maori name that refers to the legend of the wrecking of the canoe 'Takitimu': '...Struck by the wave, Takitimu lost its bailer, which turned into rock and is now the Hokonui Hills west of Gore. Then it was struck by another great wave, Okaka, now the name of the west ridge of the Waiiau River. There Takitimu lies as the range of mountains east of the river which bears its name'.	http://www.kiwinewz.com/html/feb_1999.htm
Waiiau Arm	Fishing - general	Manapouri, Lake: Those portions of the Waiiau River, Mararoa River and the Waiiau Arm of Lake Manapouri that are within 100m of the control gates on the Manapouri Lake Control structure, also known as the Mararoa Weir.....Season closed	http://www.nzfishing.com/Regulations/RegulationsSouthland.htm
Waiiau Arm	Fishing - general	The Waiiau Fisheries and Wildlife Habitat Enhancement Trust was established in 1996. It was the result of the negotiations between the community (the Waiiau Working Party) and ECNZ (now Meridian Energy Limited), one of New Zealand's major energy generator. It was designed to mitigate and remedy the adverse effects the Manapouri Hydroelectric Power Scheme has had, and continues to have, on the fisheries and wildlife values of the Waiiau Catchment, Southland, New Zealand.The Trust was set up with a \$5m fund. It is charitable and has a Deed with a set of objectives focussing on habitat enhancement, public access, education and information about these matters and fisheries research	http://www.waiiaustrust.org.nz/
Waiiau River	Accomm Fishing – trout Jet boating	Accommodation listing of activities.....The mighty Waiiau River offers great trout fishing opportunities. For the more adventurous, have a jet boat ride down the Waiiau River through the beech forests of this area.	http://www.bluemountaincottages.co.nz/
Waiiau River	Fishing - general	Fishing regulations - All rivers and lakes draining to the Tasman Sea and Foveaux Strait west of the Waiiau River All year FS 4 Waiiau River between Lakes Manapouri and Te Anau 1 Oct—31 May FS 2 Waiiau River—Manapouri Lake Control structure to Tuatapere 1 Oct—31 May FSB 4 Waiiau River—Tuatapere to sea All year FSB 4	http://www.wildangler.com/fishing-regulations-southland.htm
Waiiau River	Fishing – general Fishing - trout	Waiiau River – upper The Waiiau drains the large western lakes but most of its water is diverted through a power scheme to the Deep Cove in Fiordland. However a useful residual flow is discharged through the control gates just south of Lake Manapouri. The Waiiau is really two rivers. One that flows from Lake Te Anau to Lake Manapouri and the one that flows from Lake Manapouri through the Mararoa Weir, to the sea. The former is a very large river that fishes best in the late summer when caddis flies hatch. It is accessible from rough tracks that lead down to the river from the Te Anau to Manapouri road. The photo on the right is of the Upper Waiiau. Our Te Anau basin access brochure gives details. Waiiau River – Lower The lower Waiiau is a smaller river than the upper, but near the sea at Tuatapere it is a large river with good fishing all year round. The first 30km downstream of the weir provides excellent rainbow and brown trout fishing but access is limited. Several new access points have been opened recently and these are set out on our Southern Scenic Route brochure. The reaches from the Weir are mostly wadeable but care must be taken as the boulders are large and often slippery. Fishing from dry land is safer and usually just as productive. Rainbow trout around 1kg predominate in this reach with many 2kg brown trout being caught too. The river flows through bush clad gorges where access is very difficult, but once there anglers can be assured of solitude. The river gains a substantial flow from the Monowai River about 30km from the Weir and from here down fishing from a boat is permissible. Rainbows and browns are found from this	http://www.fishandgame.org.nz/Site/Regions/Southland/fisheries.aspx

Location	Activity	Text	Reference
		point to the sea. From November to March 4-5 kg Chinook salmon can be caught in this reach. They provide a nice surprise to a trout angler expecting a lively but much smaller rainbow to attack his lure. The Waiau does not have a long estuary as other Southland rivers do but its lagoon is large and well populated with brown trout. Later winter and spring provides the best fishing, especially in the evening or early morning using a feather lure that imitates small baifish, such as the native whitebait.	
Waiau River	Fishing – general Wildlife	11.2.3.2 Waiau Fisheries and Wildlife Habitat Enhancement Trust The Waiau Trust was created in 1996 when the resource consents for the Manapouri Power Scheme were renewed. Water from the Waiau River has been diverted through the West Arm Power Station to Doubtful Sound, resulting in a reduction in river flows. The Trust was formed as part of a mitigation and remediation package for the loss of fisheries and wildlife habitat values and amenity values of the Waiau River. One of the key objectives of the Trust is to facilitate public access to fisheries and wildlife habitats and resources within the Waiau catchment. The Trust takes a wide perspective on public access. It can mean physical construction of vehicle roads and tracks, walking tracks and other facilities.	http://www.walkingaccess.org.nz/publications/final-report/page-12.htm
Waiau River	Fishing - trout	The Waiau River runs mainly in a north-south direction, some 112 km in length flowing from Lake Te Anau through Lake Manapouri and thence through open country, some bush-clad gorges and pastoral country to the sea. Because of the much lower water flow now, it is natural to expect a decline in trout populations, but the river still has adequate stocks of both brown and rainbow trout which rise freely, especially during the evenings. It is important to note that since the transformation of the Waiau, the trout now tend to feed in certain pockets of a pool or ripple. Once an angler has found one of these feed areas, good sport is usually assured.	http://www.frontierfishing.co.nz/waiiau_river.htm
Waiau River	Fishing - trout	The Waiau is the biggest of our rivers and flows out of two of New Zealand's larger lakes, Lake Te Anau and Lake Manapouri. These lakes are the catchment for the famous World Heritage Park of Fiordland with its magnificent rain forest that forms the western side of Southland and within which many other well-known rivers and alpine streams flow. The Waiau catchment carries both rainbow and brown trout in large numbers.	http://www.fishnz.net.nz/fish.html
Waiau River	General	The water bodies identified in Te Anau that are important for tourism are: Lake Te Anau -popular for scenic cruises, with cruises often transporting passengers from Te Anau to the caves and to the Milford Track. Approximately 70,000 people visit the Te Anau Glow-worm caves each year. Tunnelburn River - a tributary to Lake Te Anau that flows through the caves. Arthur River - flows into Milford Sound and is used predominately for fishing & jet boating. Clinton River - flows alongside the Milford Track, popular for fishing and other recreational uses. Hollyford River - popular for jet boating and fishing. Lake Hauroko Wairarahiri River Waiau River Mavora Lakes Lake Manapouri	http://www.tourism.govt.nz/aboutus/au-media/au-woni/teanau.html
Waiau River	Jet boating	Luxmore Jet operates jetboat tours on the Upper Waiau River which flows between Lake Te Anau and Lake Manapouri. Our jetboat excursions explore the untouched wilderness of Fiordland National Park a World Heritage Area in the South Island of New Zealand. The jetboat tour allows you to view 3 actual Lord of the Rings film locations of the River Anduin	http://www.nzonline.org.nz/luxmorejetboatingteanau.htm
Waiau River	Jet boating Sight seeing Fishing - trout	Experience scenery on an epic scale in the Fiordland National Park, New Zealand's very own land of sheer granite mountains, with spectacular fiords reaching ever inland. View Doubtful and Dusky Sounds from the air, Milford Sound from the water, and NZ's most beautiful lake, Lake Manapouri, by jet boat down the Waiau River..... You will journey down the Waiau River, the River Anduin in the "Lord of the Rings", stopping to see brown or rainbow trout in the crystal clear water, before boating out onto the breathtakingly beautiful "lake of many isles", Lake Manapouri	http://www.fiordlandlodge.co.nz/
Waiau River	Jet boating	Enjoy a scenic jet boat ride up the Waiau River. There are many different attractions along the way which include the historic Clifden Suspension Bridge, Giant Totara Tree, Dean Forest and the Monowai Powerhouse. The Waiau River runs from Lake Te Anau to the sea in Te Wae Wae Bay.	http://www.southernscenicoute.co.nz/Activities/Jet-Boating.asp
Waiau River	Jet boating	The Tuatapere area is home to some of the best jetboating in the world, without the big crowds you'll meet in other areas. You can travel on the Waiau River from Tuatapere to the control gates at the outlet of Lake Manapouri, or you can experience New Zealand's largest waterfall, the Wairaurahiri River, which descends over 600 feet in 27 kilometres from Lake Hauroko (New Zealand's deepest lake) to the ocean. Book a trip of a lifetime with Wairaurahiri Jet or Waiau Jet.	http://nztri.aut.ac.nz/southland/pages/viewtown.php?town=6
Waiau River	Jet boating	Luxmore Jet adds a touch of adrenalin to a journey deep into the Fiordland National Park. You'll experience untouched remote landscapes and spectacular views of snow-capped mountains as you hurtle down the Upper Waiau River to Lake Manapouri. They also offer fly and boat options with the Wings and Water float plane or Southern Helicopters.	http://www.newzealand.com/travel/australia/deals/autumn2008/dunedin/fiordland

Location	Activity	Text	Reference
			/fiordland_home.cfm
Waiiau River	Kayaking Fishing - trout	The Waiiau River offers sheltered waters for kayakers and canoeists, and has a healthy population of trout for keen fisher people	http://www.possumlodge.co.nz/
Waiiau River	Tramping/ walking	The Kepler Track is one of New Zealand's great walks. Starting at Lake Te Anau the track climbs above the bushline and follows the ridge line from Mt Luxmore in a westerly direction before descending into the Iris Burn. The track follows the Iris Burn down to Lake Manapouri before returning to Lake Te Anau beside the Waiiau river	http://www.ferguson.org.nz/tramp1.html
Waiiau River	Tramping/ walking Accomm	The Manapouri Circle Track starts and finishes on the banks of the Waiiau River, and is accessed by row boat from Possum Lodge	http://www.possumlodge.co.nz/activities.html
Waiiau River	Tramping/ walking	Parts of the Waiiau River flowing out of Lake Te Anau were filmed for scenes of the River Anduin. The best way to view the river is by walking on part of the Kepler Track. Start at the Rainbow Reach carpark, signposted off the Te Anau - Manapouri Road. Cross the swing bridge over the Waiiau and go left following the river. When the track leaves the river terraces, you can follow it through beech forest to the shores of Lake Manapouri (about 3 hours return) or wander back along the river	http://www.dayout.co.nz/mi_niguide.asp?AttractionID=1937
Waiiau River	Tramping/ walking	Moturau Hut to Rainbow Reach 1.5 hours, 6.2km. The last day is a gentle stroll through beech forest to Rainbow Reach. The track crosses a wetland and then the meandering Forest Burn just above its outlet into Balloon Loop, an old part of the Upper Waiiau River. It then follows the Waiiau River terrace to the swingbridge at Rainbow Reach. In summer trampers can catch a shuttle bus service from Rainbow Reach to Te Anau.	http://www.travellink.co.nz/media/page.asp?UID=68

7 Appendix 7: On-line presence study method

7.1 Method

The on-line presence of each waterbody in the study was quantified via a search of web pages using the Google search engine. The following steps were used:

- Each waterbody was searched for via Google. The waterbody's name was entered in quotations ("Waiau River") and a domestic search completed. Where returns included locations other than that sought a more refined search was completed – for example, <"Crooked Arm" -street>
- The total number of results shown was recorded. This number includes many repeats of the results searched within individual websites and is not used to indicate the on-line presence. For example, an event website might repeat the name of a river many times to show the results for competitors in a race. The total number of results with the 'similar results' omitted is gained by selecting the highest page number for the list of result pages until the final entry is reached. The statement (as an example):
In order to show you the most relevant results, we have omitted some entries very similar to the 223 already displayed. If you like, you can [repeat the search with the omitted results included](#).
- The number shown in that statement (223) is the number of relevant results. This will include, in some cases, more than one page from a single website. However, this 'error' is consistent across all results (that is, it inflates all the results, not just those for one waterbody).
- For each set of results the first 20 pages were reviewed using two schedules. In most cases this included all the pages returned. The first schedule describes the type of web pages returned (distinguishing between websites with one or more of the following foci: academic, commercial, tourism/recreation, community news and local government, media news, photography, conservation and 'other'). The second schedule required the researcher to visit each recreation or tourism focused website and record the recreation activities described as able to be undertaken at each.
- This process was used for a review of the on-line presence of the Hurunui River and Port Hills to calibrate the results (see Section 9.3).

7.2 Limitations

Several limitations should be borne in mind when reviewing the results of the on-line presence study:

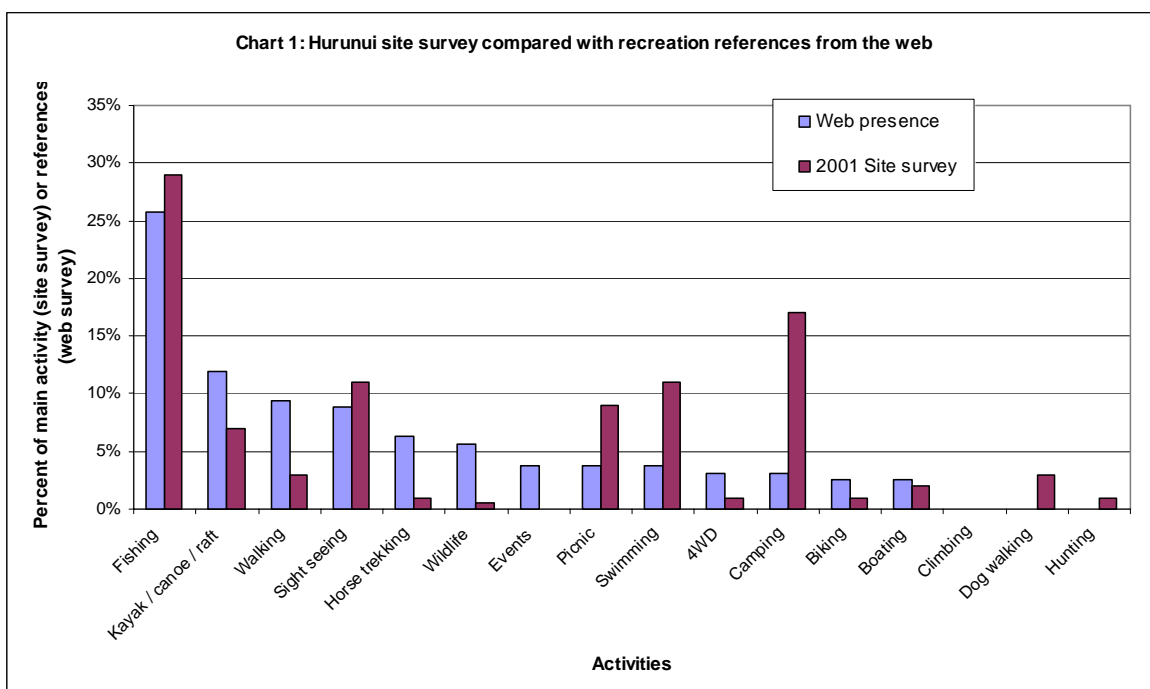
- The research, in essence, is a survey of the on-line presence of the waterbodies in the proposal area. It is not a study of the level of use of each site. However, it can be assumed that the more frequently a site is recorded on the web, the higher it is in the consciousness of the web community. As the web is used heavily for tourism and recreation promotion (as shown by the results of this study), destination descriptions are likely to indicate the level of community interest in promoting a site for specified activities, and the number of agencies that have a stake in increasing awareness about the potential and actual use of a site (the results may indicate what the web community want a location to be like in the future – for example, a company may wish to see more horse trekking in an area and promote that desire. Travellers are increasingly interested in posting web logs of their travels. The more frequently a site

is visited and impresses a visitor, the more likely they are to mention a location on a personal website. These phenomena suggest that the on-line presence can be used to indicate the *relative* level of significance of a location, but not the absolute significance.

- The results from this search will vary daily, and even hourly. The Google search engine, which is generally considered to be the most comprehensive for web searches of a general nature, is being constantly updated and reviewed. The total number of relevant results will vary by around five percent over short periods (both up and down). The same survey carried out in a month's time will offer different results, but within what could be described as a margin of error. The relative status of each waterbody should remain consistent.
- The approach may under-represent the number of individual activity references for a location which returns more than 200 results (20 pages of results). However, the limit of 20 pages of analysis is used to enable the survey to be completed in a reasonable period of time. This bias does not affect the record of the scale of results for each location (percent of recreation and tourism results, and total number of results). The limit of 20 pages (200 results) equates to a sample survey of a population (all results). A margin of error for a randomly selected sample of 200 respondents from an infinite population is $\pm 6.9\%$ at the 95% confidence level.
- Google does not list all the websites available – only those on its database. The search completed is therefore only on the 'apparent' web and not all websites on the internet. However, this bias is also consistent across all results, enabling the use of the survey output in a relative manner (the absolute figures are by themselves pretty meaningless).

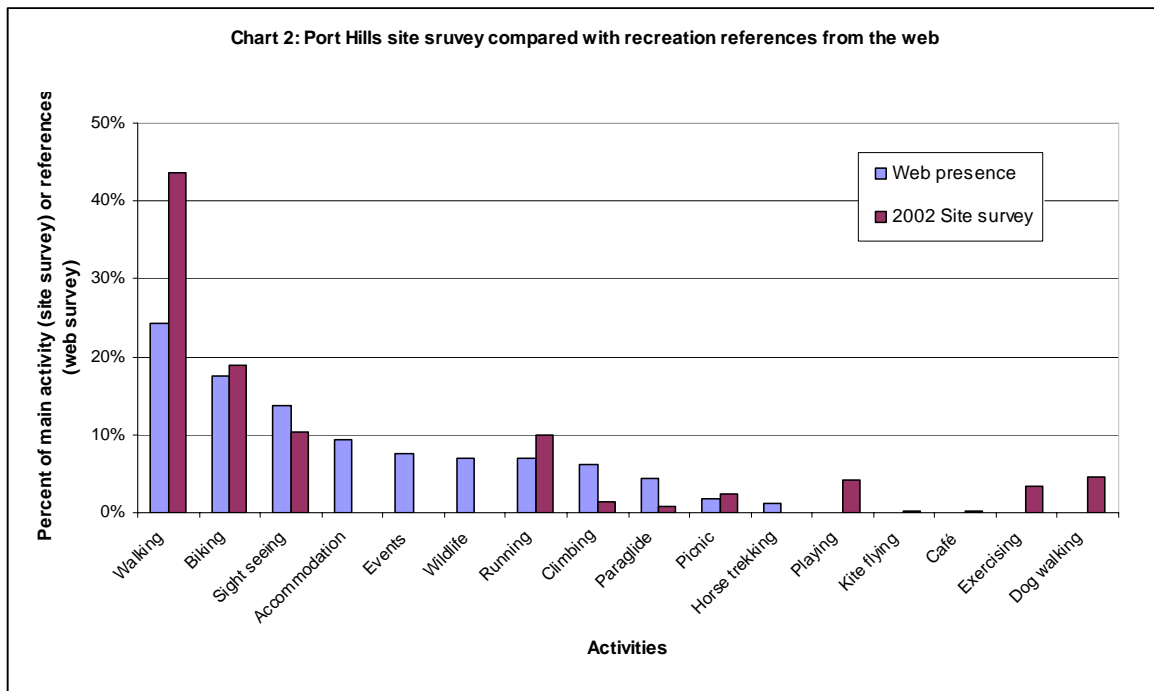
7.3 Calibration

A recreation study of the Hurunui River was completed over the 2000/01 season (Greenaway 2001). This study quantified the level of use of the river by activity, relying on 900 completed questionnaires resulting from on-site face-to-face interviews. Chart 1 shows the percent of respondents by main activity for the site survey compared with the percent of references made within recreation and tourism websites which refer to the Hurunui River (gathered within this study).



The results show that almost all activities recorded in the site survey are described in the web survey results. The exceptions are events (it appears none occurred during the site survey period), and dog walking and hunting. Neither of the latter two activities were recorded from the web survey. In terms of the relative ranking of activities, there are some similarities and some differences. As each set of results is from a different research technique it is difficult to know whether the similarities are coincidental. However, while there is over- and under-representation of activities by the web search, almost all the key activities are recorded.

A similar study completed in June 2002 on the Port Hills of Christchurch (Greenaway 2002) relied on 400 respondents. Chart 2 shows the percent of respondents by main activity for the site survey compared with the percent of references made within recreation and tourism websites which refer to the Port Hills in Canterbury (gathered within this study).



The Port Hills site survey lists additional activities not covered by the on-line search: playing, exercising and dog walking (the latter two could be considered a subset of 'walking'). Conversely the web survey lists accommodation, events, wildlife and horse trekking, which were not shown in the site survey. Accommodation and events would not normally occur in a site survey for recreation (the former not being an activity, and events would be avoided during a survey to reduce bias in the response set). Wildlife was recorded as an 'important feature' in the site survey, but not as a main activity. Walking is relatively over-represented in the site survey.

7.3.1 Summary

The web search results for specific recreation activities should be not be used as an indicator of absolutes. It would not be possible to say, for example, 'the web survey indicates that camping makes up 3% of the recreational use of the Hurunui River' – the site survey shows a much higher level of use. However, it does show the activities which occur at each site and suggests some relative levels of significance (in both the Port Hills and Hurunui studies, the most significant activity is indicated by both research methods). The web survey appears to be a good adjunct to a site survey, and it is certainly less expensive and more quick, but it should not replace a site survey if a quantification of use is required.

Manapouri Tailrace Amended Discharge:

A review of the effects of the MTAD proposal on surface navigation and marine safety in Deep Cove

FINAL REPORT



TOM SAWYER

February 2009

Prepared for

Meridian Energy Limited

Manapouri Tailrace Amended Discharge:
A review of the effects of the MTAD proposal on surface navigation and marine safety in Deep Cove

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Attachment 1: Record of site visits

Attachment 2: Accident Record: Maritime New Zealand

Attachment 3: Interview Transcripts

1 Aim

The following provides an overview of existing boat users and influences on marine safety and navigation, in Deep Cove, Doubtful Sound. It also assesses the effects of the increased tailrace discharge of the MTAD proposal on marine safety and navigation.

2 Methodology

The specific methodology used to complete this memo was as follows:

Site Visits

Five site visits were undertaken, including three accompanying on-water assessments in various boats, and participation in the high flow trials described in the MTAD *Surface Water Currents* report.

Literature analysis

Relevant research included the review of stand-alone technical reports completed for the MTAD proposal.

Interviews

Telephone and face to face interviews with stakeholders were undertaken in 2008. Copies of the interview transcripts are attached. Interviews were completed by either the author of this report or Rob Greenaway, author of the MTAD *Recreation and Tourism Assessment* report.

About the Author

Tom Sawyer joined the British Merchant Navy as a deck officer cadet in 1961 and has been associated with ships and the sea ever since.

For the last 20 years he has been a part time tutor / examiner for the NZ Coastguard Boating Education Service working with recreational boat owners and their crews on all aspects of boating safety, navigation and associated matters.

In 1995 he received an award from the Maritime Safety Authority for services to boating safety in the Southland community. Since 1984 he has been heavily involved in the Spirit of Adventure Trust and since 1996 has been relief Captain on the sail training ship the Spirit of New Zealand.

He currently owns a shipping agency in Invercargill.

3 Existing Environment

The tailrace has been discharging into Deep Cove as part of the Manapouri Power Scheme (MPS) since 1969. Since that time there have been an increasing number of maritime users of Deep Cove and Doubtful Sound.

The existing environment is, like many marine environments, a challenging one at times due to the meteorological and tidal influences that occur in the Sound. To a large extent, these sometimes difficult conditions dictate boating navigation and activity in the Sound.

A strong current and high standing waves means kayaking guides and smaller boats have to make decisions about the route taken and their abilities. When conditions permit, and there is a north-west or up-fiord wind kayaking parties heading back to Deep Cove will travel in the middle of the Sound, where there is plenty of sea-room, and use the wind to push them along, often with sails.

When conditions are rough, kayaking groups will raft-up to create a more stable platform when 'sailing'. When the current is too strong or winds are unsuitable, headway is lost and groups must paddle along the edge of the fiord.

A number of larger boats used for tourist and charter operation arrive by sea and use Deep Cove as a base. Others, such as commercial fishing boats and cruising yachts also arrive by sea. Not surprisingly, the larger the vessel, the better equipped it is at handling naturally adverse coastal conditions.

The key users of Deep Cove are:

Real Journeys

This is a private company which operates daytime and overnight cruises in Doubtful Sound. The company's daytime "wilderness" cruises operate all year round; while the overnight excursions operate during summer.

Two vessels are normally based in the Sound: a thirty metre passenger catamaran and a forty metre wind-assisted passenger vessel. These are moored at the Wanganella and Meridian Wharves.

Charter Tourist Vessels

Charter tourist vessels include Deep Cove Charters, which operates during winter months (1st of April to 31st of October), Fiordland Explorer Charters, and Fiordland Ecology Holidays. These are single vessel operators. Vessels are both power and sail-assisted in the range of 10 to 25 metres length, operate on demand and have no fixed schedule.

'Syndicate' and Other Private Boats

Syndicate vessels are owned by groups of individuals and provide bases for exploring the fiords, fishing, diving and hunting. Berth and mooring areas are available inside Brasell Point, at the Helena Falls anchorage and on the wharves and pontoon systems in Wanganella Cove.

Commercial Fishers

Members of the fishing industry use facilities at Deep Cove for the transfer of catch and for mooring.

Guided Kayakers

Three guided kayaker operators utilise Doubtful Sound and commence their trips from Deep Cove: Fiordland Wilderness Experience, Fiordland Adventure and Fiordland Expeditions Limited.

Fiordland Wilderness Experiences is the only kayak company that has clients paddling to and from Deep Cove. Other companies use powered boats to take the kayakers to and from Doubtful Sound out of Deep Cove.

Deep Cove Outdoor Education Trust (DCOET) Centre

DCOET has operated from the Deep Cove Hostel at the head of Deep Cove since 1971. The Trust and hostel have two aluminium pontoon dinghies available for school use, plus a further pontoon dinghy which is kept as a safety boat.

The general programme at the Hostel is aimed mainly at intermediate age children 11-13 years with a smaller number of senior school children coming in for specific programmes, including biology and environmental studies. About 2000 school children stay at the Hostel annually.

The intermediate programme involves a full range environmental study under the supervision of the Department of Conservation, in addition to bush walking, study of the tailings regeneration and boating activities.

The boating programme takes place during every school visit, weather permitting, and involves a small amount of recreational fishing, but is mainly concerned with biota sampling, study of the environment below the freshwater layer and as transport to or from Helena Falls. Boats are also used as transport for the children to study the northern shore of Deep Cove which is removed from the wharves, moorings and buildings on the southern shore.

Recreational vessels

Recreation vessels in Doubtful Sound comprise kayaks, power boats that are towed over the Wilmot Pass, and some visiting yachts that enter Deep Cove via the sea.

3.1 Boating Accidents

To date there have been five reported accidents, or incidents, in Doubtful Sound (see Attachment 2). There have been no reported incidents or accidents due to the tailrace flow since the project started in 1969.

3.2 Factors Affecting Marine Boating Conditions

Coastal conditions are inherently different to those encountered in, for example, lakes and rivers. The key environmental factors affecting boating safety and navigation are wind conditions (speed and direction), surface water speed and tide. These affect a boat's handling characteristics and are important considerations for all mariners.

The following provides a summary of matters that influence marine boating safety and navigation.

Further information about these physical aspects in Deep Cove can be found in the MTAD *Physical Marine* report.

- **WIND**

The climate in Fiordland is characterised by episodic strong winds from the Tasman Sea and an annual rainfall exceeding seven metres. The strength and direction of wind over water have major roles in disturbing the surface water and creating waves. The greater the force and duration of the wind and the deeper and larger the water area, the bigger the waves will be.

If the wind is in the same direction as the water current or tide then the effect is akin to stroking a cat's fur the right way: it smooths it down, relative to an opposing wind direction. If the wind is against the tide or current then the effect is to 'spike' up the waves as would the cat's fur if you stroked it the wrong way. These standing waves can have very steep faces and may be uncomfortable for mariners, even though they may not be particularly high.

Up-fiord winds (west to north-west) acting on the water within Doubtful Sound have sufficient fetch to generate significant surface waves. These waves are most noticeable where wind and water come into conflict and where either is particularly strong. Areas where mariners may notice these include all 'choke' points where the current or wind are funnelled and come into conflict with each other.

- **TIDE**

Tide is defined as the vertical movement of sea water up and down and is caused by the gravitational pull of the moon and sun. The period when there is little or no tide movement between rising (flood) and falling (ebb) tides is known as "slack water". "High tide" is the highest level a tide reaches during flood tide, and "low tide" is the lowest level a tide reaches during ebb tide.

A flood tide coming up the Sound works against the water outflow from the tailrace and other sources. This conflict of direction can have a similar effect to wind against water flow, but on a lesser scale.

Wind coming up the sound, combined with the incoming tide can work against the outgoing tailrace flow and may exacerbate wave 'spiking'. These waves would have similar effects as meteorological influences, but may be steeper because they are influenced by both wind and tide.

The tide needs to be taken into account when boat users are at the mouth of the tailrace, as in other areas of the Sound. At high tide, for example, the water covers the mud flats on either side of the outlet. This enables the outflow current to spread over a wider area, thus reducing the speed of the current. At low tide the outflow is confined to the channel between the mud flats and is thus concentrated and has a higher speed.

- ***CURRENT***

Currents influence navigation by forcing a boat in the direction and speed of the prevailing current. Also, surface waves tend to steepen and break when they propagate into an area with opposing currents. Generally, in Doubtful Sound, boats that are most affected by current are those moving either directly into it (e.g. when they are heading up the Sound to Deep Cove), and when they have the current with them, helping them along as they leave Deep Cove.

In Wanganella Cove there is a defined counter-circulation which curves off to the south of the main current and normally runs approximately parallel to the moored boats on the south side of Wanganella Cove. Current speeds near the shore are 0.2-0.6 knots.

The tailrace discharge current system in Doubtful Sound is relatively steady and follows a well-defined path out through Deep Cove and past the entrance to Hall Arm, passing to the north of Rolla Island and the south of Elizabeth Island.

On a calm day there is little to see of the discharge current, other than occasional swirls in the water, unless the current is passing a still object such as a moored buoy (see Figure 5 and Figure 6). When the wind is strong and against the current, mariners would expect to see the steepened waves indicative of such wind and water conflict. The height and severity of these waves depends on the relative strengths of the wind and the current.

Prudent captains of any vessel (from small kayaks to large tourist boats) should be aware of the currents. An understanding of the effect of wind on the current at the time of departure and of the weather forecast for the duration of their excursion are essential to a captain's plans.

- ***IMPLICATIONS FOR EXISTING USERS***

It is understood that the DCOET pontoon boats are the only boats that regularly cross the MPS tailrace discharge in order to get to the northern side of the Sound to access Helena Falls and for fishing, biota sampling and general exploration of the northern shore. As long as there are no significant wind- or tide-induced waves involved, there are no problems with crossing currents under power.

Under naturally calm conditions, the boat driver merely has to steer a diagonal path across the current to counteract the sideways motion of the water. In conditions with no wind, the DCOET boats should have no difficulties crossing the tailrace flow. The situation changes considerably if there are wind and tide influences on the current, as it does in other areas of the Sound. In situations such as these, crossings of

the outlet flow in the DCOET boats, while safer for experienced mariners, may be less so for others with limited experience (e.g. the parents of children staying at the DCOET lodge).

4 Interviews with Existing Boat Users

Boat operators and those with boating related interests in Deep Cove were interviewed to describe their experience with the existing boating conditions. Those interviewed included:

- a) Kevin O'Sullivan, Harbourmaster, Environment Southland
- b) Graham Sharp, Executive Member, Gore Boat Club
- c) Paul Gay, (Chairman) and Judith Cambridge (Board Member) DCOET
- d) Mark Peychers, Fiordland Marine Guardian and ex commercial fisherman
- e) Bill Gibson and Daphne Taylor, Fiordland Wilderness Experiences (Kayaks)
- f) Paul Norris, local manager, Real Journeys.
- g) Charlie Paterson, Hostel Manager, Deep Cove Outdoor Education Trust
- h) Robin Wilson, Boat owner
- i) Nigel Lamb, Owner/operator Doubtful Sound Cruises

Unless otherwise noted, all interviews were summarised and sent to the interviewees for checking and verification. A record of the discussions is attached.

4.1 Summary of Responses

Overall, the interviewees had not experienced or heard of any accidents or incidents associated with the tailrace discharge in their varying years of experience. Given that the MPS has been operational since the early 1970s, this is considered a good record and indicates that the standard of seamanship in the Sound has been generally good.

Three anecdotal issues related to marine safety were raised by interviewees:

1. There was some comment from boat owners and operators that the eddy flow increased during the high flow trials such that boats were a little more difficult to berth and that the current occasionally came more from off-shore than parallel to it¹. They considered that they were being pushed off the wharf or moorings by the speed and direction of the eddy current.

Generally, the current runs along the south side of Wanganella Cove, parallel to the shore and the boats. This is not normally a problem. However, if there are changes in current direction, such that it does sometimes come from off-shore and is at right angles to the boats, then boats could be pushed off the wharf or mooring rope. This is considered a minor issue and the effect was not borne out by the data collected during monitoring.

2. Fiordland Wilderness Experiences highlighted the existing difficulties encountered with their kayakers on the homeward leg of their adventure cruises. Fiordland Wilderness Experiences has a 'safety boat',

¹ This effect was noted during the first high flow trial in 2005.

based at Deep Cove, which can be used for collecting kayakers who experience difficulty. This is small boat and there is not a resident driver, but it does appear to be sufficient for present conditions.

3. The DCOET hostel manager estimated that about one-third of their expeditions across the tailrace outflow are cancelled owing to strong winds against the existing MPS tailrace discharge outflow steepening the waves.

5 Effects of MTAD on Boating Navigation and Marine Safety

The main influence of the MTAD proposal on navigation and marine safety in Deep Cove will be due to a combination of circumstances i.e. adverse weather conditions at times of increased tailrace discharges. Increases in current alone should cause no problems to any boats with motors.

It is probable that the increased current, when coupled with opposing winds and/or tide, would result in increased periods of steepened waves. Such conditions can at best be uncomfortable for small boats such as those operated by DCOET or kayaks, and at worst can be dangerous to small vessels operating in marginal weather conditions.

As noted, several interviewees commented that during previous high flow trials the back eddy along the Meridian and Wanganella wharves and the long mooring rope (Figures 2 and 3) seemed to increase and come more at right angles. However, the trials found no evidence that the current speeds at Meridian wharf or elsewhere in Wanganella Cove increase substantially when the tailrace discharge exceeds the present operational limit of 485 m³/s.

With regard to the concerns of kayakers it is considered that the increased discharge - when combined with strong west-north west winds - may make for increased wave activity. This could reduce the suitability of paddling in these conditions.

6 Conclusions and Recommendations

The MTAD proposal will create a relatively minor surface current increase that is not considered to endanger marine safety or navigation, especially for larger vessels. It is possible that there may be some increased effects on in-bound kayakers, particularly at the choke points off Rolla Island and Elizabeth Island arising from a combination of adverse weather events. In addition there may be potential limitations to children's boating activities associated with the Deep Cove hostel because of increased occurrences of unsuitable conditions at the crossing of the tailrace discharge area.

Despite anecdotal comments that the increased counter current in Wanganella Cove during high discharge flows may cause minor berthing and mooring problems, this has not been supported by subsequent data collection.

In general the following recommendations are aimed at overall safety matters for existing operation from the author's general observations and are not necessarily required due to effects arising from the MTAD proposal which, as noted above, is not considered to endanger marine safety of navigation. It should also be noted that all mariners, at all times, must be prudent by following the principles of good seamanship and seeking adequate information for the conditions in which they boat.



Figure 1: Existing signage at the Deep Cove boat ramp

6.1 Information

It was noticed that while there are plenty of information signs in Deep Cove, there are none warning of the tailrace flow.

It is recommended that signage be provided at the Deep Cove boat ramp showing a chart of Deep Cove and indications as to where maximum currents are generally located. The notice should also state that the outflow may increase at any time without notice and that mariners should at all times navigate with due regard to the principles of good seamanship.

The notice should also include information as to surface water speeds at various flows and advice as to how this may affect kayakers. This information would be especially useful to independent kayakers who may be going into Doubtful Sound without the local knowledge of a professional guide.

Provision of this notice should be undertaken as soon as possible and need not be dependent on the outcome of the MTAD application. It is understood that this recommendation is currently being implemented by Meridian.

It is also recommended that Land Information New Zealand (Chart NZ7624) and the Mana Cruising Club (publishers of The Mana Cruising Club Guide to Fiordland) be approached and a request made that similar warnings be inserted in their respective publications (note that LINZ has recently re-surveyed Doubtful Sound and will be publishing a new chart in the near future).

All mariners must be made aware that increases in tailrace flow can occur at any time and without notice.

6.2 Communications

It is noted that VHF reception in Doubtful Sound is patchy and there is no cell phone reception. It is therefore very difficult to provide real-time information to boat users about the MPS discharge, although the DCOET has internet access. As the water outflow may be increased or decreased without notice, the information in 6.1 will generally be all that is available to the local mariners.

Using this information, weather forecasts, a visual appraisal at the time, and knowledge of the handling capabilities of his or her boat a captain can then make informed decisions as to the planning and execution of their boating trip.

For the purpose of boating in Doubtful Sound, or anywhere for that matter, the definition of a 'captain' is that of being the person in charge of the vessel on the water. In this case, whether it is the captain of a Real Journey's tourist vessel carrying a hundred or more passengers or the sole occupant of a kayak they are both responsible for the safety of all aboard. As such it is incumbent upon them to collect as much relevant information (weather forecast, sea conditions etc) as they can in order to make correct, informed decisions that lead to a safe boating trip for all concerned. Equally so, it is incumbent on Meridian Energy to make easily available all relevant information that may impact on the boating fraternity. Should captains make wrong decisions it should not be the result of insufficient information.

6.3 Deep Cove Outdoor Education Trust (DCOET)

Young people on a wilderness challenge are an integral part of DCOET's purpose. It is possible that the increased flow from the MTAD proposal, in combination with adverse winds, may create longer or more periods of adverse marine conditions thus limiting this challenge by restricting operations on the water. However, any increased restrictions cannot at this stage be quantified.

I consider this type of wilderness experience is invaluable to young people and recommendations are made with a two aims: safety and minimisation of further limitations on their water activities. Any individual, group, or commercial operation venturing into the sea should be compliant with health and safety guidance, codes of practice, other relevant procedures, and be appropriately equipped for the conditions.

DCOET advise that access to the North side of the Sound is an integral part of their wilderness experience. In the past, during bad water conditions, alternative access to the North side has been possible by using the Portal Track (which is DoC-owned). However owing to recent rock falls this is now permanently closed for safety reasons. Meridian and DoC have agreed that alternative access would be feasible via a swing bridge which could be built over the tailrace. Provision of such a bridge would be the responsibility of DoC but would have the full support of Meridian. This bridge would lessen the pressure on DCOET to use boats in marginal conditions and also supply access to the North side in the event of emergencies

The existing DCOET pontoon boats are reaching the end of their useful life due to age. If DCOET replaced these boats, the new vessels may cope more effectively with the existing variability inherent in the tailrace flows. As an upgrade to their operating procedures, it is also considered prudent that DCOET review their safety boat status. At present, it is on a mooring about 30 metres from shore with fuel and lifejackets stored elsewhere. In the event of an emergency it could take up to twenty minutes to launch. An incapacitated boat or a person in the water could be well downstream by the time the rescue boat reached them; this may be exacerbated by the increase in current generated by MTAD in some circumstances. It was recommended by the author to DCOET that the safety boat be stored ashore, on wheels and ready to go at a moment's notice; it is understood that they are moving in this direction.

6.4 Sea kayaking

At times a combination of wind, tide and tailrace outflow can make for tough conditions for kayakers coming back to Deep Cove under paddle-power. Given that this is adventure tourism, it should, by its very nature be challenging at times. Whilst it may be challenging, there is no way of knowing at the moment if they are working so close to the 'edge' that the increased outflow from MTAD may make it impossible at times to get home without help.

Fiordland Wilderness Experiences is the only kayak company that has their clients paddling to and from Deep Cove. Other companies use powered boats to take the kayakers to and from Doubtful Sound out of Deep Cove. Some freedom kayakers may also paddle to and from Deep Cove from time to time.

If adequate tailrace outflow and current information is provided by Meridian to kayaking companies operating in Deep Cove, then the kayaking guides - who are basically 'Captains' in charge of a group of kayaks - would have sufficient information, when coupled with local weather conditions, upon which to make their decisions. If they make 'wrong' decisions it should not be for lack of information.



Figure 2: One of the boats tied to rope mooring off Meridian Wharf



Figure 3: Line up of four boats on the rope mooring

Attachment 1: Record of Site Visits

Site visit: 30 – 31 May 2007

This was a visit during “normal” flow from the tailrace. Some cruising time was spent on the Real Journey’s tourist vessel “Fiordland Navigator” and some time in Meridian’s boat “Little Slick”. This latter is a 5.4m aluminium pontoon cuddy boat with an 115hp outboard.

The time in “Little Slick” was spent cruising in Deep Cove down as far as Elizabeth Island. The weather was not good with showers and W to NW winds to 30 knots.

The boat handled the conditions well. There were some isolated areas of standing waves (0.5m) as a result of wind against current effect. These areas could mostly be easily avoided. If not, no likely problems were foreseen with these conditions for boats of this size if properly handled. Such conditions could have posed problems though for boats the size of those run by DCOET.

During this visit it was noticed that there is a mooring in the middle of the eddy on the true right of the tailrace discharge. This is used at the moment by Nigel Lamb’s boat (see interview transcript). It is worth noting that boats must cross the main stream of the tailrace discharge to access this mooring.



Figure 4: A calm day in Deep Cove; the boat on the left of the picture is on the Deep Cove mooring; the barge to the right is anchored

Site visit: 10 – 11 July 2007 During HFT

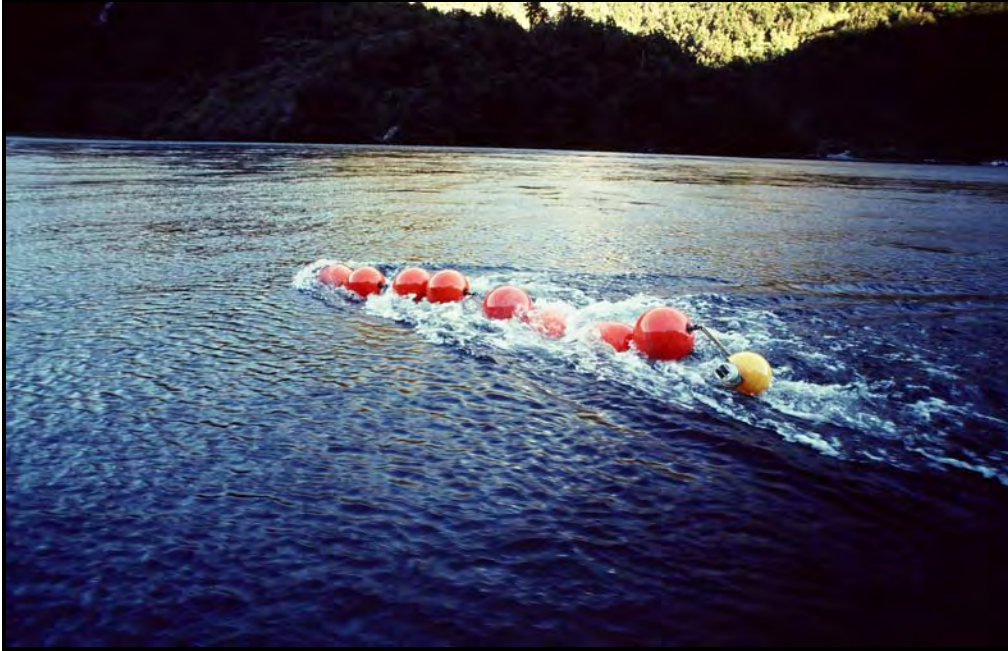


Figure 5: Tailrace flow at 350 m³/s



Figure 6: Tailrace flow at 650 m³/s

Rob Greenaway and I spent much of these two days on the water, mostly in one of the DCOET pontoon boats, but also spending some time in the other boats which were undertaking scientific work at the time. The weather for the two days was good with a light south easterly direction breeze most of the time. Owing to the light wind and its direction with the current flow as opposed to being against it, there were very few steepened waves observed.

The above two pictures are of buoys situated close to the exit of the tailrace and it should be noted how similar they are. We spent a considerable time in the DCOET boat around the tailrace exit in flows from about 350 m³/s to 650 m³/s and at no time were there any safety or constraint issues. Visually we found it impossible to judge whether the flow was high or low at any one time. The situation would have been very different if there had been a strong wind blowing against the current as this would have caused steepening waves.

The increased flow up to 650 m³/s had no apparent effect on the mooring on the NE side of the Cove.

Site visit: Deep Cove Outdoor Education Trust (DCOET) - 17 April 2008



Figure 7: Deep Cove Hostel school children on a calm day in Wanganella Cove

Rob Greenaway and I visited the Deep Cove Hostel on the morning of 17th April when it was occupied by children, parents and teachers from Limehills School, who incidentally have been going to the Deep Cove Hostel for 30 years. During and after an interview with Charlie Paterson

the Hostel manager (see interview transcript) we talked informally to the Head Teacher from the school and two of the parents who were boat drivers.

We then observed the children and supervising adults in the two pontoon boats that are used by the Hostel. We ourselves used the Hostel rescue boat during this time. The weather was perfect with no wind and no apparent pressure waves. On a day like this with no wind there were no problems at all with using the small pontoon boats in Deep Cove no matter what was the rate of tailrace flow.

Thanks are due to the Head Teacher and her team from Limehills for amending their programme in order that we could see school children in action on the water.

Attachment 2: Accident Record: Maritime New Zealand

To date there have been five reported accidents / incidents in Doubtful Sound as a whole. None of the accidents, or incidents were related to the outflow from the tailrace.

This was confirmed by email correspondence with Jo Sweetman-King of Maritime NZ (dated 7 March 2008) and illustrated in the following table.

Table 1: Accidents Recorded in Doubtful Sound (Commercial and Recreational) Since 1993

Date	Boat	Incident	Description
6/8/2008	Commercial Passenger Vessel	Person Overboard	The vessel was approaching the wharf at Deep Cove and approximately 50 metres out and idling at about five knots. Another vessel was on the wharf at the time and the Skipper thought about going alongside but changed his mind and decided to go to the unloading platform. He put on a bit more power and suddenly heard a yell from the aft deck. He put the vessel out of gear and went out onto the deck. He noticed the door to the dive platform open and a woman passenger in the water, out to the stern of the vessel. The Skipper spun the vessel round and pulled alongside the woman, who was laying across the life ring her husband had thrown to her. She was pulled onboard the vessel uninjured. It was discovered that the woman was cleaning a paua shell and leaning over the dive platform when the Skipper put more power on and she fell overboard. She had opened the stern door and kneeled on the platform to clean the shell without seeking the permission of the Master.
23/12/2005	Commercial Passenger Vessel	Machinery Failure	Shaft to blower on top of engine stripped the spline at both ends. The vessel was towed to Blanket Bay by another vessel. Another vessel then towed it from Blanket Bay to Deep Cove for repairs.
21/06/2003	Recreational	Grounding	Skipper became disorientated on approach to Blanket Bay. Due to heavy rain blurring radar and another vessel's lights, causing the Skipper to misjudge the distance between the vessel and Blanket Bay.
17/11/2005	Recreational	Machinery	The motor struck a rock and stopped it could not be

Date	Boat	Incident	Description
		Failure	restarted and the vessel was thrown onto the rocks.
23/03/1995	Commercial Passenger	Machinery Failure	Steering failure due to hydraulic failure
12/081993	Commercial Fishing	Grounding	<p>At around midday while setting a crayfish pot off the Shelter Islands inside the entrance to the Sound the skipper lost his footing and fell overboard some 20 metres out from the northern shore of the largest island in this group. The vessel, in gear at idling revs, proceeded on disappearing from view while the Skipper was in the water. On gaining the shore he heard the engine and made his way round the island following the sound. He found the vessel at the bottom of a cliff and about 20 metres up a narrow gutway with the sea breaking over it. The EPIRB was removed and activated. An attempt was made to seek assistance with VHF but by then the aerials had been carried away. Another call using the SSB equipment was successful and the FV "Exporter" was alerted and picked the Skipper up.</p>

Attachment 3: Interview Transcripts

7TH APRIL 2008

TELEPHONE INTERVIEW WITH GRAHAM SHARP.

POSITION.

Executive member, Gore Boat Club.

RESPONSIBILITIES.

Every second Easter since 1988 he has organised a group trip of club members to go into Doubtful Sound.

Each trip about 12 to 14 boats are taken in over the Wilmot Pass. The boats are all motor boats and range from 5m to 8m in length. Each trip lasts one week.

PROBLEMS/INCIDENTS.

In all these trips Graham has never had, or been aware of, any incidents or problems that have occurred in Doubtful Sound resulting from the flow from the tailrace.

Certified as a true and correct record:..........

(Signature)

Dated: 9-4-08.....

4TH APRIL 2008

INTERVIEW WITH KEVIN O'SULLIVAN.

POSITION.

Employed by Environment Southland as HarbourMaster for the whole Southland region.

RESPONSIBILITIES.

He was appointed under the Local Government Act of 1974 and has oversight of all navigation and associated water safety in Southland.

FREQUENCY OF VISITS TO DOUBTFUL SOUND.

Five or six times in 2007

PARAMETERS NOW WITH WATER FLOW.

He has noticed head currents once when travelling up Doubtful Sound near Elizabeth Island in November 2007. He was in a charter vessel the "Tutuko" a 20 metre launch. The current slowed the vessel by approximately 2 knots but this was nothing that would be a danger to safety or navigation.

PROBLEMS/INCIDENTS.

As HarbourMaster he should be notified of all relevant marine incidents/accidents in Southland. He knows of no incidents or accidents that have occurred in Doubtful Sound resulting from the flow from the tailrace.

Pacific Shipping

From: Pacific Shipping [topship@xtra.co.nz]
Sent: Monday, 7 April 2008 10:31 a.m.
To: topship@xtra.co.nz
Subject: FW: 4TH APRIL 2008.doc

From: Kevin O'sullivan [mailto:kevin.osullivan@es.govt.nz]
Sent: Friday, 4 April 2008 8:04 p.m.
To: Pacific Shipping
Subject: RE: 4TH APRIL 2008.doc

Hi Tom

A true and correct record.

Regards

Kevin

Kevin O'Sullivan

From: Peychers [peych@woosh.co.nz]
Sent: Monday, 28 April 2008 9:39 p.m.
To: Pacific Shipping Ltd
Subject: Re: Deep Cove tailrace

Hi Tom

that's fine

Regards Mark

----- Original Message -----

From: [Pacific Shipping Ltd](#)

To: peych@woosh.co.nz

Cc: [topship](#)

Sent: Monday, April 28, 2008 5:50 PM

Subject: Deep Cove tailrace

Good Evening Mark,

Here follows a transcript of our telephone conversation. As` discussed, please reply if you would confirming it's what you said.

Thanks

Tom

TELEPHONE INTERVIEW WITH MARK PEYSCHERS 28/4/08

Mark has been a Fiordland Marine Guardian for about seven years.

He has a wide experience of Doubtful Sound over a period of thirty years as both a commercial fisherman in Fiordland and for the last eighteen months as second captain on the Department of Conservation vessel "Southern Wind".

In this thirty years experience he knows of no incidents concerning vessel safety that have occurred owing to the flow from the tailrace at Deep Cove.

20th APRIL 2008

TELEPHONE INTERVIEW WITH ROBIN WILSON

Position

Robin is one of 20 owners of the vessel “James McKerrow”

The Vessel

“James McKerrow” is a 14 metre wooden launch. It has been based in Deep Cove since 1995 and has been owned by this syndicate since 1997.

The vessel is used recreationally by the owners and their friends for about 40 weekends each year.

Parameters Now With Water Flow

The vessel is always moored with the bow pointing out of the Sound and facing the oncoming counter-current from the tailrace flow.

Mooring

This vessel is one of five that moor by tying to a long, strong rope that is fixed to the Meridian wharf at one end, is looped round a steel mooring dolphin immediately south and then to one of the mooring points in the rock face about 70 metres further south that were used for the Wanganella.

Whilst this mooring system is not consented, it is recognised in the Environment Southland Coastal Plan as an existing use and is accepted as an efficient method for mooring vessels in the area

Incidents

The only incident that Robin is aware of occurred about seven years ago when the mooring rope mentioned above broke. Luckily it broke between the forward and after lines of his vessel, so that the vessel itself acted as the mooring rope. Had it parted between vessels the two ends of the mooring rope would have swung out with the currents and caused possible damage to any vessels attached.

The cause of this mooring rope breaking cannot be ascertained. There is no evidence that it was due to the counter-current.

17TH APRIL 2008

INTERVIEW WITH CHARLIE PATERSON

Position

Charlie has been Manager of the Deep Cove Hostel for 3 ½ years. The Hostel is run by the Deep Cove Outdoor Education Trust.

Scope

The Hostel has been operational since 1971 and is situated on the south side of Deep Cove. About 2000 pupils from 21 schools visit annually, staying 3 – 5 days.

As part of their Deep Cove experience they spend some time in small boats.

Three boats are available. All are aluminium pontoon boats. Two are approximately 4m long, one of these is rated for five children and one adult; the other for eight children and two adults. The third boat is a rescue boat and is kept behind as an emergency boat when the others are in use.

Safety Parameters

The boats are run to SGS/MNI safety audit requirements. All people involved in the school camps get a general boat safety briefing from the Manager. Parents or teachers nominated as boat drivers receive a special briefing. Following this the nominated drivers can use the boats in Wanganella Cove without permission. However, should they be required, or wish, to cross the tailrace flow they must get special permission from the Manager to do so.

The Manager will give, or deny, permission after visual assessment of weather and water conditions. Such permissions are refused approximately one third of the time.

Weather / Water Parameters

Charlie states that increased or decreased flow from the tailrace is as relevant to the water surface conditions as wind and tide. A flood (rising) tide or a wind coming up the Sound against the water flow will cause waves on the surface to heighten and steepen (see Appendix...NIWA). Such pressure waves are generally localised and can be uncomfortable to small boats.

Areas of such waves will be a reason for the manager to refuse permission for boats to cross the tailrace current.

It should be noted that the walking track over the tailrace portal is repaired and open again. Accordingly young people can walk to and from the Helena Falls as opposed to having to go by boat, as previously when the track was unserviceable or "out of use"?. Boats now seldom have to cross the tailrace current.

Incidents

In 3 ½ years Charlie knows of only one incident happening with the boats that related to the tailrace flow.

This was a driver misjudgement incident where one of the boats was semi swamped by pressure waves.

Being pontoon boats they are very safe and will float even when fully swamped, with the outboard power pack above the water. They are capable of being driven to shore in this condition.

Note

Charlie was not allowed to authorize this statement owing to DCOET policy. Paul Gay and Judith Cambridge both disagreed with the statement “[b]oats now seldom have to cross the tailrace current”.

Please see interview transcript with Paul Gay and Judith Cambridge.

30th April 2008

INTERVIEW WITH PAUL GAY AND JUDITH CAMBRIDGE

Please refer also to the interview transcript, 17/4/08 of Charlie Paterson, Hostel Manager for DCOET

Position

Paul has been Chairman of DCOET since its inception. Judith is a member of the Trust Board.

Incidents

Whilst in the interview with Charlie Paterson he mentioned one boat swamping that he knew about, Paul knew of another similar incident, but did not know the cause.

History and Present Condition

It would appear that there are two incidents mentioned above known about. In addition although Charlie stated that crossings of the tailrace current are cancelled about one third of the time for weather or water reasons, Paul thinks this figure is a minimum and the actual figure would be higher.

Also, while they both agree that the interview transcript with Charlie is mostly factual they would disagree with the statement “Boats now seldom have to cross the tailrace current”. They point out that their boats cross the current not only to take children to and from Helena Falls, but also that the water area on the far side is used for fishing, water sampling and general exploring of the Northern shoreline.

Overall it appears that with two boat swampings and trips across the current cancelled over one third of the time that the conditions, whilst not being inherently unsafe at present, can be marginal for some of the children’s activities.

Water and Safety Parameters

DCOET endeavours to give the school children in their care a memorable and exciting wilderness and water experience. Whilst this experience must never be dangerous, it must be exciting. To achieve this, safety is paramount but they feel that restrictions must be kept to a safe minimum.

There are already weather and water restrictions on crossing the tailrace as mentioned in the previous paragraph. In addition, although the Helena Falls track is open now after a two year closure it is liable to be closed by DoC at short notice. The DoC consent specifies that DoC will close the track for safety reasons after heavy rain or seismic events. Such events can be common in this area.

Parties walking to the Helena Falls also have to cross the stream that flows from it. This has been known to rise very rapidly and on at least one occasion a children’s party had to be brought back by DCOET boats as the stream had risen so much as to make crossing unsafe.

Summary

Overall Paul and Judith find that the weather and water safety parameters they have at present are restrictive but necessary. They worry that increased tailrace flow will further restrict the children's activities in the area and severely impinge upon their stated aim of a memorable and exciting wilderness and water experience.

PLEASE NOTE. This is believed to be a true and correct record of the interview, but has not yet been confirmed by Paul or Judith.

BILL GIBSON AND DAPHNE TAYLOR, OWNER/OPERATORS FIORDLAND WILDERNESS EXPERIENCES.

Personal interview with Rob Greenaway and Tom Sawyer. Written up by Rob Greenaway.

Bill and Daphne established Fiordland Wilderness Experiences in 1992 to offer guided sea kayaking in Fiordland and on Lakes Te Anau and Manapouri. They are founding and current members of the NZ Sea Kayak Operators Association and are a Qualmark Endorsed Visitor Activity. Their concessions and related codes of behaviour permit them to kayak in the 'no-boat' zones in the fiords (a lot of work over many years went into gaining concessions and consents).

Fiordland Wilderness Experiences currently offers single-day packages on Milford Sound, multi-day trips in Doubtful Sound and single and multi-day trips on Lakes Manapouri and Te Anau. Milford tours operate from October to May, and in Doubtful Sound from October to April, inclusive. Seven full-time guides are employed each season. While they take twice as many tours on Milford than on Doubtful Sound, the longer trips on Doubtful means they can have up to 24 people on the water at any one time on the latter, and up to 16 on Milford.

The overnight tours are self-catering, and this ensures clients are to some degree self-reliant and sufficiently competent to be in a wilderness setting. They also offer rental kayaks, but have a selection process to ensure clients are competent (minimum age, no solo rentals, experienced paddlers).

Guided and rental parties are equipped with two-way hand-held VHF radios, and on Doubtful Sound guided parties also carry a more powerful 24 volt VHF. The Hall Arm campsite is equipped with a satellite phone. There is poor reception near Deep Cove, and in many other parts of the fiords, and all operators, including the DCOET hostel, cooperate to relay calls if required. Bill and Daphne consider the communications systems in the area to be weak considering the level of local tourism activity. The existing marine radio repeater funded by the Fiordland Fisherman's Association is aimed at boats off the coast. DOC has temporary repeaters in place to assist predator control work on Secretary Island, but these will be removed once this work is complete. Real Journeys has been considering installing a repeater.

The business has a rescue boat on the hard in Deep Cove, but this is rarely used and there is no on-site skipper. If the weather looks doubtful, Bill will head over to Deep Cove and await a call, if needed. The

boat is too small to take all members of a guided tour, and several return trips are required. The boat is consented with Environment Southland as a safety vessel and can only be used as such – although ‘safety’ is not defined in the consent. Bill and Daphne assume this means that they cannot use it to take kayaks out from Deep Cove if the local conditions are too rough. All consents for tour boats on the Sound are allocated (Bill and Daphne were the key individuals who pushed for a limited number of consents) and so there is no scope under the current Southland Coastal Plan to create a new boat-supported kayak operation.

The Manapouri discharge is always a consideration when paddling in the Sound, and varies from a mild inconvenience to a major consideration when weather conditions compound. A strong current and high standing waves means guides have to make some serious decisions about the route taken and the abilities of their clients. When conditions permit, and there is a north-west or up-fiord wind – which is not uncommon in the afternoons – parties heading back to Deep Cove will travel in the middle of the Sound, where there is plenty of sea-room, and use the wind to push them along, often with sails. When conditions are rough, the groups will raft-up to create a more stable platform. When the current is too strong, headway is lost and the group must paddle along the edge of the fiord. Although there are many eddies between headlands with a counter-current which may assist paddling, the headlands can feature strong winds, waves and currents, and even the eddies can present unusual and rough conditions. Head-currents slow paddlers, and if they are not sufficiently skilled in steering, they can also push the bow of the boats away from the coast and back into the main current, and even turn the boats around. More skilled kayakers know to adjust their paddling and steering to stay on track. However, the sides of the fiord generally offer easier paddling routes when there is little wind (not enough to sail) and a strong current.

Bill and Daphne have noted a change in the discharge pattern after the completion of the second tailrace. For example, the Rolla Island gap is normally a comfortable position in which to rest and wait for conditions to improve before moving around the headland into Deep Cove, although it has always had some tidal or discharge-influenced current. In recent years there is often a more confused current and it takes more energy to stay within shelter. The safety manual for the operation has had to be updated as a result. The Hall Arm intersection is often a tricky area, with occasional high waves east of and opposite Elizabeth Island. On one-day trips, the route normally takes kayakers to the north of Elizabeth Island and the guide must then make a decision about where to cross back to the south of the fiord, considering currents, winds and waves.

Bill and Daphne find it difficult to put their finger on the discharge as the main cause of any single sea condition. For example, in heavy rains there are also standing waves at the mouth of Hall Arm as water escapes. The degree of leeway in light of changing or higher flows is therefore not clear.

Over time, as business operators in a dynamic natural environment, Bill and Daphne are getting more cautious and feel that they are more likely to cancel trips than when they first started, reflecting the changing ‘risk climate’. They also note that tourists are less flexible than in former years, with shorter holidays and more committed schedules. Whereas they used to accept sitting out a weather event, they now move on. Cancellations are therefore more costly to the company.

Bill estimates that an average kayaker travels a little faster than walking speed, which is about 5 km/hr. A good speed is around 3 knots (5.5 km/hr), but 2.5 knots would be more sustainable (4.6 km/hr).

**NIGEL LAMB, OWNER/OPERATOR DOUBTFUL SOUND CRUISES (FIORDLAND EXPLORER CHARTERS LTD)
TELEPHONE INTERVIEW BY ROB GREENAWAY.**

Doubtful Sound Cruises offers a full-day tour package including a cruise across Lake Manapouri to the DOC visitor centre at West Arm, a tour of the power station and a three-hour cruise on Doubtful Sound aboard the catamaran, Charmaine Karol. The main season is October to April, but the operation runs all year. Nigel only occasionally pilots the vessel. He also owns a launch moored in the Helena Anchorage.

The Charmaine Karol is moored inside Brasell Point and uses the Meridian wharf in Deep Cove for boarding passengers. Normally the service operates with only the skipper as crew.

Nigel has observed that the back-eddy in Wanganella Cove always dominates over local tidal currents. In the heads of other fiords there is normally very little current effect and boats will answer to the wind rather than the direction of the tide. In Wanganella Cove there is always a current influenced by the Manapouri discharge, and its strength varies over time and location within the Cove. For example, at his mooring inside Brasell Point there is very little, if any, current. At the slipway, some effect is apparent, and at the Meridian wharf, it is often quite strong. The current moves in a general southerly direction, counter to the flow of the Manapouri discharge. However, there is often an additional flow away from the walls of the Cove. This can create a push on boats as they attempt to berth, making getting alongside difficult. With crew it may be possible to get a line off the bow onto shore and to then bring the boat side on. However, with only the skipper on board the Charmaine Karol, this is more difficult.

The side current is generally quite manageable, being only occasional and not of sufficient strength to limit any berthing activities.

The current at Helena Anchorage is quite variable – sometimes there is no flow around the boat and at others times there is a discernable current. Nigel has not worked out if the stronger flows coincide with a particular state of the tide. Overall though, the anchorage remains very comfortable and well sheltered.



9 Appendix 9: Manapouri Tailrace Amended Discharge: Distribution of Tailrace Flows Through the Day. Ollie McCahon memo



Memo

To	Rob Greenaway, Tom Sawyer
Copy	Dave Herrick, Lisa Mead, Richard Turner
From	Olly McCahon – Modelling Services Manager, Meridian Energy
Date	10 September 2008
Subject	Manapouri Tailrace Amended Discharge: Distribution of Tailrace Flows Through the Day

Dear Rob and Tom,

This memo is in response to your request for more detail in the description of the Manapouri tailrace flows than is available from the daily average flows produced by the SoDaPop modelling.

9.1 Introduction

Although Meridian has extensive historical records of Manapouri operation and tailrace flows, this data is of limited value when considering how the tailrace would operate with a higher consented maximum discharge.

Extensive data describing the Manapouri tailrace discharge with the maximum consented discharge increased to 550 cumecs has been produced by the SoDaPop modelling. However, this data is in terms of daily average flows that do not describe how the tailrace would behave over shorter timeframes.

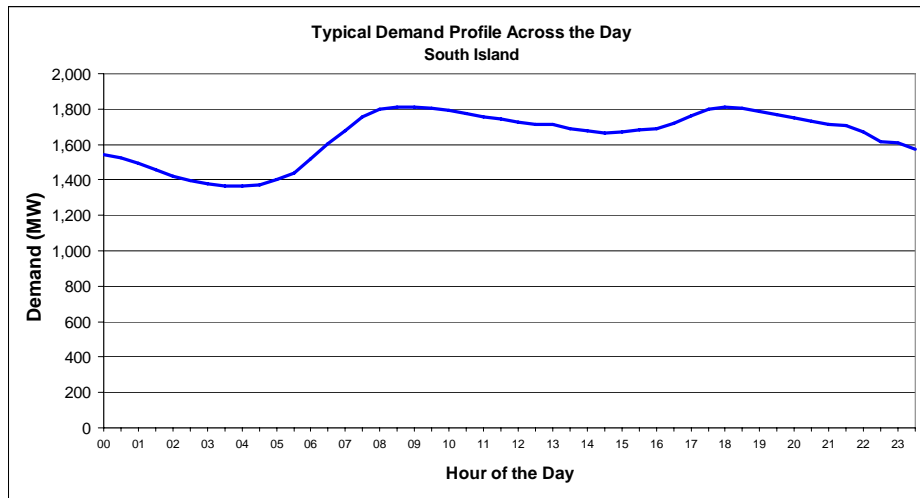
Despite this, sufficient insights about the tailrace flows can be drawn from the SoDaPop results to make provision of detailed flow data unnecessary. The SoDaPop results show that high tailrace flows will occur in all months of the year. This means that surface water users in Doubtful Sound will be on the water when the tailrace is discharging 550 cumecs.

Analysis of the daily profile of electricity demand shows that high tailrace flows are most likely to occur during the mornings and the evenings of weekdays.

9.2 Pattern of High Tailrace Flows

9.2.1 Typical Daily Demand Profiles

Figure 1: A typical profile across the day for electricity demand in the South Island.



Key Points:

- Demand is lowest in the early hours of the morning.
- Demand is highest between 7:30am and 10:30am in the morning, and again between 5:00pm and 7:30pm in the evening.
- Total generation must exactly follow this pattern, and most generators follow it to at least some extent.

9.2.2 Meeting Demand Peaks at Manapouri

Frequently there is only enough water available at Manapouri for the station to generate at high output for part of the day. At such times the station will run at low generation levels at night and during the weekends and at high generation levels during periods of peak demand and during periods of high prices.

As illustrated above, in the South Island the morning peak starts between 6:30 and 7am and reaches its maximum around 9am. This level is maintained until mid-morning. The evening peak starts around 5pm and lasts 3 or 4 hours.

This demand pattern leads to the station ramping up to meet the morning peak, and down again after the evening peak. The station may also reduce generation across the middle of the day. This means that high tailrace flows are most likely to occur during mornings and evenings. This behaviour will be less pronounced during weekends when demand is lower than during the week.

9.2.3 Influence of Price

While demand must be met, it is electricity prices that provide the signals to generators about how much to generate, and when to generate it. Electricity prices generally follow the demand profile, but transmission constraints often lead to price differences between regions. In the case of Manapouri, the electricity price in Southland may be different to the rest of the South Island because of transmission constraints between Southland and the rest of the island.

These transmission driven price differences can lead to Manapouri generation having a bigger differential between peak and off-peak generation than would result from the demand profile alone. This is because transmission constraints can lead to abrupt increases in price which lead Manapouri to increase its generation.

Transmission driven price differences also occur at off-peak times and can lead to Manapouri generating hard during the night, and during weekends.

9.2.4 SoDaPop Results

The SoDaPop modelling is discussed, and the results summarised, in the report written by Mark Mabin of URS New Zealand Ltd²⁴. In that document the results are described as annual summaries by wet, typical and dry years. Because surface water use is more intensive in summer than winter, this memo summarises the tailrace flows as flow duration curves by month. These graphs appear in 0, and show that the tailrace can be expected to operate all day at 550cumecs for at least some days in every month. For days in which the daily average flow is less than 550 cumecs, the tailrace flow can be expected to follow the daily demand profile shown in Figure 1 above. Thus the tailrace flows may still reach 550 cumecs for a few hours of the day.

The following table s summarise the data by month for the year (Table 1) and by flow band for the summer months (Table 2).

Table 1 summarises the data to show the average number of days per month that the tailrace can be expected to operate at full capacity (550 cumecs) for the whole day (middle column) and the average number of days per month for which the average daily flow will be 500 cumecs or higher (right column). When the average flow for a day is above 500 cumecs, the station can be expected to run close to its maximum of 550 cumecs during the morning and/or evening, and below 500 cumecs during the night.

Table 1: Tailrace Flows from SoDaPop Results

Tailrace Flows - Average Days per Month		
SoDaPop Results		
	Flow close to 550 cumecs for the whole day	Average Flow for the day exceeds 500 cumecs
January	3	12
February	2	7
March	2	7
April	2	8
May	2	9
June	2	8
July	1	8
August	1	8
September	3	11
October	6	17
November	5	17
December	4	14

Key Points:

- These are the modelled long-run averages over the historical inflow sequences from 1947 to 2006.
- Manapouri generation is highest during the high inflow periods of spring and early summer.
- On average, tailrace flows close to 550 cumecs and lasting for more than a day at a time will be uncommon.
- However, during prolonged wet periods tailrace flows close to 550 cumecs could last for a week or more.

²⁴ Manapouri Tailrace Amended Discharge Project (MTAD): Hydrology Assessment (URS 2008)

- When the daily average flow exceeds 500 cumecs, Manapouri can be expected to generate close to full capacity during the morning and afternoon demand peaks and at times of high prices in Southland. However, during these 24-hour periods Manapouri will almost certainly generate below 500 cumecs during the night.
- On average, during spring and summer at least half of the days can expect tailrace flows close to 550 cumecs for at least a few hours.
- High tailrace flows will occur less often during weekends than on weekdays, but will still occur in some weekends in all months.

Table 2 shows statistics for the tailrace flows over the recreational period October to April inclusive, referred to as the 'summer'. The statistics are by flow band, segregated into wet, typical and dry years. For the classification of years into these categories refer to the report written by Mark Mabin of URS New Zealand Ltd²⁵.

Table 2: Summer Tailrace Flows from SoDaPop Results

Discharge (m ³ /s)	Mean days per 'summer' of flow in bands			Mean event duration in days – 'summer'		
	Wet	Typical	Dry	Wet	Typical	Dry
485 - 499	6.9	6.7	5.4	1.8	1.5	1.5
500 - 524	15.4	16.9	11.9	3.0	3.0	3.6
525 - 549	56.6	45.9	22.5	8.0	8.8	9.4
550	61.1	18.3	5.5	14.9	9.5	10.2

Key Points:

- The statistics were calculated from the SoDaPop results for the years 1947 to 2006.
- The mean days per 'summer': The number of 'summer' days (1 October to 30 April) in which the tailrace flow is in the band, divided by the number of years of the type (wet, typical or dry).
- The mean event duration in days: An event is defined as a period of time during which the tailrace flow is within the flow band. The mean duration is the average length in days of these events.
- The days per summer in each flow band decrease from wet years to dry years.
- The average duration of the high flow events is longer in dry years than in typical years. This is because there are only 6 high flow events during the dry years, but 3 of these last for 1 week, 2.5 weeks and 4 weeks respectively. In the typical years there are 75 high flow events, many of which last only a day or two.

9.3 Rates of Change in Tailrace Flows

9.3.1 High Flow Trials

When the tailrace discharge increases, the current speed in Doubtful Sound also increases. The following table was derived from the results of the high flow trials of 9 - 13 July 2007²⁶ and illustrates how the current speed increases as the tailrace discharge increases.

Table 3: Increase in Current Speed with Increase in Tailrace Discharge

Discharge (m ³ /s)	Mean increase in current speed
485	0
500	3%
525	7%
550	12%

9.3.2 Historical Data

Half-hourly generation flows were extracted from Meridian's databases for the period since the second tailrace tunnel was commissioned (01 June 2002 to 30 March 2008). Half-hourly rates of increase in tailrace flows were derived from this data. Rates of decrease were not calculated because they are not relevant to the safety of surface water users. This analysis shows that tailrace flows have increased at rates in excess of 200 cumecs in a half-hour period on a small number of occasions. However, it is uncommon for tailrace flows to increase this quickly. The 1st percentile of the rate of increase is 70 cumecs in half an hour, and the 5th percentile is 22 cumecs in half an hour.

To put this in context, if the maximum allowed discharge is increased to 550 cumecs the average tailrace flow at Manapouri is predicted to be 392 cumecs.

9.3.3 Station Responses to Frequency Excursions on the Grid

The response of Manapouri to frequency excursions resulting from another station tripping is discussed in the memo "Frequency Responses at Manapouri"²⁷. The main points of this memo are summarised here.

In common with all other stations supplying electricity to the grid, Manapouri will automatically increase its generation if another station trips (abruptly stops generating). Station trips are referred to as a "Contingent Events".

A Contingent Event could lead to Manapouri increasing its generation by 70 to 80 MW, and the tailrace flow by 45 to 55 cumecs. If an event of this size occurs when Manapouri is generating above 500 cumecs the tailrace flow is likely to go above 550 cumecs for a short period of time (less than 15 minutes). Analysis of the system operator guidelines²⁸ and the SoDaPop results suggest that an event of this size could coincide with tailrace flows greater than 500 cumecs up to twice a year. However, because the operator guidelines on event frequency are upper bounds the frequency of events leading to tailrace flows greater than 550 cumecs should be less than this.

The guidelines for the system operator also provide for "Extreme Contingent Events". These events result from the failure of a large component of the system, such as a sub-station or transmission line, or from two contingent events occurring very close together. Guidelines for the system operator state that events of this magnitude should occur less than once every 5 years.

²⁶ Hadfield, M.G., O'Callaghan, J., Stevens, C.L., Grant, B., Stewart, C., 2008. *Effects of Manapouri Tailrace high-flow conditions on currents and waves in Deep Cove and Doubtful Sound*. NIWA Client Report: WLG2007-75

²⁷ *Frequency Responses at Manapouri*. Olly McCahon, 26 May 2008

²⁸ The system operator is responsible for operation of the national transmission grid.

Under an Extreme Contingent Event each unit at Manapouri might increase its output by up to 35MW in a few minutes. In a situation where all seven units are running, this could lead to an increase in tailrace flow of 170 cumecs in a few minutes and will almost certainly result in tailrace flows in excess of 550 cumecs. However, it is important to note that the capability of the units limits the maximum possible tailrace discharge to around 665 cumecs. This means that increases of 170 cumecs are not possible when the tailrace discharge exceeds 500 cumecs. It is also impossible for increases of 170 cumecs to occur when fewer than seven units are on-line.

Very high flows resulting from a frequency excursion will be of short duration, because the system operator is required to reduce the output of all stations to normal levels within about 15 minutes of the event. Typically, the time to return to normal output is around 5 minutes.

9.4 Summary

- In the event that the maximum allowed tailrace discharge at Manapouri is increased to 550 cumecs, the tailrace discharge can be expected to reach that level on a regular basis. The tailrace will discharge at 550 cumecs for days at a time during periods of sustained high inflows and this can happen in all months of the year.
- Analysis of the outputs from the SoDaPop modelling, combined with consideration of the profile of electricity demand across the day, show that high tailrace flows can be expected on at least half of the days of spring and summer.
- The profile of electricity demand across the day shows that peaks in demand occur in the mornings and evenings. As a result, high tailrace flows are most likely to occur during these times, although they can happen at any time.
- Very high tailrace flows, up to 665 cumecs, could occur in response to an extreme contingent event when the station is generating close to 550 cumecs. However, it would very uncommon for extreme contingent events to occur when Manapouri is generating this hard. The probability is probably less than once every 50 years. The resulting high discharge is of short duration because the system operator is required to return the station to normal operation within 15 minutes of the event. Typically, the time to return to normal output is around 5 minutes.
- Rapid changes in tailrace flows at Manapouri occur quite regularly. Historically, increases in tailrace flows have occasionally exceeded 200 cumecs in half an hour, although they are normally less than 70 cumecs in half an hour. This pattern can be expected to continue.
- A system event leading to very high tailrace flows will also involve a rapid increase in the flows. In an extreme contingent event the increase could be 170 cumecs in a few minutes. The system operator's guideline for extreme contingent events states that these should occur less than once every 5 years. As discussed above, such events can only lead to increases of 170 cumecs when the tailrace discharge is less than 500 cumecs and all seven units are online and not generating hard. This means that the likelihood of an increase of 170 cumecs at Manapouri is much lower than one every 5 years.

Tailrace Flow Duration Curves – SoDaPop Modelling

