

# Napier Works Sustainable Site Project

## Air Discharge Strategy 2021

Author Andrew Torrens

Date November 2021

**Document Information**

<b>DOCUMENT ID</b>	
<b>DOCUMENT OWNER</b>	Andrew Torrens – Works Manager
<b>ISSUE DATE</b>	23 November 2021

**Document History**

<b>VERSION</b>	<b>STATUS</b>	<b>ISSUE DATE</b>	<b>AUTHOR</b>	<b>CHANGES</b>
V1.0	Draft for TFG Comment	August 2021	Richard Chilton Tonkin + Taylor  Stephen Daysh Mitchell Daysh Ltd  Andrew Torrens Ravensdown	
V1.1	Draft following TFG Comment	September 2021	Richard Chilton Tonkin + Taylor  Stephen Daysh Mitchell Daysh Ltd  Andrew Torrens Ravensdown	
V1.2	Approved for consent application	25 November 2021	Stephen Daysh Mitchell Daysh Ltd  Andrew Torrens Ravensdown	

**Document Review**

<b>ROLE</b>	<b>NAME</b>	<b>VERSION</b>
Partner – Mitchell Daysh Ltd.	Stephen Daysh	V1.2

**Document Sign-off**

<b>ROLE</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
Works Manager	Andrew Torrens		25/11/2021

# Contents

---

- 1 Introduction..... 1
- 2 Existing Emission Control ..... 1
  - 2.1 Stack Emissions..... 1
  - 2.2 Fugitive Emissions..... 2
- 3 Baseline Environmental Assessment ..... 3
- 4 Future Discharge Strategy ..... 4
  - 4.1 Overview ..... 4
  - 4.2 Committed Improvement Projects..... 4
  - 4.3 Technical Focus Group..... 4
  - 4.4 Habitat Abundance Restoration Project..... 4
  - 4.5 Vegetation Study ..... 4
  - 4.6 Source Control Measures ..... 5
- 5 Determination of Air Discharge Targets ..... 5
- 6 Conclusion ..... 7

## 1 Introduction

This Discharge Strategy relates to emissions to air from the Ravensdown Limited Napier Works (“the Site”). The Discharge Strategy is Ravensdown’s cornerstone document underpinning a complete review of emission management on the Site looking forward to the replacement of the company’s resource consent to discharge contaminants into the air from the Site which expires on 21 October 2022.

In order to continue to operate under this consent, under section 124 of the Resource Management Act 1991 (**RMA**), an application to renew this resource consent must be lodged with the Hawke’s Bay Regional Council on or before 21 April 2022 (six months prior to the expiry date).

While the company is currently operating in reasonable compliance with the conditions of its existing resource consent, it is recognised that positive and significant improvement will form the basis for requesting a long term (35 year) discharge consent to secure the future of the site, and in recognition of:

- The strong desire for Ravensdown to be outward looking, responsive and respectful towards both its Napier neighbours and wider stakeholders by championing excellence in environmental performance and compliance.
- The conspicuous presence of the Site as part of the southern gateway to Napier on State Highway 51.
- The location of the Site near to the significant Waitangi Regional Park, which has considerable environmental, historical and cultural values.

A variation to the existing air discharge permit was granted by the HBRC on 5 July 2021 to allow for a discharge from a single higher stack 50m above ground level, providing increased dispersion of the discharge, and the replacement of the existing Den scrubber system which controls the fluoride emissions produced during fertiliser manufacturing.

The Discharge Strategy considers recent discharge monitoring results relative to existing consent discharge limits compared against relevant national guidance documents and planning instruments and the changes predicted as a result of dispersion from the 50m stack.

This Discharge Strategy will be used to write a Project Description section of the Assessment of Environmental Effects document describing the changes that will be made across the site, and to the process and treatment plant.

## 2 Existing Emission Control

Various processes across the Site generate both stack discharges and fugitive emissions. Stack discharges at the Napier Works arise from the processes involved in the production of sulphuric acid and superphosphate fertiliser. Fugitive emissions (including dust and odour) typically occur at ground level or through buildings and do not undergo any treatment processes.

### 2.1 Stack Emissions

Most stack emissions from the site occur from the Acid Plant stack and the Manufacturing stack(s) (see Figure 1 below). Emissions from the Acid Plant stack are associated with the production of sulphuric acid and will mainly consist of sulphur dioxide (SO<sub>2</sub>) and acidic gases (sulphur trioxide, SO<sub>3</sub>). The Manufacturing Plant contains two scrubber systems (den and hygiene) which currently discharge via three stacks (two den stacks and the hygiene

stack) but which are to be combined and discharged through a single 'Manufacturing' stack. The main emission from the manufacturing process is fluoride, however some SO<sub>2</sub>, acidic gases, and steam are also discharged.

The Manufacturing Plant's four Bradley mills are used to grind the phosphate rock and each discharge through a bag-house filter system. Three of these (Mill #2, Mill #3, and Mill #4) discharge to the atmosphere through vents above the roof of the Manufacturing Building, and one (Mill #5) discharges to the atmosphere underneath the 'Rock Canopy'. Bradley Mill #1 was decommissioned in 2011. The main discharge from the bag filters will be residual particulate matter.



FIGURE 1: LOCATIONS OF MANUFACTURING STACK AND ACID PLANT STACK

## 2.2 Fugitive Emissions

Fugitive emissions come from a variety of sources and can include the contaminants mentioned above as well as dust and odour. A summary of the probable sources of fugitive emissions from the Site are listed below:

- Dust from wind erosion (from either surfaces or stockpiles within the buildings)
- Dust generated by vehicle movements
- Dust from the handling of materials e.g., loading and unloading
- Exhaust emissions (e.g., SO<sub>x</sub>, NO<sub>x</sub>, and PM) from heavy vehicles
- Hydrogen sulphide (rotten egg odour) from the melting of sulphur and some phosphate rocks
- Sulphur dioxide from the manufacturing of sulphuric acid
- Acidic gases (e.g., SO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, and Fluorosilicic Acid) that escape the Acid Plant or Manufacturing Plant
- Volatile gas releases from the superphosphate piles (superphosphate type odour)
- Fugitive fluoride emission from the manufacturing process
- "Upset" emissions such as fires of sulphur

Fugitive emissions are generally difficult to quantify and therefore unable to be predicted to the same level of precision as point source discharge stack emissions can.

### 3 Baseline Environmental Assessment

Tonkin + Taylor (“T+T”) has undertaken dispersion modelling of all major air emissions<sup>1</sup> from the Site assessing the monitoring data from the key contaminant emissions from the current stack configuration associated with operation of the site. T+T’s assessment of potential air quality effects of the discharges include those on human health (SO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>), impacts on vegetation (fluoride, SO<sub>2</sub> and acid mist), and amenity impacts (odour and dust) concluding that:

- The predicted concentrations of fluoride and SO<sub>2</sub> are well within the relevant MfE guidelines for the protection of sensitive ecosystems (in regard to the effects on vegetation).
- There will be a significant reduction in fluoride ground level concentrations from the proposed combined Manufacturing Plant stack (discussed further below) compared with the existing plant configuration.
- Predicted SO<sub>2</sub> concentrations are well within the relevant assessment criteria for human health and vegetation impacts and the potential effects are considered to be low.
- Relatively high concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> are predicted for the location immediately east of the Bradley mills (i.e., the former Winstone site). However, exposure over a 24 hour period is not reasonably expected to occur at this location given the industrial nature of the site. At the most impacted location where human exposure is relevant, predicted cumulative concentrations are low relative to the assessment criteria.
- The assessment of the potential odour and dust nuisance effects concluded that there is low potential for offensive or objectionable odour effects to occur as a result of discharges from the Ravensdown site, which is consistent with the record of dust and odour complaints (few complaints).

Further assessments by Environmental Medicine Ltd (Health) and Plant and Food Research Ltd (Vegetation), based on the T+T modelling have found that:

- Health effects in relation to air emissions from the Site are:
  - overall less than minor
  - negligible in regard to food exposure to air contaminants
  - negligible for fluoride inhaled exposure
  - less than minor for sulphur dioxide exposure
  - minor in regard to PM<sub>10</sub>
- There has not been an instance of reported injury to crops or other vegetation attributable to emissions from the Napier Works since the pH of the manufacturing stack was raised to >2.7 in 2008.
- Annual leaf monitoring of perennial crops since November 2007 has not found any visual symptoms of Fluoride damage, or any high Fluoride leaf concentrations that may be indicative of yield loss.
- There are no signs of damage from emissions in vegetation at the Waitangi Regional Park

Looking to the future, Plant and Food Research stated that “*atmospheric modelling indicates that the risk of future damage from F or SO<sub>2</sub> is minimal, since conservative modelling indicates that the concentrations of these pollutants are below MfE critical values*”. They concluded that “*concentrations were below the concentrations likely to cause economic damage to crops in the Awatoto-Meeanee area, or damage to vegetation in the Waitangi Regional Park*”.

---

<sup>1</sup> Excluding odour and dust

## 4 Future Discharge Strategy

### 4.1 Overview

The management of the Site discharges to air needs to align with Ravensdown's organisational goals, meet the expectations of the community, and be consistent with national and regional planning documents. Community and regulatory expectations have changed significantly since the previous resource consent process. Through the resource consent renewal project for the air discharge from the Site, Ravensdown will balance environmental and business sustainability, with the aim of achieving Best Practice for air discharges where possible.

Resource consent conditions will set discharge quality standards at the point of discharge.

### 4.2 Committed Improvement Projects

The first step in doing this is already underway with the programmed replacement of the existing Den scrubber system and Acid Plant Converter Tower, both programmed for completion in 2023.

The Manufacturing Plant discharge from the new Den scrubber will be combined with the existing Hygiene scrubber through a single combined stack with an increased height of 50m above ground level. An overall improvement in the ground level concentrations of fluoride measured around the Napier Works is anticipated as a result of this new plant and a variation to the existing air discharge permit to provide for the changes was granted by the HBRC on 5 July 2021 on this basis.

Ravensdown are also completing a project to replace the end-of-life Converter Tower in 2023. Ravensdown have taken the decision to increase the volume of catalyst inside the tower, which will allow for greater conversion of SO<sub>2</sub> to SO<sub>3</sub> and therefore reduce SO<sub>2</sub> emissions in line with Best Practice as defined by Worley.

### 4.3 Technical Focus Group

Ravensdown have formed a Technical Focus Group ("TFG"), made up of representatives from key stakeholder groups to engage with Ravensdown during the renewal of both the water and air discharge permits. The purpose of the TFG is to provide advice and input to Ravensdown as part of a two-way information sharing process. The results of the baseline assessments have been discussed with the TFG and details of the Discharge Strategy will be shared as part of the ongoing engagement process.

### 4.4 Habitat Abundance Restoration Project

As part of the Discharge Strategy - Water, Ravensdown will make a long-term commitment to improving the ecological values through planning and establishing a Habitat Abundance Restoration Project ("HARP") within an identified area of the Waitangi Regional Park as part of the consent, in partnership with Mana Whenua, TFG members and the HBRC.

### 4.5 Vegetation Study

Ravensdown are working with the technical team and mana whenua to undertake monitoring of selected mahinga kai (traditional food resources) in the area and waterways in the vicinity of the Site in order to understand the fluoride levels in agreed species and respond to concerns from these key stakeholders. Results of this monitoring will be fed into the risk assessment in relation to human health effects through ingestion of these plants. The requirements for future monitoring will be determined following a review of the background assessment results.

## 4.6 Source Control Measures

A key pillar for the Discharge Strategy will be controlling contaminants at their source. Source control is particularly relevant to fugitive air discharges, which currently do not undergo any treatment processes or are captured.

A Source Control Management Plan for both Air and Water will be prepared as part of the resource consent application documents. This will include relevant management controls for fugitive emissions to air such as:

- Improvement to housekeeping around site.
- Maintenance of existing assets, such as building claddings and gas ducting.
- Identification of problem sources and investment in keeping contaminant on site, such as fast-acting doorways on buildings.

## 5 Determination of Air Discharge Targets

The air discharge strategy and targets which will be proposed as consent conditions have been developed following consideration of the relevant regulatory standards and guidelines, the existing monitoring data, advice of the project technical team. Table 1 below sets out the proposed air emission targets for each key contaminant in Ravensdown's discharge.

TABLE 1: PROPOSED DISCHARGE TARGETS

EMISSION SOURCE	CURRENTLY MEASURED	EXISTING CONSENT CONDITION	PROPOSED QUALITY CONDITIONS / DISCHARGE STRATEGY	RATIONALE
<b>Fluoride - existing site configuration</b>				
Den Stack 1	Yes <ul style="list-style-type: none"> <li>• using standard stack testing methods</li> </ul>	<ul style="list-style-type: none"> <li>• Combined discharge rate of <b>1.5 kg/hr</b></li> </ul>	<ul style="list-style-type: none"> <li>• Roll over emission limits until installation of replacement scrubber system.</li> </ul>	Existing limits based on current plant to be replaced.
Den Stack 2				
Hygiene Stack				
Fugitive Emissions	Not directly <ul style="list-style-type: none"> <li>• Ambient monitoring of fluoride at Front Paddock and Winstone site provide an indication of fugitive emissions</li> </ul>	<ul style="list-style-type: none"> <li>• None directly targeting the fugitive emissions.</li> <li>• The monitoring limit of <b>5.5 µg/m<sup>3</sup></b> as a 7-day average mostly depends on fugitive emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Review the targeting of key sources for extraction to the Hygiene Scrubber.</li> <li>• Review upgrading extraction and treatment to the Hygiene scrubber</li> </ul>	Existing limits based on current plant to be replaced.
<b>Fluoride - post installation of new Den Scrubber and combined stack</b>				
Combined manufacturing plant stack	Yes	<ul style="list-style-type: none"> <li>• Combined discharge rate of <b>1.5 kg/hr</b> Emission further mitigated with a taller stack (50 m)</li> </ul>	<ul style="list-style-type: none"> <li>• Proposed discharge rate of <b>1.0 kg/hr</b></li> </ul>	New scrubber technology will enable Ravensdown to meet new reduced discharge conditions with certainty.

EMISSION SOURCE	CURRENTLY MEASURED	EXISTING CONSENT CONDITION	PROPOSED QUALITY CONDITIONS / DISCHARGE STRATEGY	RATIONALE
Fugitive Emissions	-	-	<ul style="list-style-type: none"> <li>Develop management plan.</li> </ul>	Not able to be measured accurately with approach that key problems areas will be identified, mitigated, and monitored under the Source Control Management Plan.
<b>Sulphur dioxide</b>				
Acid Plant main stack	Yes <ul style="list-style-type: none"> <li>using standard stack testing methods</li> <li>continuous in-stack monitoring.</li> </ul>	<ul style="list-style-type: none"> <li><b>1.5kg/min</b> as 2 min average</li> <li><b>60 kg/hr</b> as 1hr average</li> </ul>	<ul style="list-style-type: none"> <li>Roll over current consent limits until converter replacement project is completed in 2023.</li> <li><b>1.5kg/min</b> as 2 min average.</li> <li>Reduced emission rate limit of <b>40 kg/hr</b> as 1hr average</li> </ul>	New converter technology will enable Ravensdown to meet new reduced discharge conditions with certainty.
Acid Plant start up stack	No <ul style="list-style-type: none"> <li>Has never been measured and is generally not feasible to measure</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Investigate and implement management measures to reduce emissions</li> <li>Increase height of start-up stack or alternatively duct to main stack</li> </ul>	Start-up processes cannot be managed through a specific discharge standard, however as discussed in the strategy there are a range of management and mitigation options which will be written into a start-up management condition.
Manufacturing plant stacks	No <ul style="list-style-type: none"> <li>Although recent testing has been done to confirm low levels</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Proposed emission rate limit of <b>10 kg/hr</b> as 1hr average</li> </ul>	A new discharge standard is proposed as there is a sulphur dioxide discharge from this stack.

EMISSION SOURCE	CURRENTLY MEASURED	EXISTING CONSENT CONDITION	PROPOSED QUALITY CONDITIONS / DISCHARGE STRATEGY	RATIONALE
<b>Acid mist and sulphur trioxide</b>				
Acid Plant main stack	Yes <ul style="list-style-type: none"> <li>Using standard stack testing methods</li> </ul>	<ul style="list-style-type: none"> <li>0.5 kg/hr</li> </ul>	<ul style="list-style-type: none"> <li>0.5 kg/hr</li> </ul>	Existing conditions are consistent with the plants process capability and known best practice.
<b>Particulate Matter - Total suspended particulate (TSP) and acid mist</b>				
Mill vents	Yes	<ul style="list-style-type: none"> <li>1 kg/hr for any one mill</li> <li>2 kg/hr for all mills combined.</li> </ul>	<ul style="list-style-type: none"> <li>1 kg/hr for any one mill</li> <li>2 kg/hr for all mills combined.</li> </ul>	Existing conditions are consistent with the plants process capability and known best practice.
Fugitive emissions from the Manufacturing Plant, rock stores and super stores.	No	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Review dust sources and mitigation options to reduce fugitive emissions</li> </ul>	Not able to be measured accurately with approach that key problems areas will be identified, mitigated, and monitored under the Source Control Management Plan.
<b>Hydrogen sulphide (H<sub>2</sub>S)</b>				
Sulphur melter and molten sulphur storage tank	No	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>No condition limit proposed.</li> </ul>	A small data set for this parameter exists confirming its presence, however the values observed are well below environmental and health effect guidelines

## 6 Conclusion

This discharge strategy is a culmination of a dedicated 18 month process of confirming baseline information and assessing the effects of air discharges from the Ravensdown site. An important element has been the establishment of the TFG, a broadly based stakeholder group comprising people with a wide range of expertise and local knowledge.

The resulting discharge strategy is designed to implement a sustainable long-term solution for the management and discharge of air emissions from the site to ensure that national and regional planning instruments are met. The strategy is supported by the Ravensdown Senior Management and Board as an appropriate basis for seeking a long term (35-year) discharge permit, that will enable both environmental bottom lines to be met and for the security of ongoing site operations.