Marsden Point
Air Quality
Strategy

NORTHLAND REGIONAL COUNCIL

CARING FOR NORTHLAND AND ITS ENVIRONMENT

Marsden Point Air Quality Strategy

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1. Introduction

Industrial development of Marsden Point has the potential to significantly affect the air quality in the area. There is particular concern for the residential or 'Living' areas of Whangarei Heads, Ruakaka and One Tree Point and those areas having significant ecological values.

This strategy provides a framework for the future management of the Marsden Point area to ensure consistent and equitable decisions on future air discharge consent applications. The strategy recognises the benefits of the existing development while ensuring air quality remains within acceptable levels and that areas of significant ecological value are protected.

The contaminants identified as being critical in the Marsden Point area are particulate matter smaller than ten micron (PM_{10}), sulphur dioxide (SO_2), and nitrogen dioxide (NO_2). The strategy focuses on managing these critical contaminants but also provides guidance for other potential discharges of contaminants to air.

There are a number of developments that have had a major bearing on the strategy and these have been resolved just recently. Notable issues include the specifications of 'air sheds' or 'local air management areas' by notice in the New Zealand Gazette, and the outcomes of the Resource Management Amendment Act 2005.

As far as possible, this report aims to present the strategy in a form that can be incorporated into the Regional Air Quality Plan for Northland with little change in format. The intention is to keep the report concise providing the outcomes of background work rather than a deliberation of issues and technical aspects.

2. Background

2.1 The District Plan

Marsden Point incorporates an area of around 560 hectares of land zoned 'Business 4' for heavy industrial purposes. At the time of writing, this industrial area encompasses the New Zealand Refining Company (NZRC) oil refinery and associated deep-water port, and a cargo port operated by Northport Limited. Other developments in the same area include the Carter Holt Harvey Ltd Laminated Veneer Lumber Plant and sawmill, utilities and several light industrial operations.

Most of the land in the Marsden Point business zone is currently used for pastoral farming and is under-utilised for industrial purposes. Industrial development is likely to occur in these areas, for example, the recent proposal to re-power the Marsden B power station up to 320 MW. This and other such proposals need to be considered in the light of their potential to have cumulative effects on air quality when combined with existing emissions.

Areas zoned *Living* under the Whangarei District Plan are located at Ruakaka and One Tree Point. Areas to the north and east of Marsden Point at Whangarei Heads are also zoned *Living* including the coastal communities of Urquharts Bay, McGregors Bay, McLeods Bay and Taurikura Bay. Notably, the *Living* zone at One Tree Point is in relatively close proximity to the oil refinery, the largest source of sulphur dioxide discharges in the area.

The District Plan also incorporates areas for future environments including *Business* and *Living* areas and a *Future Marine Village* at Marsden Point. *Future environments* are areas that have been identified to accommodate growth of a particular type over time. If these are developed in the Marsden Point area the present buffer between *Living* and *Business* Environments will be reduced. Any development or land use that proposes to utilise the provisions of the future environment is a discretionary activity and requires consent.

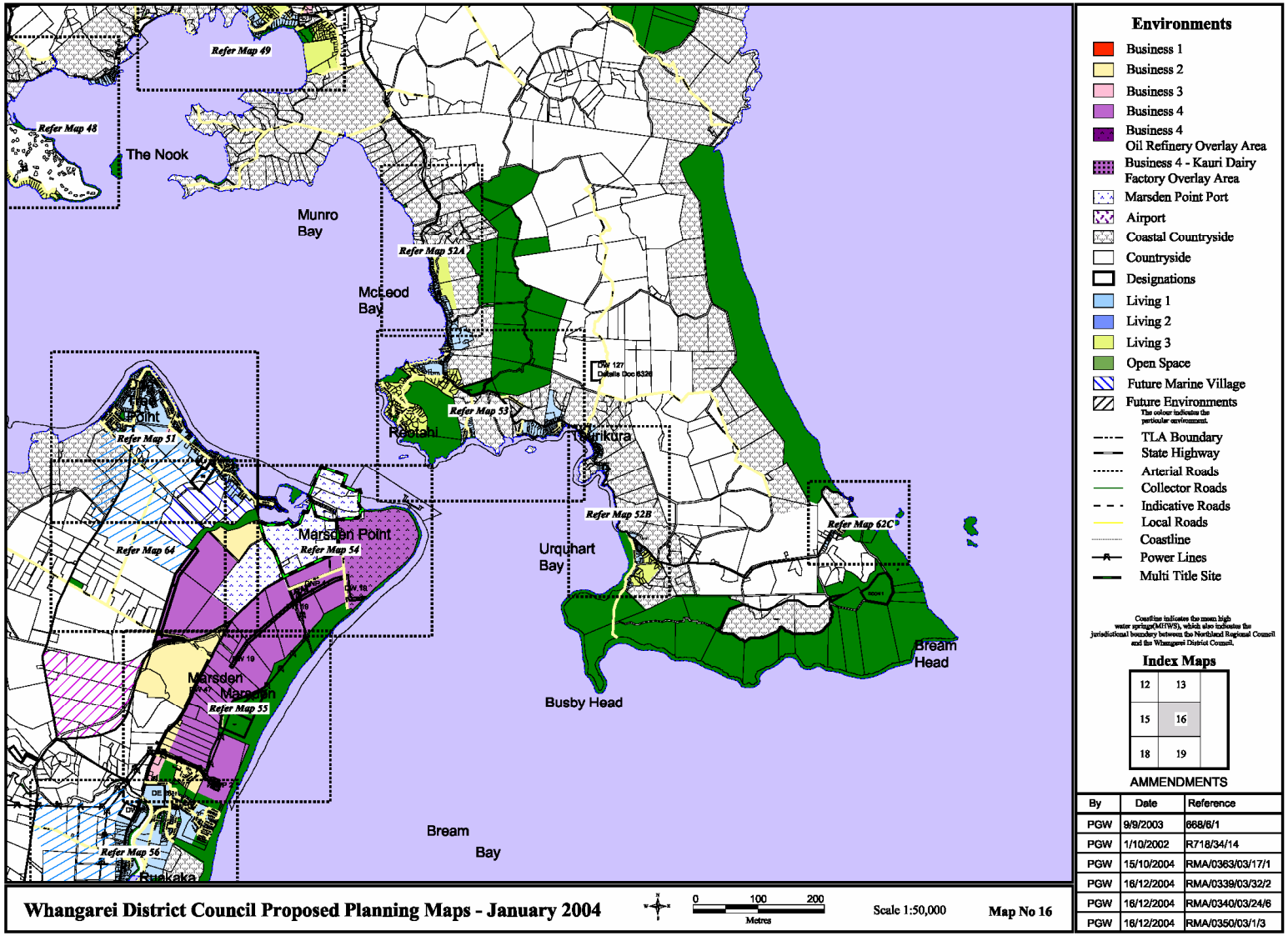
A decreasing buffer between *Living* and *Business* zones creates the potential for conflict from local air quality impacts and introduces the issue of reverse sensitivity. Reverse sensitivity is where a proposed sensitive activity may impose constraints on an existing less-sensitive activity already located within the area. Auckland RC v Auckland CC (EnvC) A010/97 confirmed that it is appropriate in some circumstances to make provisions addressing reverse sensitivity in district plans. Reverse sensitivity has been specifically incorporated into the Whangarei District Plan as a consideration for consent decisions involving Future, Living and Business Environments and the Future Marine Village Environment. In addition the Plan requires an amenity or buffer strip of at least a 50 m to minimise the reverse sensitivity effects between any Future Living Environment and adjoining Business Environments.

The NRC will continue to promote the consideration of reverse sensitivity effects in the Marsden Point area.

The District Plan classifies land as having significant ecological value within the vicinity of Marsden Point including Mt Manaia, Mt Aubery and the Bream Head Scenic Reserve.

Figure 2.1 illustrates the District Plan zoning boundaries for the area in question.

Figure 2.1 District Plan Zones



2.2 Regional Air Quality Plan

The Regional Air Quality Plan for Northland (RAQP) contains specific policies (Section 6.17) for Marsden Point, which give priority to developing an air quality strategy for the Marsden Point area.

A number of options for the strategy are identified in the RAQP, including relying on the policies in the plan, formulating ambient air quality standards, identifying maximum allowable discharge volumes of particular contaminants, and allowing the transfer of discharge volume allocations between discharges.

The policies for the entire Northland region are set out in section 6.7 of the RAQP. They include ambient air quality guidelines for the region, listed in Table 1, although the RAQP recognises that these guidelines may be subject to change. More recent guidelines have been developed by the Ministry for the Environment (MfE) and may therefore be used as preference.

- **Table 1 Ambient Air Quality Guidelines Listed in the Northland Regional Plan**

Indicator	Maximum Acceptable Level (µg/m^3)	Averaging Time
Particulates (PM10)	120	24-hr
	40	Annual
Sulphur dioxide	500	10-min
	350	1-hr
	125	24-hr
	50	Annual
Carbon monoxide	30,000	1-hr
	10,000	8-hr
Ozone	150	1-hr
	100	8-hr
Nitrogen dioxide	300	1-hr
	100	24-hr
Lead	0.5-1.0	3-month
Fluoride –special land use	1.8	12-hr
	1.5	24-hr
	0.8	7-day
	0.4	30-day
	0.25	90-day
	3.7	12-hr
	2.9	24-hr
Fluoride – general land use	1.7	7-day
	0.84	30-day
	0.5	90-day
Fluoride – conservation areas	0.1	90-day
Hydrogen Sulphide	7	30-min

The Regional Coastal Plan for Northland (RCP) covers air quality management in the Coastal Marine Area (CMA) of the Northland Region. The Marsden Point area is influenced by emissions arising from the CMA particularly from shipping, emissions from sources at Marsden Point also influence air quality in the CMA.

The policies relating to the discharge of contaminants into air from activities located within or near to the CMA are set out in section 20.4 of the RCP.

While regard has been had to the policies of the RAQP and the RCP in preparing this strategy, the Strategy has been developed recognising that the Marsden Point area is unique in Northland and requires its own framework of objectives and policies to ensure its future use as an industrial area while maintaining air quality within acceptable limits as set out below.

2.3 National Environmental Standards

The National Environmental Standards (NES) set ambient air quality standards that provide bottom lines for air quality for the whole of New Zealand.

The NES for ambient air quality took effect on 1 September 2005. Table 2 presents the National Environmental Standards 2004. For the full regulations the reader should refer to the *Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulation 2004,* or Ministry for the Environment's website www.mfe.govt.nz.

Table 2 National Environmental Standards 2004

Indicator	Threshold Concentration µg/^{m3}	Averaging Time	Permissible excess
Particulate matter (PM_{10})	50	24 hour	One 24-hour period in a 12-month period
Sulphur dioxide (SO_2)	350	1 hour	9 hours in a 12 month period
	570	1 hour	Not to be exceeded at any time
Carbon monoxide	10,000	8 hour	One 8-hour period in a 12-month period
Nitrogen dioxide (NO_2)	200	1 hour	9 hours in a 12-month period
Ozone	150	1-hour	Not to be exceeded at any time

These standards supersede two of the guidelines listed in the RAQP. The NES is more stringent than the corresponding NRC guideline, as follows:

- The 24-hour guideline for PM_{10}. The NES allows only one excursion a year above 50 µg/m^3, compared to the NRC guideline of 120 µg/m^3, as a maximum acceptable level; and

- The 1-hour guideline for nitrogen dioxide. The NES allows 9 excursions per year above 200 µg/m^3 compared to the NRC guideline of 300 µg/m^3 as a maximum acceptable level.

2.4 New Zealand Ambient Air Quality Guidelines

New Zealand also has Ambient Air Quality Guidelines (MfE 2002), which provide criteria for the same contaminants listed in the NES but include other averaging periods and other contaminants. Table 3 lists the Ambient Air Quality Guidelines for criteria that are not addressed by the NES.

- **Table 3 New Zealand Ambient Air Quality Guidelines (MfE 2002), excluding criteria addressed by the NES**

Contaminant	Guideline Value (µg/m^3)	Averaging Time
Particulate matter (PM_{10})	20	Annual
Sulphur dioxide	120	24-hr
Ozone	100	8-hr
Nitrogen dioxide	100	24-hr
Hydrogen Sulphide	7	1-hour
Lead	0.2	3-month moving average
Benzene	10	Annual
Benzene (year 2010)	3.6	Annual
1.3 Butadiene	2.4	Annual
Formaldehyde	100	30-minutes
Acetaldehyde	30	Annual
Benzo(a)pyrene	0.0003	Annual
Mercury (inorganic)	0.33	Annual
Mercury (organic)	0.13	Annual
Chromium VI	0.0011	Annual
Chromium metal and Cr III	0.11	Annual
Arsenic	0.0055	Annual
Arsine	0.055	Annual
Carbon monoxide	10 000	8-hr

The guidelines listed in the RAQP have stated that any revised national guidelines will be recognised, so the guidelines listed in Table 3 can be applied under the existing Plan. However, it may be appropriate to update the regional guidelines to accommodate the more recent national guidelines, still allowing for future developments. Whatever is done, air quality objectives for the Marsden Point area will, as a minimum, need to comply with the National Environmental Standards.

2.5 Airsheds or Local Air Management Areas (LAMAs)

Several regulations in the NES refer to 'airsheds'. These attach monitoring, reporting, and consent decision requirements. The term 'airsheds' is also referred to as a 'Local Air Quality Management Area' (LAMA), since it does not necessarily represent a strict geophysical airshed. At Marsden Point the area of interest centres on the location of large industrial air discharges and extends to areas where future industry may develop (business zones), i.e. it is not a geophysical airshed.

Subclause 14(a) of the NES regulations stipulates that the Minister for the Environment can specify airsheds (which some have referred to as LAMAs) by notice in the *New Zealand Gazette.* Furthermore, the Ministry invited councils to advise decisions for defined airshed(s) by 1 July 2005. Gazetting by this date was to allow 28 days for notification prior to the ambient standards coming into force on 1 September 2005.

Some 'prototype' LAMAs have been defined in a report prepared under the foundation for research, science and technology programme (Fisher *et al*, February 2004). The basis for the prototypes is primarily census area units from Statistics New Zealand, but estimates of emission flux for PM_{10} from emissions inventory calculations have also been used to categorise the areas. For the Marsden Point area, Fisher *et al* suggest dividing into two airsheds or LAMAs. One is defined as 'Bream Bay', which includes One Tree Point, Ruakaka and areas across the harbour. However the report also suggests a larger LAMA may be necessary for this area.

For many reasons relatively small airsheds may be preferred over larger ones. However, two factors suggest a large airshed (or LAMA) should be considered for Marsden Point:

- The presence of large industrial sources with wide ranging effects; and
- The need to accommodate for transfers of discharge permits.

The need to accommodate permit transfers may be considered the driving factor for a large airshed, particularly given the potential interest in providing for emissions trading. The *Resource Management Amendment Act 2005* is designed to encourage regional council management of resource allocation. However, the Amendment Act specifically states that air discharge permits may only be transferred if "*both sites are in the same airshed as defined by the regulations".* This does not appear to allow for discharges that may cross airshed/LAMA boundaries.

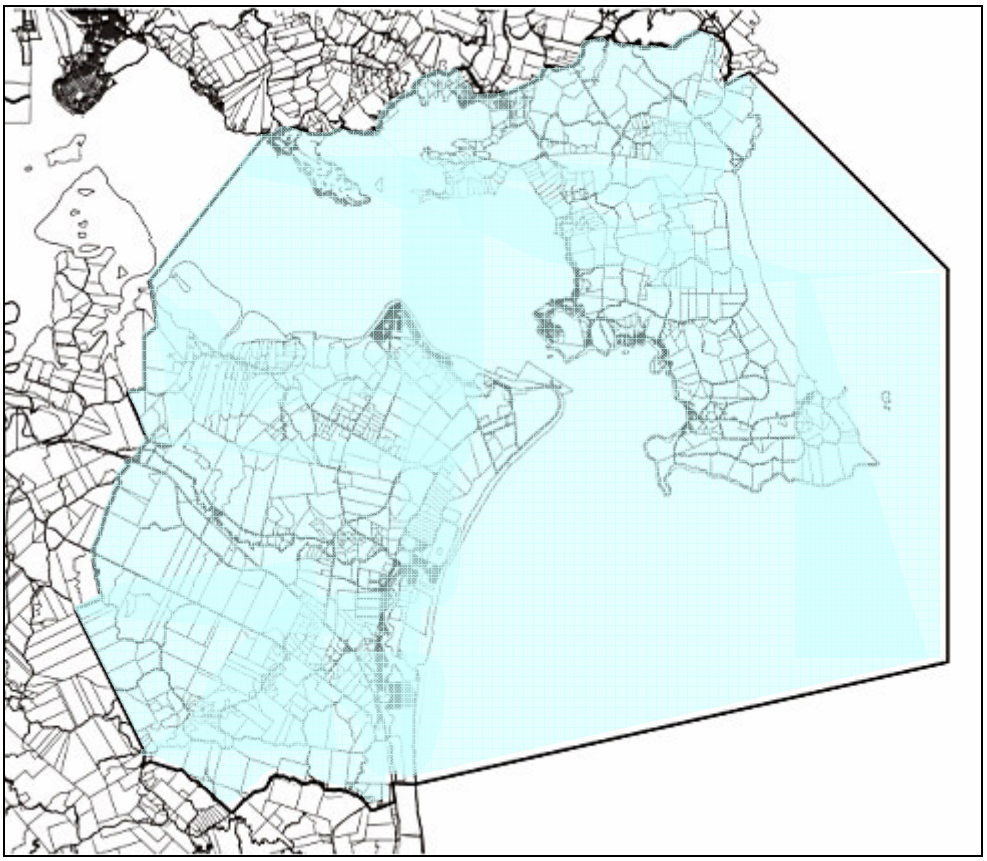
Given this situation, the NRC has defined a relatively large airshed/LAMA that is bounded by the range to the west of Ruakaka and the terrain on Bream Head and encompasses:

- The areas where existing discharges impact to the extent that potential cumulative effects may occur if new sources were developed in their vicinity[1];
- Areas within the vicinity that are zoned *Business* in the District Plan;
- Other areas where future industrial development is likely, such as areas zoned future environments that may become business zones; and

[1] This is tentatively suggested to be where modelled contaminant concentrations are more than one tenth of the relevant ambient air quality standard. Ten percent is chosen to be consistent with the air-quality reporting concept developed for the national indicators programme.

Figure 2.2 is a map of the Marsden Point airshed boundary. This airshed covers an area similar to that discussed by Air and Environmental Sciences Ltd in the pre-planning report for the Marsden Point strategy (Stevenson *et al*, August 2002).

- **Figure 2.2: Airshed for Marsden Point.**



3. The Marsden Point Air Quality Management Area

This strategy is designed to manage air quality in the Marsden Point. The strategy applies to any existing or new development requiring resource consent to discharge to air if the development:

1) is to be located within the area identified in Figure 2.2; or

2) is located outside the area in Figure 2.2 but there is the potential for air discharges to enter the area and significantly add to the cumulative effects of discharges of sulphur dioxide, fine particulate (PM_{10}) or nitrogen dioxide.

In this content 'significantly' means where the estimated contribution to air quality degradation, in terms of contaminant concentrations in ambient air, is more than 10% of the relevant guideline or standard.

As discussed previously, the Northland Regional Council defined its airshed boundaries and provided these to MfE before July 2005. The airshed is identical to Figure 2.2.

3.1 Objectives for Air Quality

Objectives 1 to 3 in the existing Regional Air Quality Plan for Northland are unlikely to be changed as a result of the development of this strategy. However, specific policies for Marsden Point will need to be developed, to sit within the air quality objectives in the Plan.

It is recognised that Marsden Point is an area where industrial development is allowed to occur according to the Whangarei District Plan. Development of the area will be encouraged with regard given to policies 1 and 2 of this strategy.

Policy 1

That air quality in the Marsden Point Area shall be managed in a consistent way to allow for industrial development while ensuring that:

(i) Ambient air quality is maintained in a state of compliance with the National Environmental Standards in Table 2, and

(ii) That the air quality is maintained in accordance with the guidelines listed in Tables 2 and 3.

Policy 2

That regard shall be given to reverse sensitivity effects from incompatible uses when considering future land use decisions in the Marsden Point area.

3.2 Implementation Methods

To implement Policy 1, the Northland Regional Council will:

Method 1
Maintain input data for a comprehensive dispersion modelling tool (CALMET and CALPUFF) to be used for new consent applications in the Marsden Point area. Particular attention will be given to cumulative effects of discharges of sulphur dioxide, fine particulate (PM_{10}) and nitrogen dioxide.

Consider establishing a technical liaison group to assist in the maintenance and review of the CALMET input data files.

Method 2
Promote the use of CALPUFF version 5.7 or later versions for assessing cumulative effects from new discharges of sulphur dioxide, fine particulate (PM_{10}) or nitrogen dioxide in the Marsden Point area. Encourage use of the same model for other contaminants as appropriate.

Method 3
Develop and maintain an air emissions inventory for the Marsden Point area in an electronic format suitable for use in the CALPUFF modelling tool.

Consider establishing a technical liaison group to assist in the development and maintenance of the air emissions inventory.

Method 4
When appropriate, encourage and support industry with emissions trading for those who discharge sulphur dioxide, fine particulate (PM_{10}) or nitrogen dioxide in the area.

Method 5
Facilitate a co-ordinated ambient air monitoring network in the area by imposing monitoring conditions in resource consents and, if necessary, maintaining council monitoring sites.

Method 6
Apply the best practicable option to minimise emissions of toxic air pollutants

To implement Policy 2, the Northland Regional Council will:

Method 7
Where necessary, make submissions on the Whangarei District Plan and applications for resource consents to ensure that the potential for reverse sensitivity effects is addressed.

Method 8
Promote the use of airshed management tools (described in Methods 1 to 5) for assessing potential reverse sensitivity effects associated with new developments.

4. Air Quality at Marsden Point

4.1 Emission Inventory

'Air and Environmental Sciences' (Stevenson *et al* 2003) provided a preliminary emission inventory for the Marsden Point and Ruakaka area, which covered domestic emissions, the New Zealand Refining Company Ltd (NZRC), Carter Holt Harvey LVL Plant (CHH) and motor vehicle emissions. The two industrial sources were estimated to emit 98% of the PM_{10}, 99% of the NO_X and 100% of the SO_2. This indicates that an assessment of cumulative effects is unlikely to require the consideration of non-industrial sources, thus in the short to medium term an inventory of emissions will best focus on the industrial sources.

In accordance with Method 3, the emission inventory will be developed, kept in an electronic format and updated as required to provide a management tool for the airshed. The focus is industrial emissions but future inventories should also consider non-industrial sources as the area develops. For example, sulphur dioxide emissions from shipping emissions may become more important as the port grows.

Updated inventories will form the basis of emission input files for of PM_{10}, SO_2 and NO_2 that will be incorporated into the Marsden Point CALPUFF modelling tool.

4.2 Ambient Air Quality Monitoring Data

4.2.1 Sulphur Dioxide

Available ambient air monitoring data for the area are summarised by Air and Environmental Sciences (AES) and by NIWA'S air quality assessment for the proposed Marsden B re-powering project (Marsden B Power Station Re-powering Project: Air Discharge Assessment, NIWA 2004).

The NZRC operates the existing sulphur dioxide monitoring sites at Urquharts Bay, Whangarei Heads School and Little Munroe Bay. According to AES the Whangarei Heads School site was the most affected of the three sites. A large amount of SO_2 data is also available from the Takahiwai station, which was operated between 1994 and 2000 by ECNZ.

The monitoring data has indicated that the area may have experienced very high short-term concentrations of SO_2 in the past. Any plans for new combustion processes in the area will trigger a renewed focus on SO_2, as with the current proposal to re-power the Marsden B power station. Air discharge assessments undertaken for Mighty River Power for this proposal predict that the new NES standards for SO_2 will be met in the future as a result of power station discharges, taking into account cumulative discharges from NZRC. However, careful assessment is necessary and SO_2 will remain a critical contaminant for monitoring and management in the area and will be a significant concern for any new discharges that may propose to locate near the refinery.

4.2.2 Particulate (PM_{10})

Ambient PM_{10} levels are measured at the boundary of the CHH plant by CHH in accordance with its consent. According to NIWA (2004), the peak 24-hour average measured over 2000/2001 was 21 $\mu g/m^3$ compared to the NES of 50 $\mu g/m^3$. Air discharge assessments undertaken for Mighty River Power indicated that maximum discharges of particulates as PM_{10} from both the power station and refinery, and taking account of existing monitored levels, do not lead to the exceedance of any standards or guidelines. While the area does not currently appear to be limited by PM_{10} emissions, this is a critical contaminant for managing air quality under the NES.

Managing PM_{10} will also be important for the development of residential areas and monitoring potential increases in emissions from domestic sources.

4.2.3 Nitrogen Dioxide (NO_2

A limited amount of ambient monitoring information for nitrogen oxide has been undertaken by the NZRC. While the results indicated low ambient concentrations during the 2002/03 monitoring period, it is likely that Nitrogen oxides will become increasingly important in the future if developments involving large combustion facilities proceed.

4.3 Future Ambient Air Monitoring

The majority of the existing monitoring in the area is managed by industry pursuant to resource consents. Consent requirements tend to focus the monitoring on the potential effects of specific sites. The programmes could be useful for airshed management if the council oversees the individual programmes with a view to their integration.

An appropriate ambient monitoring programme needs to:

- Evaluate the effectiveness of the air quality strategy; and
- Provide validation data for dispersion modelling; and
- Provide meteorological inputs for modelling.

In accordance with Method 5, the NRC will oversee the monitoring in the area but industry will be responsible for undertaking the majority of the monitoring through resource consent conditions. The extent of the individual monitoring programmes will be consistent with the scale of the individual discharges. In addition, the NRC will maintain monitoring sites at locations that may not be covered by the resource consent programmes.

Three existing SO_2 monitoring locations are at Whangarei Heads School, Urquharts Bay and Little Munroe Bay (operated by NZRC).

In addition to the 3 sites already operated by NZRC, a fourth SO_2 station in the vicinity of residential development along Marsden Bay or One Tree Point is recommended because these developments are in proximity to the predicted impact of the refinery emissions. There is some conflicting information as to the benefits and limitations of the individual locations of some of the monitoring stations. It is recommended that the suitability and location of the four monitoring stations be reviewed as part of the review of the monitoring programme.

It is considered that further PM_{10} monitoring is necessary in addition to the CHH site. This is to allow for particular concerns over the health effects of this contaminant, and to also monitor the effects of future industrial expansion and potential expansion of residential

areas, which may increase discharges from domestic heating and transport. Marsden Bay is a suitable location given the proximity to the residential developments.

Most combustion processes discharge a mixture of oxides of nitrogen, which consist predominantly of NO a relatively non-toxic contaminant. However NO is converted to the more toxic NO_2 after discharge and a measure of the ratio of both oxides of nitrogen is one of the factors that can be used to assess the rate of conversion. Thus both NO and NO_2 monitoring is important for assessing the impact of large-scale combustion plant (like Marsden B). Moreover, the NIWA study for the proposed Marsden B project suggests discharges of oxides of nitrogen and the subsequent formation of NO_2, although with the standard at present, could become an important issue in the area.

As part of the development of this strategy, NIWA was commissioned to evaluate the available meteorological data in the region with a view to developing suitable dispersion modelling input data. Among other recommendations NIWA suggest that 'The Northland Regional Council and other key stakeholders in the region need to … provide better surface meteorology for air dispersion modelling in the Whangarei-Marsden area' (Heydenrych, 2005, see Appendix A). NIWA suggested that some of the existing meteorological sites operated by NZRC are not ideally situated to provide a representative indicator of winds in the area. For this reason, a surface meteorological station is recommended near One Tree Point or in Marsden Bay.

Table 4 summarises the monitoring and sites for the area and recommended new sites. Figure 4.1 shows the location sites recommended for future monitoring.

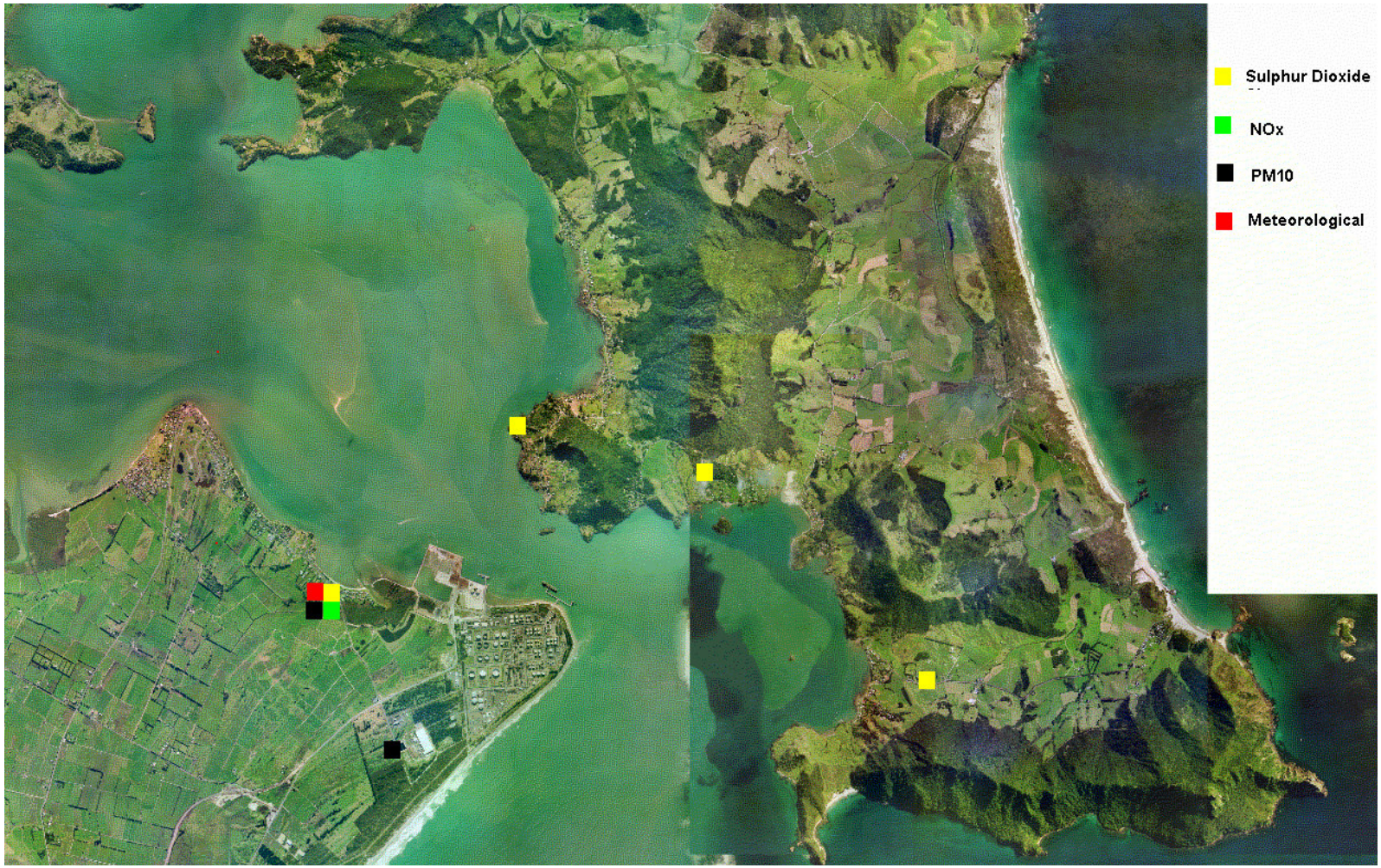
- **Table 4 - Existing and Future Ambient Monitoring Sites**

Parameter	Existing Sites	Recommended Future Sites
SO_2	Whangarei Heads School Urquharts Bay, Little Munroe Bay	Whangarei Heads School Urquharts Bay, Darch Point
PM_{10}	Carter Holt Harvey LVL	Carter Holt Harvey LVL Marsden Bay
NO_x		Marsden Bay
Surface Meteorology Winds Solar radiation Relative humidity Temperature		Marsden Bay

A number of soil, vegetation and lichen studies have been undertaken during recent years, many of these by NZRC. While this monitoring failed to identify any effects on soil, vegetation or lichen populations arising from exposure to air contaminants – mainly refinery emissions – the studies still provide useful baseline data with which to compare any future investigations.

The monitoring programme will need to be reviewed to accommodate future developments. For the most part, this can be handled by imposing appropriate monitoring conditions within resource consents. However, the overall monitoring programme should be reviewed whenever the strategy is reviewed, i.e. at five-yearly intervals.

- **Figure 4.1 – Recommended Ambient Air and Meteorological Monitoring Sites**



4.4 Atmospheric Dispersion Modelling

Figure 4.2 shows contours plots with predicted concentrations of sulphur dioxide from air dispersion modelling undertaken by NIWA as part of the application for the proposed Marsden B re-powering project (NIWA 2004). The plots illustrate the impact of both the existing refinery and the proposed Marsden B discharges for SO_2. Two key points can be noted from the modelling:

- Predictions approach the NES for 1-hour averages within the immediate vicinity of the NZRC;

- There may be some cumulative impact from the Marsden B proposal in combination with the refinery, occurring on the hills across the harbour.

The modelling indicates the airshed may be close to capacity for sulphur dioxide but only near those locations identified above. The pattern of dispersion predicted by the modelling also suggests that ambient monitoring should focus on those areas across the harbour and in the areas zoned 'Living' located between One Tree Point and the refinery, such as Marsden Bay.

Furthermore, the modelling results suggest that particular care needs to be taken when considering proposals for future activities that may add to the impact of these sources. In particular, any activity likely to add more than negligible amounts to sulphur dioxide concentrations in locations within two to three kilometres of the NZRC refinery or the terrain above Urquharts Bay and Taurikura.

Unfortunately, at the time of writing, the atmospheric dispersion modelling undertaken by NIWA on behalf of Mighty River Power has been questioned and is being revised with new inputs. Whilst every effort has been made to use the best available information at the time, it is accepted that the information is changing and more accurate dispersion modelling may become available in the next 12 months. It is recommended that the dispersion modelling be reviewed after 12 months and if required, the appropriate changes to the strategy be made. This may include an amendment to the Marsden Point Airshed.

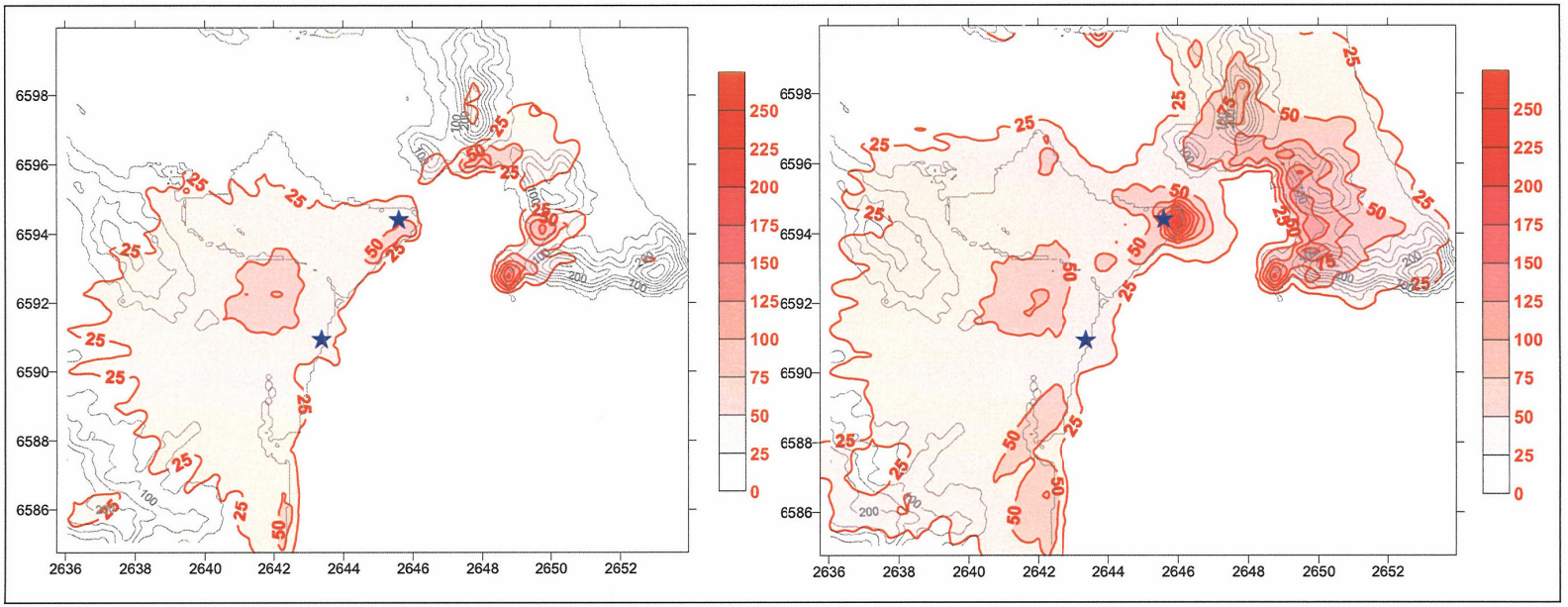


Figure 5.4a and 5.4b. 1-hour averaged (99.9%) Marsden B 300 MW (same as Figure 5.1a) and combined discharges of Marsden B 300 MW + NZRC (12 tonnes/day)

5. Emission Offsets and Trading

In order to comply with Policy 1 of the Marsden Point Air Quality Strategy, resource consent applications will need to be carefully managed in circumstances where the CALPUFF Modelling Tool predicts the cumulative impacts to be above relevant guidelines and standards. It may be necessary to reduce emissions from existing sources before a new entrant can obtain a resource consent to discharge.

This section discusses potential approaches for managing consents to allow for reallocation of the discharge rights.

5.1 Load Based Licensing

Load based licensing is where dischargers are charged an annual fee based on their total emission; and/or the fees for the licence application have a component related to the pollutant load sought. A number of Australian states have load based licensing systems that aim to provide economic incentives to reduce discharges. In Victoria for example, the maximum annual licence fees for the emissions component are $AU350 000.

The NRC's resource consent application fees are based on administration costs only. Monitoring charges are set annually but also cover staff time only rather than a fee relating to the load discharged.

The challenges with setting a load-based licensing fee are developing a fair system that provides a suitable realistic cost incentive, and that also avoids an unnecessarily complex calculation procedure. Whatever the case, it is considered that load-based fees are not a necessary prerequisite for effective airshed management or potential emissions trading. Consequently, this option is not being pursued at this stage.

5.2 Tradeable Permits

An environment could be provided where emissions can be directly traded between an existing user and a new user. Overseas studies indicate a tradable emission permit system generally requires a competitive market and a situation where the capacity of the air resource is almost fully allocated (Queensland EPA, 1999). The latter condition is probably met at Marsden Point (albeit in a small sub-part of the area) but there may be insufficient sources currently in the Marsden Point area to establish an efficient trading scheme. Currently, for sulphur dioxide, the airshed is dominated by the refinery.

In some cases, future proposals to discharge to air will only be able to establish in the area if emissions from existing sources are reduced, i.e. the application will need to obtain the discharge right from an existing discharger. At this stage the NRC will encourage an informal emission-trading regime where a new entrant will need to negotiate with an existing discharger to obtain an offset that would allow them to operate in the airshed. Therefore trading will be by private agreement between the dischargers.

The Resource Management Amendment Act 2005 allows for transferring consents if provided for in a regional plan. Resource consents are able to be transferred in whole or in part to another user and/or location. Transfers may be for a limited time or for the remaining time of the permit.

The Amendment Act states a regional plan may allow a transfer or a consent authority may allow a transfer if:

- The transfer does not worsen the actual or potential effect of any discharges on the environment; and

- The transfer does not result in any discharges that contravene a national environmental standard; and

- If the discharge is to air and a national environmental standard applies to a discharge to air, both sites are in the same airshed as defined in the standard.

An application must be considered as if the application for a transfer were an application for a resource consent and the holder were an applicant for a resource consent.

The transfer has no effect until the consent authority that granted the permit receives written notice of it. On receipt of the written notice the, transfer is made and the old permit or part of the permit is cancelled. The new interest or the part transferred becomes a new permit with the same conditions as the original permit.

It is recommended that the RAQP can be changed to allow the transfer of air discharge permits within the Marsden area, in accordance with the new provisions of the Resource Management Amendment Act 2005.

In the interim a transfer could effectively be achieved by a consent holder applying to change any consent condition limiting the emission rate, thus making the allocation available to another user as discussed above.

6. Guidelines for Assessing New Sources

This section summarises methods that will be used to assess new industrial discharges proposing to come into the Marsden Point airshed. It is intended that the following wording could form part of a guide to be published by NRC, or incorporated as an appendix to the strategy with minor changes to wording.

Section 11 of the RAQP sets out the information, which is required to accompany applications for air discharge permits. Section 12 of the Plan sets out the matters that the NRC will take into account when making decisions on resource consent applications. The matters set out in this strategy are in addition to the matters set out in the RAQP and are specific to the Marsden Point area.

In general, whenever atmospheric dispersion modelling is to be undertaken, it is advisable that applicants use CALPUFF dispersion modelling system (version 5.7 or later versions), with emissions files and CALMET meteorological data that is maintained by the NRC. The NRC may accept another modelling approach if there are specific circumstances justifying an alternative approach or the emission source is relatively small and/or with little potential for cumulative effects. Any alternative approach must be in accordance with the Ministry for the Environment's *Good Practice Guide for Atmospheric Dispersion Modelling,* June 2004. Prior agreement from the NRC should be obtained before undertaking any alternative modelling approaches.

The potential cumulative effects should be considered in all circumstances, but are likely to be particularly important if the proposal includes SO_2, NO_X or PM_{10} when:

- The discharge rate of SO_2 or NO_X is more than 10 kilograms per hour (roughly equivalent to a 10MW coal-fired boiler for example); or
- The discharge of PM_{10} is more than 5kg/hr; or
- The site is located with 3 kilometres of Marsden Point, Taurikura or Urquharts Bay.

When assessing cumulative effects in the airshed, applications will need to consider:

- Existing sources; and
- Sources that have a resource consent but are not yet built; and
- Proposed sources i.e. those that have submitted an application that has been publicly notified; and
- Potential future sources, which may include applications subject to s92 requests.

It is imperative that applicants consider the existing (consented) activities, and ensures these are factored into an assessment. Proposed activities should also be considered depending on timing and particular circumstances, for example, if an application has been notified or if applicants are interested in emissions trading.

The NRC will maintain an emissions database for input into the model. In this way cumulative effects assessment will be handled with consistent assumptions. However, the onus will be on applicants to ensure that all cumulative discharges are properly considered. It will be necessary to communicate closely with NRC and other developers particularly as

developments and consent applications progress. The need for expert advice will also remain essential.

Where there is more than one application at one time and there is a potential for overlapping effects, the NRC may make a Section 92 request for further information for the applicant/s to consider the combined effect of the new discharges if not already assessed. However, applicants cannot be forced to consider other proposals where applications have yet to be lodged. In this context, the notification data is a critical milestone, at least for those activities where notification is necessary. Again, communication with NRC and other developers is crucial in these circumstances.

If the modelling tool predicts that peak downwind concentrations overlap to the point where they exceed the NES or other relevant guidelines, then further mitigation will be necessary or the proposal will need to be revised. Alternatively, an emission offset will need to be obtained from an existing discharger as discussed in Section 5. The effects of this offset will also need to be assessed using the available tools.

7. Maintain the CALPUFF Modelling Tool

In accordance with Method 1, it is recommended that NRC develops and maintains CALMET and CALPUFF modelling inputs (the modelling tool) in consultation with industry and other stakeholders. The modelling tool will be used for assessing the effects of discharges to air within the Marsden Point area. The current basis for this tool is the CALMET and CALPUFF input files developed by NIWA for the Marsden B application on behalf of Mighty River Power. This is the most recent large-scale modelling exercise involving the tools. Ongoing input from existing industry and consent applicants will be critical and the NRC is committed to updating and improving these files over time, including undertaking validation studies as both ambient monitoring and real-time emissions data becomes available.

7.1 CALMET Data Set

The CALMET data set developed by NIWA for the Marsden B application is a 26-by-35 km domain at a 500 m grid resolution. The model incorporates hourly weather observations from 10 surface stations and has 10 vertical levels up to 3000 m. It uses upper air data from Whenuapai (over 60 km to the south of Whangarei Harbour) and relies on surface observations collected by NZRC at Marsden Point. The NIWA CALMET files were produced for the year 2001.

The NIWA set is considered the best meteorological data currently available. NIWA considers that the CALMET data can be improved by incorporating observations from a quality surface meteorological station located in the Marsden Point area and incorporating prognostic meteorological data from an appropriate meteorological model (such as MM5). Measured upper air data is not considered necessary at this stage. NRC will develop a meteorological monitoring site located in Marsden Bay, as discussed in Section 4.

It is recommended that NRC update the CALMET data, incorporating these measurements once at least 18 months to two years of data has been collected.

7.2 Modelling Tool Development

Developing the Marsden Point CALPUFF Modelling Tool will provide a consistent basis for determining the potential cumulative effects on air quality for new air discharge consent applications.

NIWA's CALPUFF modelling for Marsden B incorporated the maximum theoretical emissions from the proposed Marsden B power station on coal and maximum daily emissions from NZRC. NIWA ran CALPUFF on an 18-by-15 km grid with a resolution across the grid of 250 m and 125 m near Marsden B. Twenty-one discrete receptors were included to determine maximum ground level concentrations at key terrain features and residential areas. This is considered an appropriate modelling domain for future applications within the airshed.

NIWA also made a simplistic comparison with available monitoring data in the region but at this stage a full evaluation of the model performance has not been undertaken because there is not sufficient data. NRC recognises that model validation is a very important part of the air quality strategy.

To do this, it will be necessary to develop a real time emissions file for the refinery and other existing sources, and model emissions for the same year as ambient monitoring observations. Such a validation study will require co-operation from the existing industry, and will best be completed following an upgrade of the monitoring programme. It is anticipated that this could not be undertaken for 18 months to two years, when a suitable

amount of monitoring data is available. As such, the NRC commits to completing a model validation exercise within three years of the air quality management strategy being implemented. In the meantime, however, it is considered that the modelling inputs already used for the Marsden B application will be suitable for the purpose, with some modifications (which are likely to be dealt with as part of the further information request to Mighty River Power).

The NRC, in consultation with the industry and other stakeholders, can develop and maintain the NIWA modelling to provide a modelling tool for general use in the Marsden Point area. As discussed previously, the meteorological data will need to be upgraded over the next few years, and model validation exercises completed.

The emission input files will incorporate the major sources of NO_X, PM_{10} and SO_2 and any sources identified as being important in the airshed following a review of the emission inventory e.g. shipping. The file will need to be updated when:

- A resource consent is issued;
- Consents are implemented (i.e. facility built);
- The airshed inventory is updated; and
- Consent applications for significant point sources are publicly notified.

At the time of writing, the emission files are likely to include the major point sources only, i.e. the NZRC, the Carter Holt Harvey LVL plant and possibly the Marsden B power station (depending on the outcome of the current application). The NRC will need to make these files available to applicants for air discharge consent applications.

8. Reviews

It is recommended that the air quality strategy for the Marsden Point area be reviewed on a five yearly basis. The ambient monitoring programme (discussed in section 3.3) will assist in reviewing the effectiveness of the strategy in managing air quality.

The airshed modelling tool and air emission inventory will be updated as required to reflect changes in emission patterns, resource consents and advances in modelling techniques.

A minimum of one year's monitoring data will be used to carry out model validation. NRC commits to undertaking a model validation study within three years of implementing the strategy, and update the model input files accordingly.

9. References

Air and Environmental Sciences (2003), *Pre-planning for an Integrated Marsden Point Air Quality Strategy Prepared for Northland Regional Council,* August 2003, Titirangi, Auckland.

Ministry for the Environment (2002) Ambient Air Quality Guidelines, May 2002

NIWA 2004*, Marsden B Power Station Re-powering Project: Air Discharge Assessment Prepared for Mighty River Power Ltd,* October 2004, Auckland

Appendix A: NIWA Report on Calmet Data for Marsden Point