OCEANAGOLD

PROJECT MARTHA

Applications for Resource Consents and Assessment of Environmental Effects

25 May 2018

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PART 1

Application for Resource Consent

FORM 9

APPLICATION FOR RESOURCE CONSENT OR FAST-TRACK RESOURCE CONSENT

Sections 87AAC, 88, and 145, Resource Management Act 1991

To: Hauraki District Council
PO Box 17
Paeroa 3640

1. OceanaGold (New Zealand) Limited, apply for the following type(s) of resource consent:

A **land use consent** to authorise all activities associated with the construction, operation, maintenance and rehabilitation of Project Martha as described in the Assessment of Environmental Effects attached to this application for resource consent, including, but not necessarily limited to:

- All activities associated with the Phase 4 Cutback and the subsequent rehabilitation of the Martha Pit to a recreational lake and community parkland facility;
- All activities associated with the Martha Underground Mine, including the use and maintenance of existing and consented underground mine infrastructure; and
- The use of existing stockpile areas to temporarily stockpile material from Project Martha, and the use of a consented (but not yet constructed) concrete batching plant located near the Processing Plant.

A **subdivision consent** to subdivide land to accommodate the re-alignment of Bulltown / Cambridge Roads in the area of the Phase 4 Cutback.

2. The activity to which the application relates (the proposed activity) is as follows:

The proposed activity is known as Project Martha, which is described fully in the Assessment of Environmental Effects attached to this application for resource consent. Project Martha contains two key aspects:

- The Martha Underground Mine – which involves new underground mining beneath the Martha Pit and under a small area of residential, reserve and commercial land to the southeast of the pit; and
- The Phase 4 Cutback – which generally comprises a small extension to the north of the Martha Pit to remedy the failure of the north wall in a manner that:
  - Will enable the pit walls to be left in a stable and safe condition at the completion of mining; and
  - Restores access to the remaining consented ore reserve in the pit.

Project Martha will extend the life of mining in Waihi by approximately 12 years.

The Martha Underground Mine and the Phase 4 Cutback will operate largely in parallel, with some of the material mined from the Phase 4 Cutback being used as backfill for the Martha Underground Mine (and the existing Correnso and Slevin Underground Mines), with the remainder of the mined material being conveyed to the Processing Plant, Central, Northern and Eastern Stockpiles or Tailings Storage Facilities for disposal.

Much of the existing and consented mining infrastructure operated by OceanaGold (New Zealand) Limited will be used to transport, process, store and dispose of material extracted from the Martha Underground Mine and Phase 4 Cutback. This includes the use of:

- Existing underground portals, access drives, ventilation shafts and other underground facilities and infrastructure to provide access to, and support the operation of, the Martha Underground Mine;
- The Surface Facilities Area to crush ore and rock material;
- The conveyor and surface mine roads to transport ore and rock material;
- The Processing Plant to process ore and temporarily stockpile rock material;
- The stockpiles at the Favona Portal and the Polishing Pond;
- The Water Treatment Plant to manage water from mining and mining operations;
- The Central, Northern and Eastern Stockpiles for the disposal of rock material; and
- The Tailings Storage Facilities for the disposal of tailings.

3. The site at which the proposed activity is to occur is as follows:

The activities associated with Project Martha will be undertaken in the central area of Waihi, within and adjacent to the existing mining infrastructure operated by OceanaGold (New Zealand) Limited.

The legal description of all properties that will support the various activities associated with Project Martha are documented in Appendix A to the Assessment of Environmental Effects attached to this application for resource consent.

4. The full name and address of each owner or occupier (other than the applicant) of the site to which the application relates are as follows:

The details of all owners of properties that will support the various activities associated with Project Martha are documented in Appendix A to the Assessment of Environmental Effects attached to this application for resource consent.

5. There are no other activities that are part of the proposal to which this application relates.

6. The following additional resource consents are needed for the proposal to which this application relates and have been applied for:

All necessary land use consents, discharge permits and water permits from the Waikato Regional Council to authorise all activities associated with the construction, operation, maintenance and rehabilitation of Project Martha as described in the Assessment of

Environmental Effects attached to this application for resource consent, including, but not necessarily limited to:

- A **water permit** to take groundwater (including geothermal water) to dewater the Martha Pit and Martha Underground Mine (including any surface water which has seeped into the ground from the Martha Pit);
- A **discharge permit** to discharge material to land within, and adjacent to, the Martha Pit, including stockpiled material and material for the creation of noise bunds;
- A **land use consent** to remove vegetation and carry out earthworks and contouring of land for mining and mining operations (including 12124859rehabilitation) in a high-risk erosion area (being the pit walls);
- A **land use consent** and **discharge permit** to place rock and Concrete Aggregate Fill into land in the Martha Underground Mine as backfill and to allow groundwater to discharge from the flooded workings in the Martha Underground Mine into the surrounding ground post-closure;
- A **water permit** to take surface water from the Ohinemuri River and use it for the flooding of the Martha Pit and associated underground workings;
- A **discharge permit** to discharge surface water from the Ohinemuri River and treated water from the Water Treatment Plant to the Martha Pit to create the pit lake, and to flood underground workings;
- A **discharge permit** to discharge limestone to the pit lake;
- A **discharge permit** to discharge overflow water from the pit lake to the Mangatoetoe Stream;
- A **land use consent** to construct an intake structure in the Ohinemuri River;
- A **land use consent** to construct an outlet structure in the Mangatoetoe Stream;
- A **water permit** to divert groundwater during the construction of the outlet structure in the Mangatoetoe Stream;
- A **discharge permit** to discharge groundwater during the construction of the outlet structure in the Mangatoetoe Stream; and
- **A change to Condition 1 in Schedule One of Consent 124859 under Section 127 of the Resource Management Act 1991** so it authorises all discharges to air associated with Project Martha as follows:

  SCHEDULE ONE – GENERAL CONDITIONS

  Resource consents 124859 - 124864 (inclusive) are subject to the following general conditions, which are applicable to all consents.

  General

  Except as otherwise provided for by subsequent conditions of consent, all activities to which this consent relates shall be undertaken generally in accordance with the information contained in the document titled ***"Golden Link Project including the Correnso Underground Mine: Application for WRC for resource consent and AEE Volumes 1 and 2"*** *dated June 2012 and the s92 further information recorded as documents 2214077, 2214082 and 2265673 on*

*the Waikato Regional Council's document system for the Golden Link Project and the information contained in the document titled "**Project Martha: Applications for Resource Consents and Assessment of Environmental Effects**" dated 25 May 2018. Where there are inconsistencies between these documents the information contained in "**Project Martha: Applications for Resource Consents and Assessment of Environmental Effects**" shall prevail.*

7. I attach an assessment of the proposed activity's effect on the environment that—

(a) Includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

(b) Addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

(c) Includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

8. I attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

9. I attach an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

10. I attach information that adequately defines the following:

(a) The position of all new boundaries; and

(b) The areas of all new allotments; and

(c) The locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips; and

(d) The locations and areas of any existing esplanade reserves, esplanade strips, and access strips; and

(e) The locations and areas of any parts of the bed of a river or lake to be vested in the territorial authority under section 237A of the Resource Management Act 1991; and

(f) The locations and areas of any land within the coastal marine area (which is to become part of the common marine and coastal area under section 237A of the Resource Management Act 1991); and

(g) The locations and areas of land to be set aside as new roads.

Signature: 

Bernie O'Leary
General Manager Waihi Operation

Date: 25 May 2018

Electronic Address for Service: kathy.mason@oceanagold.com

Telephone: (07) 863 9826

Postal Address: OceanaGold (New Zealand) Limited
43 Moresby Avenue
Waihi 3610

Contact Person: Kathy Mason

Note an electronic address for service must be provided if you are applying for a fast-track resource consent application.

Note to applicant

You must include all information required by this form. The information must be specified in sufficient detail to satisfy the purpose for which it is required.

You may apply for 2 or more resource consents that are needed for the same activity on the same form. If you lodge the application with the Environmental Protection Authority, you must also lodge a notice in form 16A at the same time.

You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991 (if any).

If your application is to the Environmental Protection Authority, you may be required to pay actual and reasonable costs incurred in dealing with this matter (see section 149ZD of the Resource Management Act 1991).

Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgment.

A fast-track application may cease to be a fast-track application under section 87AAC(2) of the Act

FORM 9

APPLICATION FOR RESOURCE CONSENT OR FAST-TRACK RESOURCE CONSENT

Sections 87AAC, 88, and 145, Resource Management Act 1991

To: Waikato Regional Council
401 Grey Street
Private Bag 3038
Waikato Mail Centre
Hamilton 3240

1. OceanaGold (New Zealand) Limited, apply for the following type(s) of resource consent:

All necessary land use consents, discharge permits and water permits are sought to authorise all activities associated with the construction, operation, maintenance and rehabilitation of Project Martha as described in the Assessment of Environmental Effects attached to this application for resource consent, including but not necessarily limited to:

- A **water permit** to take groundwater (including geothermal water) to dewater the Martha Pit and Martha Underground Mine (including any surface water which has seeped into the ground from the Martha Pit);
- A **discharge permit** to discharge material to land within, and adjacent to, the Martha Pit, including stockpiled material and material for the creation of noise bunds;
- A **land use consent** to remove vegetation and carry out earthworks and contouring of land for mining and mining operations (including rehabilitation) in a high-risk erosion area (being the pit walls);
- A **land use consent** and **discharge permit** to place rock and Concrete Aggregate Fill into land in the Martha Underground Mine as backfill and to allow groundwater to discharge from the flooded workings in the Martha Underground Mine into the surrounding ground post-closure;
- A **water permit** to take surface water from the Ohinemuri River and use it for the flooding of the Martha Pit and associated underground workings;
- A **discharge permit** to discharge surface water from the Ohinemuri River and treated water from the Water Treatment Plant to the Martha Pit to create the pit lake, and to flood underground workings;
- A **discharge permit** to discharge limestone to the pit lake;
- A **discharge permit** to discharge overflow water from the pit lake to the Mangatoetoe Stream;
- A **land use consent** to construct an intake structure in the Ohinemuri River;
- A **land use consent** to construct an outlet structure in the Mangatoetoe Stream;

- A **water permit** to divert groundwater during the construction of the outlet structure in the Mangatoetoe Stream;
- A **discharge permit** to discharge groundwater during the construction of the outlet structure in the Mangatoetoe Stream; and
- **A change to Condition 1 in Schedule One of Consent 124859 under Section 127 of the Resource Management Act 1991** so it authorises all discharges to air associated with Project Martha as follows:

  SCHEDULE ONE – GENERAL CONDITIONS

  Resource consents 124859 - 124864 (inclusive) are subject to the following general conditions, which are applicable to all consents.

  General

  Except as otherwise provided for by subsequent conditions of consent, all activities to which this consent relates shall be undertaken generally in accordance with the information contained in the document titled ***"Golden Link Project including the Correnso Underground Mine: Application for WRC for resource consent and AEE Volumes 1 and 2"*** *dated June 2012 and the s92 further information recorded as documents 2214077, 2214082 and 2265673 on the Waikato Regional Council's document system for the Golden Link Project and the information contained in the document titled "**Project Martha: Applications for Resource Consents and Assessment of Environmental Effects**" dated 25 May 2018. Where there are inconsistencies between these documents the information contained in "**Project Martha: Applications for Resource Consents and Assessment of Environmental Effects"** shall prevail.*

2. The activity to which the application relates (the proposed activity) is as follows:

The proposed activity is known as Project Martha, which is described fully in the Assessment of Environmental Effects attached to this application for resource consent. Project Martha contains two key aspects:

- The Martha Underground Mine – which involves new underground mining beneath the Martha Pit and under a small area of residential, reserve and commercial land to the southeast of the pit; and
- The Phase 4 Cutback – which generally comprises a small extension to the north of the Martha Pit to remedy the failure of the north wall in a manner that:
  - Will enable the pit walls to be left in a stable and safe condition at the completion of mining; and
  - Restores access to the remaining consented ore reserve in the pit.

Project Martha will extend the life of mining in Waihi by approximately 12 years.

The Martha Underground Mine and the Phase 4 Cutback will operate largely in parallel, with some of the material mined from the Phase 4 Cutback being used as backfill for the Martha Underground Mine (and the existing Correnso and Slevin Underground Mines), with the remainder being conveyed to the Processing Plant, Central, Northern and Eastern Stockpiles or Tailings Storage Facilities for disposal.

Much of the existing and consented mining infrastructure operated by OceanaGold (New Zealand) Limited will be used to transport, process, store and dispose of material extracted from the Martha Underground Mine and Phase 4 Cutback. This includes the use of:

- Existing underground portals, access drives, ventilation shafts and other underground facilities and infrastructure to provide access to, and support the operation of, the Martha Underground Mine;
- The Surface Facilities Area to crush ore and rock material;
- The conveyor and surface mine roads to transport ore and rock material;
- The Processing Plant to process ore and temporarily stockpile rock material;
- The stockpiles at the Favona Portal and the Polishing Pond;
- The Water Treatment Plant to manage water from mining and mining operations;
- The Central, Northern and Eastern Stockpiles for the disposal of rock material; and
- The Tailings Storage Facilities for the disposal of tailings.

3. The site at which the proposed activity is to occur is as follows:

The activities associated with Project Martha will be undertaken in the central area of Waihi, within and adjacent to the existing mining infrastructure operated by OceanaGold (New Zealand) Limited.

The legal description of all properties that will support the various activities associated with Project Martha are documented in Appendix A to the Assessment of Environmental Effects attached to this application for resource consent.

4. The full name and address of each owner or occupier (other than the applicant) of the site to which the application relates are as follows:

The details of all owners of properties that will support the various activities associated with Project Martha are documented in Appendix A to the Assessment of Environmental Effects attached to this application for resource consent.

5. There are no other activities that are part of the proposal to which this application relates.

6. The following additional resource consents are needed for the proposal to which this application relates and have been applied for:

A **land use consent** from the Hauraki District Council to authorise all activities associated with the construction, operation, maintenance and rehabilitation of Project Martha as described in the Assessment of Environmental Effects attached to this application for resource consent, including but not necessarily limited to:

- All activities associated with the Phase 4 Cutback and the subsequent rehabilitation of the Martha Pit to a recreational lake and community parkland facility;
- All activities associated with the Martha Underground Mine, including the use and maintenance of existing and consented underground mine infrastructure; and

- The use of existing stockpile areas to temporarily stockpile material from Project Martha, and the use of a consented (but not yet constructed) concrete batching plant located near the Processing Plant.

A **subdivision consent** from the Hauraki District Council to subdivide land to accommodate the re-alignment of Bulltown / Cambridge Roads in the area of the Phase 4 Cutback

7. I attach an assessment of the proposed activity's effect on the environment that—

(a) Includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

(b) Addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

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8. I attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

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Signature: 

Bernie O'Leary
General Manager Waihi Operation

Date: 25 May 2018

Electronic Address for Service: kathy.mason@oceanagold.com

Telephone: (07) 863 9826

Postal Address: OceanaGold (New Zealand) Limited
43 Moresby Avenue
Waihi 3610

Contact Person: Kathy Mason

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Note to applicant

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You may apply for 2 or more resource consents that are needed for the same activity on the same form. If you lodge the application with the Environmental Protection Authority, you must also lodge a notice in form 16A at the same time.

You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991 (if any).

If your application is to the Environmental Protection Authority, you may be required to pay actual and reasonable costs incurred in dealing with this matter (see section 149ZD of the Resource Management Act 1991).

Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgment.

A fast-track application may cease to be a fast-track application under section 87AAC(2) of the Act

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PART 2

Assessment of Environmental Effects

1. INTRODUCTION

1.1 OVERVIEW OF THE PROPOSAL

OceanaGold New Zealand Limited ("***OGNZL***") owns and operates various mines and mining infrastructure in Waihi. This includes:

- An open pit mining operation located more-or-less in the middle of Waihi township ("***Martha Pit***");
- A series of underground mines to the east and southeast of the Martha Pit (being the "***Favona Underground Mine***", "***Trio Underground Mine***", "***Correnso Underground Mine***" and "***Slevin Underground Mine***"); and
- A suite of ancillary facilities associated with mining and mining operations, including a Surface Facilities Area ("***SFA***"), Ore Processing Plant ("***Processing Plant***"), Water Treatment plant ("***WTP***"), Central, Northern and Eastern Stockpiles[1], Tailings Storage Facilities ("***TSF***"), and a conveyor which connects the Martha Pit to the Processing Plant.

Operations at the Martha Pit commenced in 1987 and operated relatively continuously up until April 2015, when a series of small failures undercut the haul road in the Martha Pit and resulted in the cessation of mining. Failure of a major portion of the north wall subsequently occurred on 26 April 2016.

The failure of the north wall is preventing OGNZL from fulfilling its obligations to leave the walls in the Martha Pit in a 'safe and stable' condition upon closure of the pit, as some of the works required to achieve a safe and stable pit wall need to take place outside the area within which surface mining and mining operations are currently authorised. The failure of the north wall is also preventing OGNZL from obtaining access to the remaining consented ore at the base of the pit.

At current mining and processing rates the existing consented ore resources at Waihi (primarily comprising ore in the Correnso and Slevin Underground Mines) is scheduled to be exhausted by the end of 2019. Unless the ability to mine additional ore is authorised in advance of the existing consented ore being exhausted the workforce required for mining and mining operations at Waihi will need to be reduced. OGNZL is, therefore, investigating opportunities to access additional ore resources. This includes extending the life of productive underground mining at Waihi and addressing the north wall of the Martha Pit.

The outcome of these investigations to date is Project Martha, which contains two key aspects:

- The Martha Underground Mine – which involves new underground mining beneath the Martha Pit and under a small area of residential, reserve and commercial land to the southeast of the pit; and

[1] Including the deposition of rock in the embankments of the TSF's.

- The Phase 4 Cutback – which generally comprises a small extension to the north of the Martha Pit to remedy the failure of the north wall in a manner that:
  - Will enable the pit walls to be left in a stable and safe condition at the completion of mining; and
  - Restores access to the remaining consented ore reserve in the pit.

Project Martha will extend the life of mining in Waihi by approximately 12 years and the economic gains will average approximately $73M a year. This represents significant additional economic activity than would otherwise not occur.

The Martha Underground Mine and the Phase 4 Cutback will operate largely in parallel, with some of the material mined from the Phase 4 Cutback being used as backfill for the Martha, Correnso and Slevin Underground Mines – with the remainder being conveyed to the Processing Plant for disposal.

An illustrative overview of the two facets of Project Martha is provided in Figure 1.1 and Figure 1.2 below.

Figure 1.1: Indicative Area of the Martha Underground Mine[2]

[2] Light Blue = Avoca Virgin Stopes, Green = Backfilled Remnant Backfilled Stopes, Pink = Ore Development and Purple = Remnant Stopes (not backfilled).

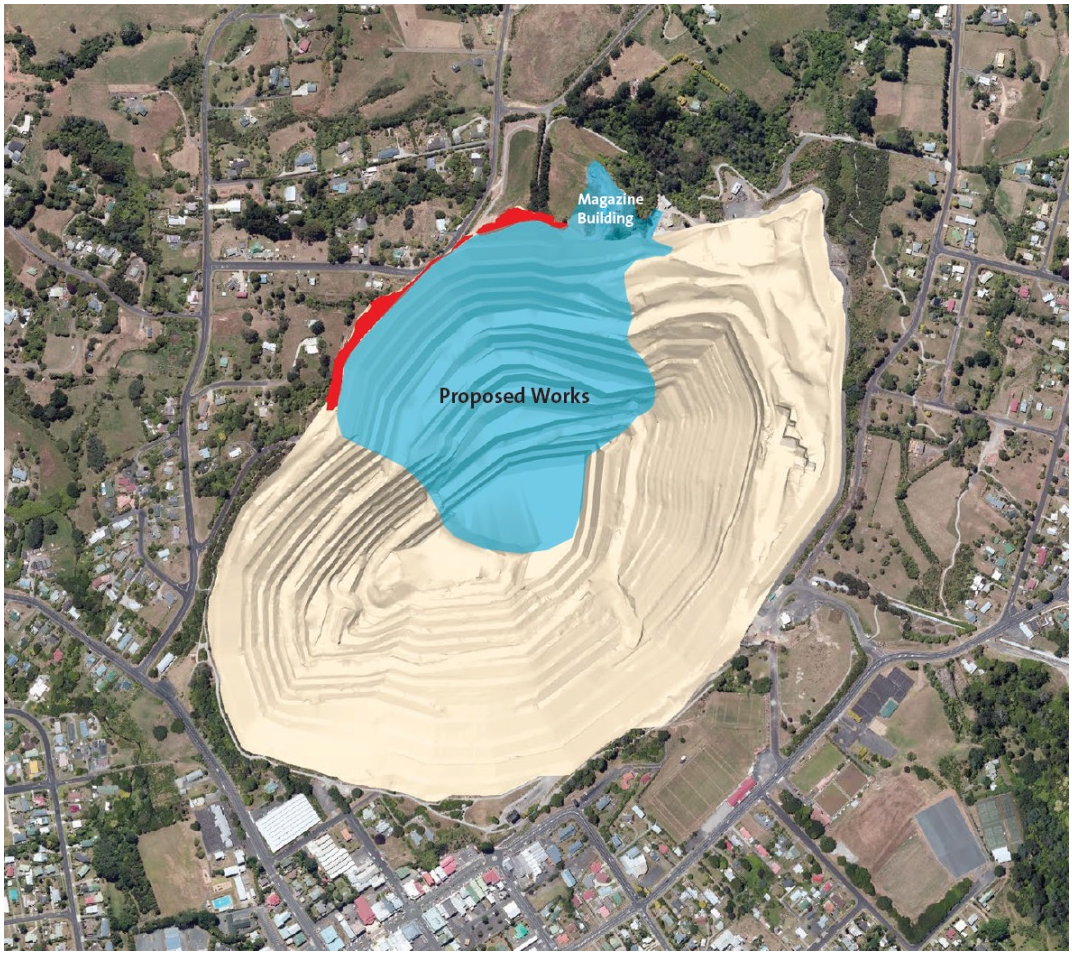

Figure 1.2: Indicative Area of the Phase 4 Cutback (Cutback Area in Blue / Proposed Noise Bunds in Red)

Much of the existing and consented mining infrastructure operated by OGNZL will be used to transport, process, store and dispose of material extracted from the Martha Underground Mine and Phase 4 Cutback. This includes the use of:

- Existing underground portals, access drives, ventilation shafts and other underground facilities and infrastructure to provide access to, and support the operation of, the Martha Underground Mine;
- The SFA to crush ore and rock material;
- The conveyor and surface mine roads to transport ore and rock material;
- The Processing Plant to process ore and temporarily stockpile rock material;
- The stockpiles at the Favona Portal and the Polishing Pond;
- The WTP to manage water from mining and mining operations;
- The Central, Northern and Eastern Stockpiles for the disposal of rock material; and
- The TSF's for the disposal of tailings.

1.2 OCEANAGOLD NEW ZEALAND LIMITED

OGNZL acquired the mines at Waihi from Newmont Mining in October 2015.

OGNZL is a wholly owned subsidiary of OceanaGold Corporation (***"OceanaGold"***). OceanaGold is a Canadian corporation with its head office in Melbourne, Australia. OceanaGold is a publicly listed company on the Australian and Toronto stock exchanges. In addition to the New Zealand mines owned and operated by OGNZL as discussed below, OceanaGold also owns and operates major mines in the Philippines (Didipio) and United States (Haile), and holds development rights in other parts of the world - including Central America and Australia.

OGNZL considers that strong environmental performance and maintaining its social licence to operate are an integral part of being a successful business. The company is committed to working with the local community to create opportunities, build resilience and leave a positive, long-lasting legacy well beyond the mining life-cycle. This commitment is detailed in a suite of company policies which are available on the OGNZL website.[3]

In addition to the mines in Waihi, OGNZL:

- Owns and operates the Macraes Gold Project in East Otago, which has been operating since 1989 and is New Zealand's largest gold mine, consisting of a number of open pit mines and the Frasers Underground Mine; and
- Owns the Reefton Mine in the West Coast Region, which is currently undergoing closure and rehabilitation; and
- Owns several prospecting and exploration rights elsewhere in New Zealand, which are in various stages of evaluation for their mineral development potential.

1.3 RESOURCE CONSENT REQUIREMENTS

OGNZL is seeking all necessary resource consents from the Hauraki District Council ("***HDC***") and Waikato Regional Council ("***WRC***") for all construction, operation, maintenance and rehabilitation activities associated with Project Martha. By way of summary:

- A land use consent is sought from the HDC to authorise:
  - All activities associated with the Phase 4 Cutback and the subsequent rehabilitation of Martha Pit to a recreational lake and community parkland facility;
  - All activities associated with the Martha Underground Mine, including the use and maintenance of existing and consented underground mine infrastructure; and
  - The use of existing stockpile areas to temporarily stockpile material from Project Martha, and the use of a consented (but not yet constructed) concrete batching plant located near the Processing Plant.

[3] http://www.waihigold.co.nz/about/

- A subdivision consent is sought from the HDC to subdivide land to accommodate the re-alignment of Bulltown / Cambridge Roads in the area of the Phase 4 Cutback; and
- All necessary land use consents, discharge permits and water permits are sought from the WRC for the construction, operation, maintenance and rehabilitation of the Phase 4 Cutback and the Martha Underground Mine.

Further information on the activities associated with Project Martha that trigger the need for resource consent from the HDC and WRC, including the term of consent being sought, is provided in Section 4 of this Assessment of Environmental Effects ("***AEE***").

1.4 REPORT STRUCTURE

This AEE is in support of resource consent applications by OGNZL under the Resource Management Act 1991 ("***RMA***") to authorise all necessary activities associated with Project Martha.

All matters required to be addressed in accordance with Schedule 4 of the RMA are contained within this AEE, which is set out in nine sections as follows:

Section 1 Is this introduction.

Section 2 Describes the existing environment for Project Martha.

Section 3 Provides an overview of Project Martha.

Section 4 Sets out the resource consent requirements for Project Martha.

Section 5 Addresses the actual and potential effects of Project Martha on the environment.

Section 6 Provides a summary of the measures proposed by OGNZL to avoid, remedy or mitigate any actual or potential effects on the environment, and the monitoring that is proposed.

Section 7 Describes the consultation undertaken by OGNZL for Project Martha and the feedback received from stakeholders and the community.

Section 8 Sets out the statutory framework against which the resource consent applications for Project Martha have been made and assesses the project in relation to the provisions of the relevant statutory planning documents and the RMA.

Section 9 Is a concluding comment.

Various technical assessments have been commissioned by OGNZL to support this AEE. They are appended to this AEE and are referenced throughout this document as necessary.

Any references to 'mining', 'surface mining', 'underground mining' and 'mining operations' in the technical assessments appended to this AEE should be interpreted in the general sense and the purpose for which they were prepared. These references should not be construed as referring to the definitions of these terms in the Hauraki District Plan.

2. EXISTING ENVIRONMENT

2.1 INTRODUCTION

This section describes the existing environment against which actual and potential effects of Project Martha are to be assessed. It addresses:

- Land use and zoning;
- Land ownership;
- The existing and authorised mining activities;
- The socio-economic context;
- Cultural values;
- Landscape context and character;
- The transportation network;
- Noise and vibration;
- Geotechnical values;
- Hydrogeology;
- Surface water;
- Ecology;
- Heritage values;
- Significant trees; and
- Air quality, meteorology and climate.

In addition, the existing environment for Project Martha also embraces:

- The future state of the environment as it might be modified by the utilisation of rights to carry out a permitted activity in accordance with the Waikato Regional Plan or the Hauraki District Plan; and
- The environment as it might be modified by the implementation of resource consents which have been granted at the time this particular resource consent application is being considered, where it appears that those resource consents will be implemented.

2.2 LAND USE AND ZONING

The zoning in the Hauraki District Plan attributed to the site of the Phase 4 Cutback is shown in Figure 2.1 below.

Most of the Phase 4 Cutback is located in the Martha Mineral Zone (the light green area in Figure 2.1). However, a small portion of the cutback and the new noise bund will be located in the Low Density Residential (the red area in Figure 2.1) and Residential Zones (the purple area in Figure 2.1).

The re-alignment of Bulltown / Cambridge Roads will also be partially located in the Low Density Residential Zone.

Figure 2.1: Hauraki District Plan Land Use Zones – Phase 4 Cutback

The zoning in the Hauraki District Plan attributed to the land within which the Martha Underground Mine will be located is shown in Figure 2.2 below. The mine is predominantly in the Martha Mineral Zone. However, it will also be partly located in the Reserve (Active), Residential and Town Centre Zones.

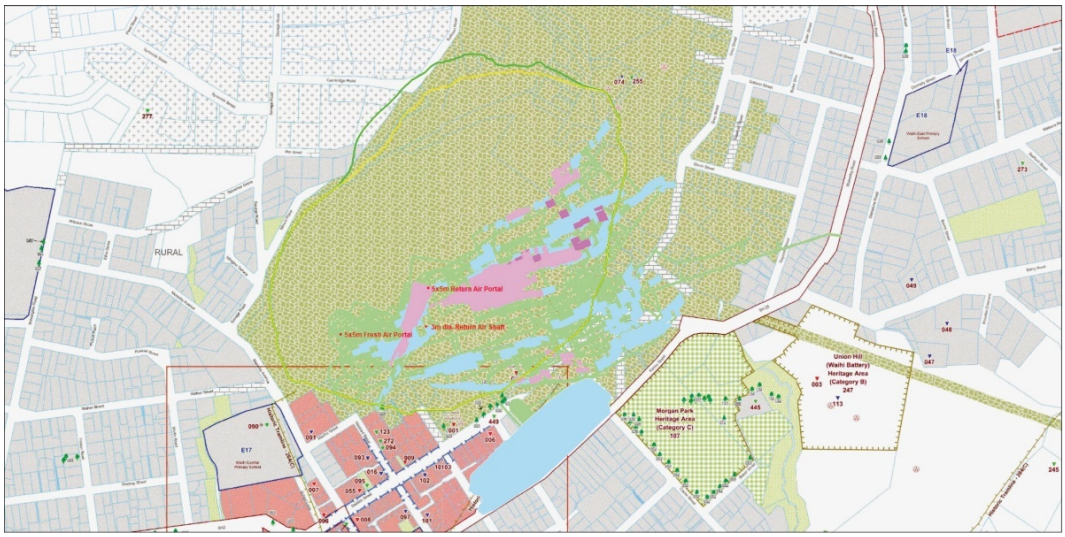

Figure 2.2: Hauraki District Plan Land Use Zones – Martha Underground Mine

It is noted that:

- The existing and consented portals, access drives, ventilation shafts and other underground facilities and infrastructure which will be used to support the Martha Underground Mine are located beneath the Martha Mineral, Residential, Town Centre, Reserve (Active), Reserve (Passive) and Rural Zones;
- The existing and consented stockpile areas at the Favona Portal and the polishing pond are located within the Rural and Martha Mineral Zones respectively; and
- The concrete batching plant is consented within the Rural Zone.

It is also understood that there are some sites in the Residential and Low Density Residential Zones that are vacant. The Hauraki District Plan allows residential activities to be established on those sites as a permitted activity.[4] Likewise, residential activities located above the ground floor level are a permitted activity in the Town Centre Zone.[5]

In light of the above, it has been assumed that there is potential for further residential activities in parts of the Low Density Residential, Residential and Town Centre Zones when assessing the actual and potential effects of Project Martha.

2.3 LAND OWNERSHIP

The properties that will support the various activities associated with Project Martha are documented in **Appendix A** to this AEE.

The majority of the activities directly associated with Project Martha will be undertaken on, or beneath, land owned by OGNZL, Land Information New Zealand, Department of Conservation or the HDC. The exceptions are properties located above:

- That part of the Martha Underground Mine which will access the Rex orebody located to the southeast of Martha Pit; and
- The existing underground access drives and other underground facilities and infrastructure that will provide access to, and support the operation of, the Martha Underground Mine (e.g. access to the underground mining areas for both ore extraction and backfilling, and to allow for the transportation of ore and rock).

In accordance with the requirements of the Crown Minerals Act 1991, where mining activities involve surface disturbance on land not owned by OGNZL an access arrangement with the landowner will be required.

2.4 SOCIO-ECONOMIC CONTEXT

Mining has been a major part of the development of Waihi, with the town's fortunes closely tied to the fortunes of the generations of gold miners who worked the resource of the Hauraki Goldfield.

Open pit mining, and then underground mining, has been a feature of life in, and around, Waihi since 1987.

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4 Rules 5.7.4.1 (P1) and 5.8.4.1 (P1) of the Hauraki District Plan.

5 Rule 5.11.4.1 (P2) of the Hauraki District Plan.

An assessment of the economy of Waihi and the Hauraki District is provided in Sense Partners (2018), which is attached as **Appendix B** to this AEE. This assessment notes that Waihi currently has a population of approximately 5,200 people and has a relatively large local economy. Mining tends to boost local economic activity to a larger size than other similar sized towns for the following key reasons:

- The mining sector is highly productive. For each employee, it creates economic activity of around $534,000 per year (compared to around $43,000 in the retail sector and $95,500 across the whole economy); and
- The mining sector doesn't tend to crowd out other parts of the economy. The ore resource is either used for mining or not used at all (it is not like farming where an increase in one type of activity generally displaces some other current use). It also tends to attract its labour force from other parts of New Zealand or overseas, rather than re-directing the local labour force away from other productive purposes.

The economy of Waihi was worth approximately $229M in 2017. This compares with an official estimate of New Zealand Gross Domestic Product ("***GDP***") of $269B, and the estimate by Sense Partners (2018) of the GDP of the Waikato Region as $22B and the GDP of the Hauraki District as $498M.

Figure 2.3 below outlines the composition of the Waihi economy.

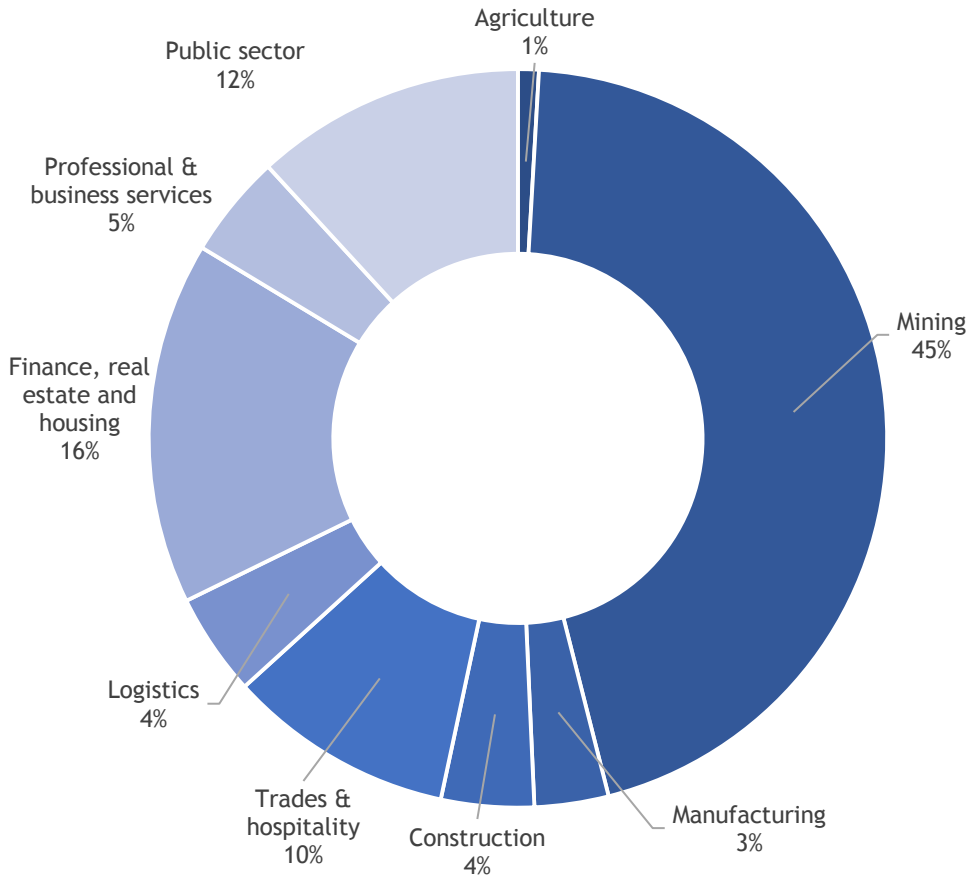

Figure 2.3: Composition of the Waihi Economy

2.5 CULTURAL VALUES

OGNZL (and its predecessors) has engaged with the iwi of Waihi in relation to various mining proposals over the last 30 years, and engagement is currently occurring in relation to Project Martha.

The nature of the engagement between OGNZL and iwi has been wide-ranging. It has included the establishment of Memoranda of Understanding, which have sought to recognise the relationship of iwi with some of the areas that are subject to mining activities and their role as kaitiaki (and for iwi to recognise the perspectives and interests of the company). It has also included engagement in relation to the potential cultural effects of resource consent applications for new mining proposals (e.g. through the preparation of cultural impact assessments), acknowledging that at times there has been a need for iwi to submit on resource consent applications by the company. OGNZL has also worked with iwi to implement cultural awareness training of its staff.

In light of the above, OGNZL recognises that its mining activities are located within the rohe of Hauraki iwi. The rohe of Hauraki iwi is described as *"Mai Matakana ki Matakana"* and covers the area from Matakana Estuary (near Mahurangi) in the north to Te Kauri Point (overlooking Matakana Island) in the south. OGNZL understands that the following iwi

have, or have had, a relationship with Waihi and therefore have an interest in mining activities undertaken by the company in and around Waihi:

- Ngati Hako;
- Ngati Koi;
- Ngati Maru;
- Ngati Tamatera;
- Ngati Tara Tokanui; and
- Ngati Whanaunga.

It is also understood that some of the iwi identified above principally have an interest in the potential effects of the mining activities in Waihi on the Ohinemuri and Waihou Rivers.

The Martha Pit has involved the mining of the ore body in Pukewa – a prominent hill in Waihi that had a pa nestled at its base. Ngati Hako have previously advised that Pukewa is the source of great energy and power and is the resting place of its ancestors.[6]

It is understood that the mauri of Pukewa has been affected by the mining activities that have been undertaken historically and in modern times, but that iwi continue to have a significant relationship with Pukewa. In this regard, the Hauraki Iwi Environment Plan acknowledges the loss of waahi tapu associated with the mining activities at Pukewa.[7]

It is also recognised that the Ohinemuri River is a taonga to iwi[8] and they have previously advised that in pre-European times the river was home to thriving populations of whitebait, tuna, and other native fish and the surrounding forest teemed with birds. Various iwi have also noted that historic mining activities in Waihi damaged and polluted the Ohinemuri River and that the Ohinemuri / Waihou Rivers are of spiritual, cultural and historic significance.[9]

The Waikato Regional Policy Statement ("***RPS***") does not identify any scheduled sites of significance to iwi within the vicinity of Project Martha. It does, however, include a method that specifies that the WRC will encourage tangata whenua to identify (using the criteria provided in section 10A of the RPS) those areas, places, landscapes and resources of significance - including those with significant spiritual or cultural historic heritage values.

The Hauraki District Plan also does not identify any scheduled sites of significance to iwi within the vicinity of Project Martha. It does acknowledge the relationship of Maori with their ancestral lands, water, waahi tapu and other taonga has the potential to be destroyed or compromised through inappropriate land use and development. Further, it notes that ancestral land is an important source of spiritual strength.

There are currently no statutory acknowledgements in the vicinity of Project Martha or the general area of Waihi.

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6 Cultural Values Assessment for the Favona Underground Mining Application, Te Kupenga o Ngati Hako Inc, 29 October 2003.

7 Hauraki Iwi Environment Plan, March 2004, Page 24.

8 Ngati Hako Cultural Values Assessment, 2003.

9 Maori Values Assessment, Ngati Maru 1999, Page 23.

2.6 EXISTING AND AUTHORISED MINING ACTIVITIES

2.6.1 Overview

A variety of existing mining and mining-related activities have, and continue to be, undertaken in Waihi (see Figure 2.4 below). These activities and areas include:

- The Martha Pit;
- The various existing and consented underground mines;
- The conveyor;
- The Processing Plant;
- The Central, Northern and Eastern Stockpiles;
- The TSF's; and
- The WTP and an extensive network of mine water management infrastructure.

A brief description of each is provided below.

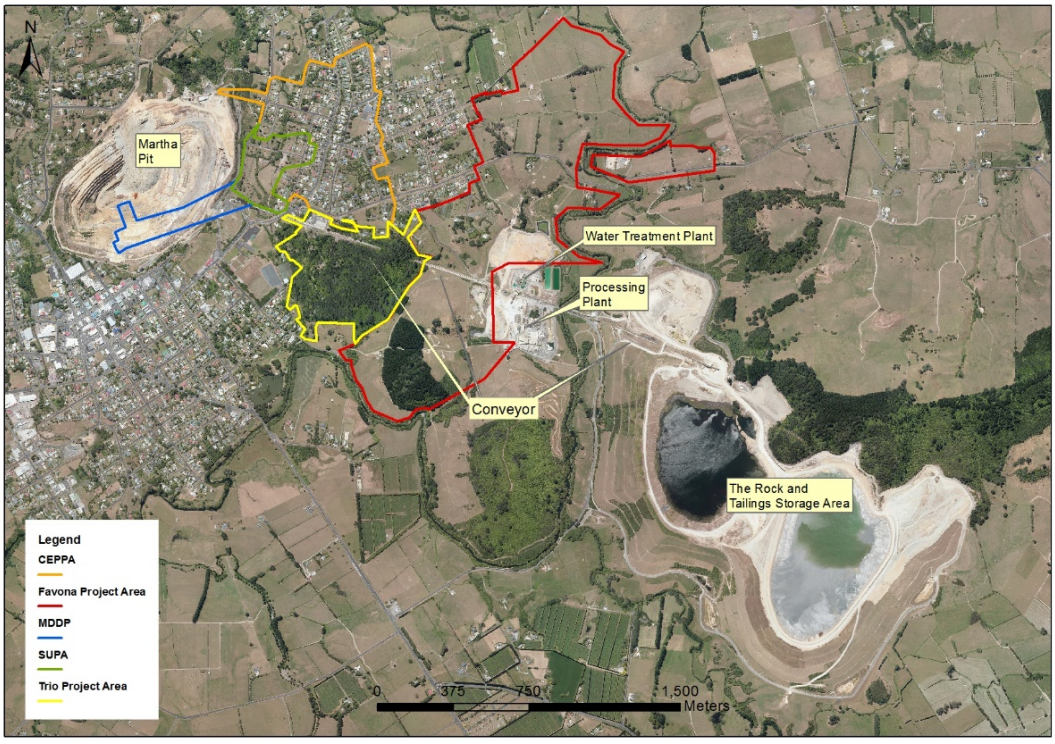

Figure 2.4: Overview of Existing Mining Activities / Infrastructure[10]

2.6.2 Martha Pit

The Martha Pit commenced operations in 1987 in accordance with Mining Licence 32 2388 ("***ML 32 2388***") and a number of water rights. Subsequently, the Martha Mine Extended Project ("***Extended Project***") provided for the pit to be extended both in area and depth.

[10] The coloured polygons show the project areas for the various underground mines.

The Extended Project was authorised by a variation to ML 32 2388, a new land use consent from the HDC (LUC 97/98-105)[11] and a number of resource consents from the WRC.

The Extended Project commenced in 1999 and increased the life of the mine by an additional seven years. A stability cutback of the south wall, including limited ore recovery, took place between 2006 and 2010 under the conditions of the ML 32 2388 and LUC 97/98-105.

The existence of an ore body to the east of the Martha Pit (but still within the area covered by ML 32 2388 and LUC 97/98-105) was proven in 2008 and this resulted in an extension to the pit, which was known as the East Layback. The East Layback partly overlaid the historic 'milking cow' collapse zone, which is a zone of significant subsidence caused by the collapse of historic underground mine workings. The East Layback provided an opportunity to access ore, while also addressing some of the stability issues in the area, thereby assisting in meeting closure obligations to leave the walls of the Martha Pit in a 'safe and stable' condition at closure.

The East Layback was cut short in April 2015 when a series of small failures undercut the haul road and led to the cessation of mining. Failure of a major portion of the north wall took place on 26 April 2016.

ML 32 2388 expired in July 2017 and LUC 97/98-105 expires in October 2019. However, the surface mining and mining operations authorised by each permit are grandfathered into the Hauraki District Plan as permitted activities.[12] This means that the activities authorised by ML 32 2388 and LUC 97/98-105 can continue to be undertaken in those parts of the Martha Mineral Zone to which each permit applied, provided the activities meet the various conditions on each permit.

To provide some context to the areas in which ML 32 2388 and LUC 97/98-105 already permit surface mining and mining operations (relative to the location of the Phase 4 Cutback), Figure 2.5 shows:

- The area subject to ML 32 2388 in blue;
- The area subject to LUC 97/98-105 in red;
- The Martha Mineral Zone in pink;
- The existing pit crest in yellow; and
- The pit crest following the completion of the Phase 4 Cutback in green.

Only a very small part of the Phase 4 Cutback will be located outside the area covered by ML 32 2388, LUC 97/98-105 and the Martha Mineral Zone.

[11] Also known as the 'EMMA' Consent.

[12] Rules 5.17.4.1 (P1) and (P2) of the Hauraki District Plan.

Figure 2.5: Martha Pit Zoning and Permit Overlays

ML 32 2388 and LUC 97/98-105 require the rehabilitation of the Martha Pit at closure in accordance with an approved Rehabilitation and Closure Concept Plan. The centre piece of this concept plan is a pit lake and recreational open space. Rehabilitation and closure is addressed in more detail in Section 2.6.8 of this AEE.

OGNZL also holds several resource consents from the WRC which authorise various activities associated with the operation and rehabilitation of the Martha Pit. These are documented in **Appendix C** to this AEE. Of note, the dewatering of the Martha Pit is currently achieved by the dewatering of the existing underground mines (refer to Section 2.6.4 of this AEE).

It is also noted that OGNZL has applied to the WRC to replace resource consents that expired in July 2017 for:

- The removal of vegetation (Consent 971282);
- Undertaking earthworks (Consent 271283);
- The placement of ore, rock, topsoil and tramp material in stockpiles (Consent (971284); and
- The diversion of an unnamed ephemeral tributary of the Eastern Stream around the perimeter of the SFA for stormwater management purposes.

OGNZL is currently relying on the expired resource consents to undertake these activities in accordance with Section 124 of the RMA.

2.6.3 Historic Martha Mine Workings

Gold was first discovered at Pukewa (Martha Hill) in 1878. Between then, and the closure of the original Martha Mine in 1952, extensive surface and underground mining was undertaken at the site. The original mine extended to a depth of approximately 620 m.

The location of the historic workings of the Martha Mine is shown in Figure 2.6 and Figure 2.7 (relative to the Martha Underground Mine). These extensive historical underground workings have implications for the design and mining methods used for both surface and underground work proposed as part of Project Martha, and have been considered in the geotechnical evaluations that support the resource consent applications for the project.

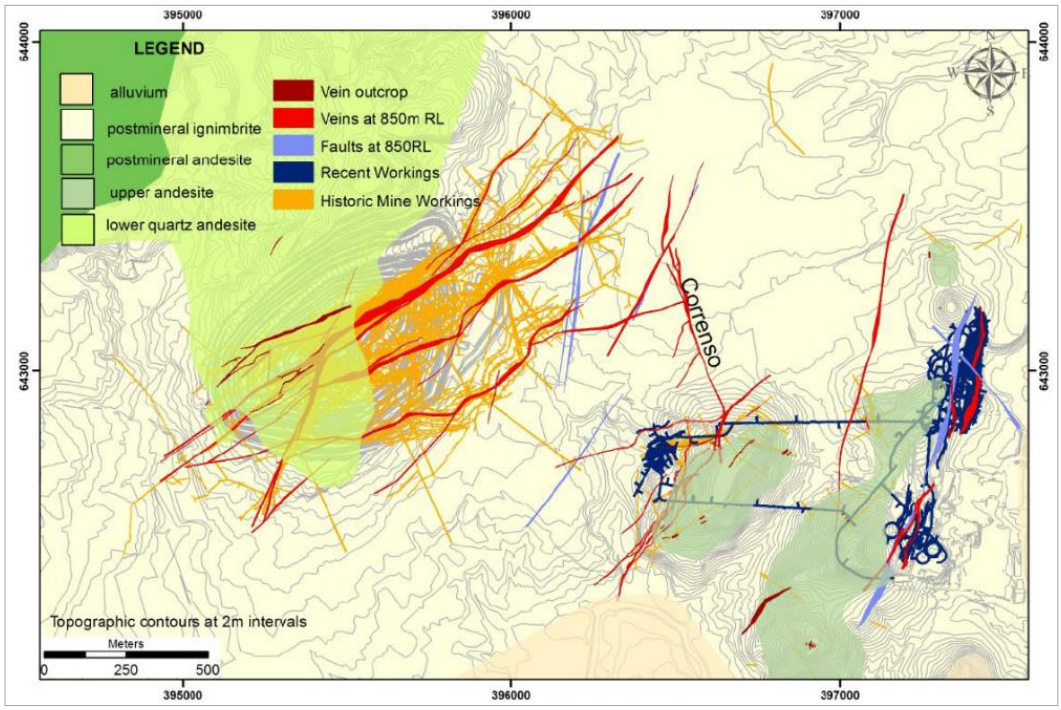

Figure 2.6: Historic Underground Mining Areas

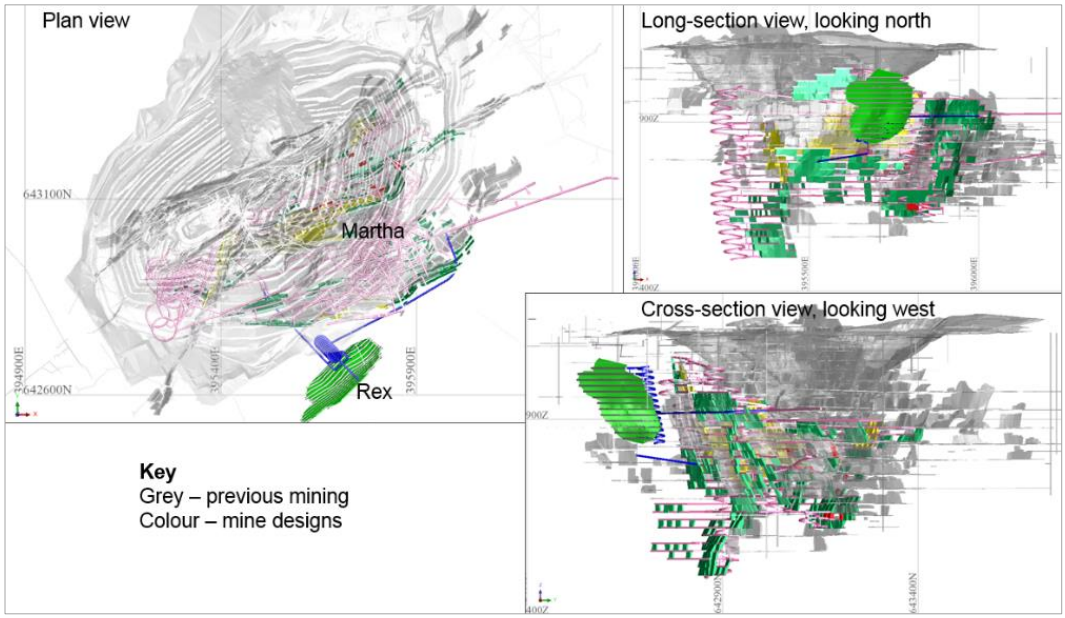

Figure 2.7: Historic Martha Mine Underground Workings - Relative to Martha Underground Mine

2.6.4 Modern Underground Mining

Several underground mines have been established to the east and southeast of the Martha Pit in the last 30 years. They include:

- The Favona Underground Mine;
- The Trio Underground Mine;
- The Correnso Underground Mine; and
- The Slevin Underground Mine.

OGNZL has also undertaken construction of two exploration drives beneath the Martha Pit (known as the Martha Drill Drive Project).

OGNZL also holds several resource consents from the WRC for the ancillary activities associated with these underground mines. These are documented in **Appendix C** to this AEE and include:

- The discharge of contaminants to air from mine portal, vent shafts and project areas;
- The abstraction of groundwater and mine water for the de-watering of the underground mines;
- To discharge rock and ore onto land in temporary surface stockpiles and to discharge seepage from the temporary stockpiles into ground;
- To construct and place a water intake structure in the Ohinemuri River to facilitate accelerated flooding of the underground workings and the filling of the pit lake;
- The abstraction and use up to 15,000 m^3 of water per day from the Ohinemuri River associated with the flooding of the underground mines and the pit lake; and
- To discharge treated mine water from the WTP to ground in association with the flooding of underground mines.

These resource consents expire between 2028 and 2047.

It is noted the groundwater taken to dewater the underground mining areas is pumped to the WTP for treatment (refer to Section 2.6.6.2 of this AEE).

2.6.5 The Conveyor

Material from the Martha Pit is transported to the Processing Plant, Central, Northern and Eastern Stockpiles and TSF's by an overland conveyor system. The conveyor passes under Grey Street and State Highway 25 ("***SH25***"). It then enters the area around Union Hill, where it rises to ground level and then enters a tunnel through Union Hill. From the eastern end of the tunnel the conveyor passes over open farm land at ground level directly to the Processing Plant.

Ore is directed to a stockpile at the Processing Plant by a tripper and stacking conveyor, while rock remains on the conveyor and is transported across the Ohinemuri River to a truck loading facility at the Central, Northern and Eastern Stockpiles and TSF's.

Access is provided along the conveyor route to permit daily inspection, maintenance and rock spillage clean up.

The use and operation of the conveyor was authorised by ML 32 2388 and LUC 97/98-105. As outlined in Section 2.6.2 of this AEE, the activities authorised by each permit are grandfathered into the Hauraki District Plan via rules which make activities undertaken in accordance with each permit a permitted activity.

There are two resource consents from the WRC which authorise activities associated with the conveyor. These are also documented in **Appendix C** of this AEE, and include:

- The discharge of contaminants to air; and
- The discharge stormwater from the conveyor trench via silt ponds.[13]

2.6.6 Processing Plant and Water Treatment Plant

The Processing Plant and WTP are located to the east of Waihi (see Figure 2.4 above). Access is by way of Baxter Road and an access road over the Ohinemuri River.

The layout of the Processing Plant and WTP is set out in Figure 2.8 below.

Both facilities operate 24 hours per day, seven days per week.

[13] This resource consent expired in July 2017 and a new resource consent for this activity has been sought from the WRC. The activity is currently undertaken in accordance with Section 124 of the RMA.

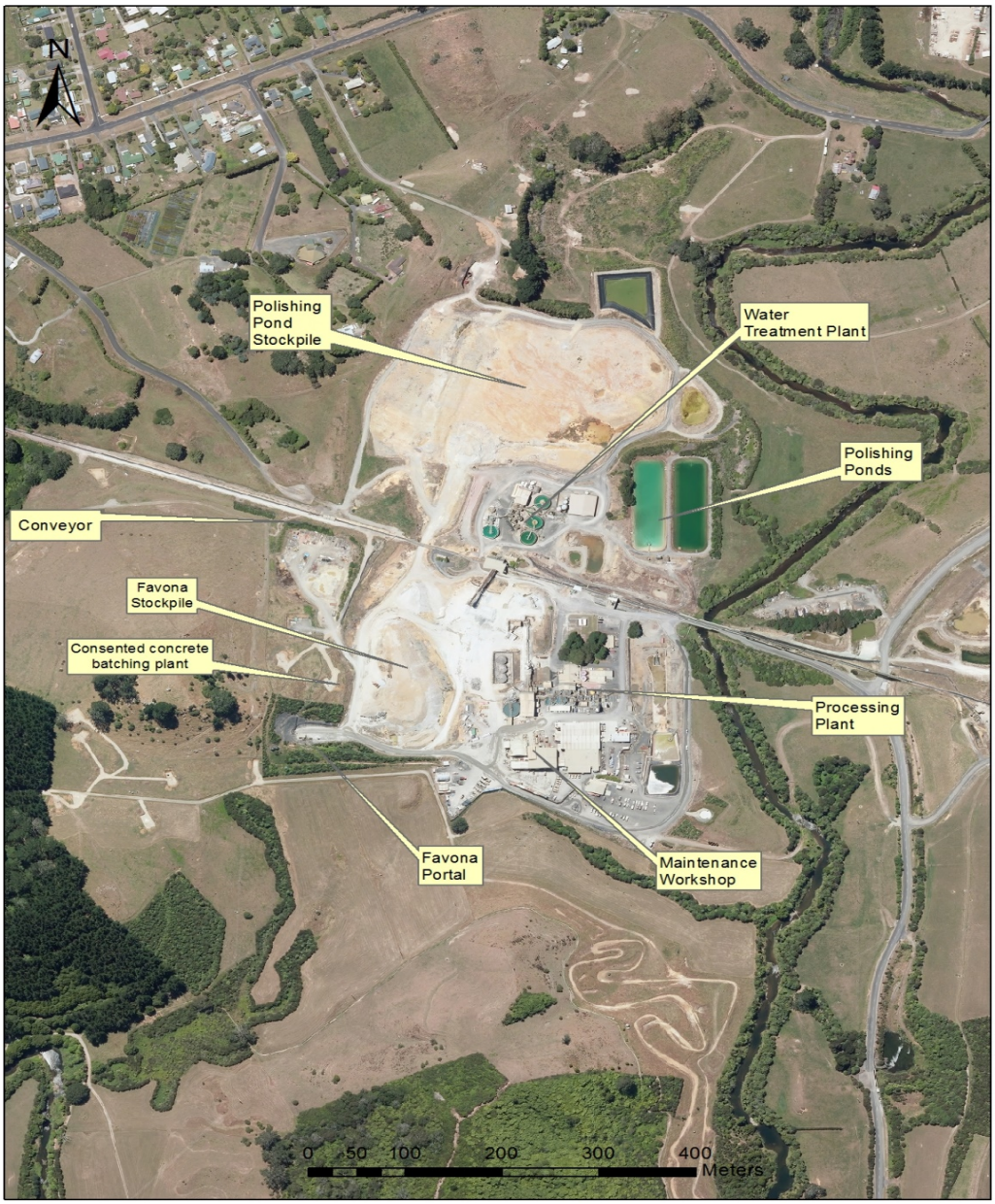

Figure 2.8: Layout of the Processing Plant and Water Treatment Plant

2.6.6.1 Processing Plant

The Processing Plant consists of a conventional carbon-in-pulp gold and silver processing plant. It can process up to 1.25 million tonnes of ore per annum.

Ore from the conveyor is discharged onto a coarse ore pad. This coarse ore stockpile material is fed into a semi-autogenous grinding mill and secondary ball mill circuit. Water and limestone is added and the ground ore in slurry form is pumped to a series of cyanide leach and carbon adsorption tanks for dissolution of the gold and silver, which is then adsorbed onto the activated carbon.

The carbon is removed from the circuit and the remaining slurry (tailings) which is barren of economically recoverable gold and silver is pumped to the tailings storage area. The carbon, which is loaded with gold and silver, is chemically washed to remove the gold and silver – which are then recovered by electrowinning. The remaining barren solution is recycled to the leach tanks.

The precipitated gold and silver are smelted to produce bullion bars and the slag from the smelting process is returned to grinding circuits. The bullion bars are exported to Australia for refining.

2.6.6.2 Water Treatment Plant

OGNZL operates a comprehensive mine water management system at Waihi. An overview is provided in Figure 2.9 below. The system is designed to capture and treat as necessary all water impacted by mining activities.

While some water is re-used as process water, there is always a net gain of water on site due to the high rainfall experienced in Waihi. The basic operating regime applied to site water management includes:

- Natural water is diverted away from areas disturbed by mining activities wherever practicable, in order to reduce the volumes of water affected by the mining activities;
- All water from areas disturbed by mining activities is directed to appropriate collection and treatment facilities prior to discharge off-site;
- Where practicable, OGNZL endeavours to reduce the volumes of water requiring treatment; and
- Disturbed areas are progressively rehabilitated at the earliest practicable time to minimise silt losses and improve runoff water quality.

Areas that currently generate water requiring treatment by the WTP include:

- The Martha Pit – stormwater runoff and groundwater;
- Underground Mines – groundwater dewatering;
- Runoff from the area around the Processing Plant and WTP;
- Decant pond water – from TSF1A;
- Collection pond water (at times) – stormwater runoff from overburden storage areas; and
- Seepage – from TSF1A and TSF2 (including embankment structures).

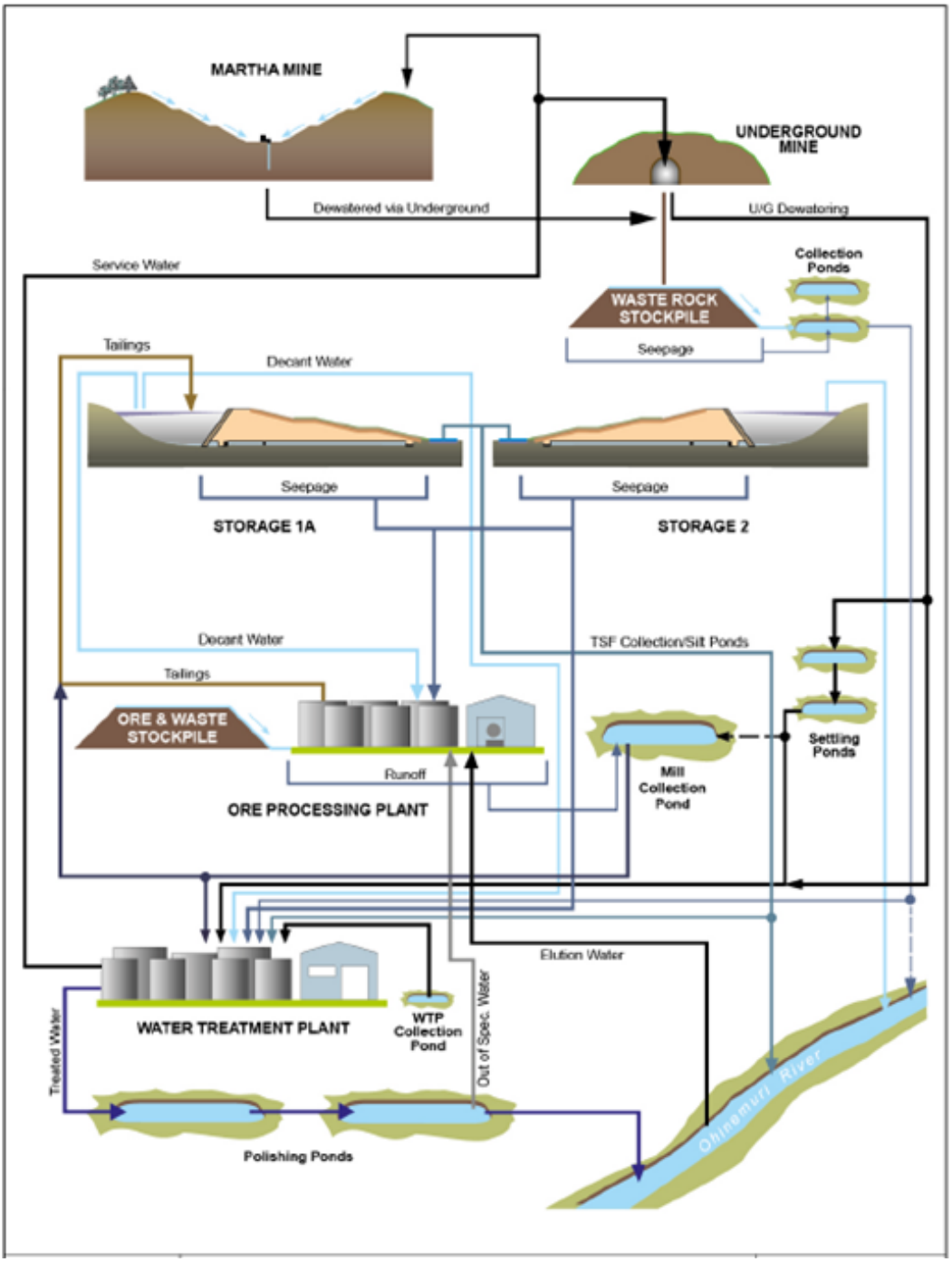

Figure 2.9: Water Management System Overview

The WTP has been in operation since 1988 and was subject to upgrades in 1999 and 2011. A reverse osmosis plant was built and commissioned in 2008 to provide an additional treatment option for the removal of metals if necessary.

The WTP incorporates four parallel streams, with three of these dedicated to soluble metals removal only. The fourth stream has two phases of treatment – oxidation of cyanide to destroy the cyanide complexes followed by metals precipitation and removal.

Cyanide oxidation is achieved using a combination of hydrogen peroxide, copper sulphate and limestone. A series of tanks are used for reagent mixing followed by retention to provide time for chemical reaction. Hydrogen peroxide in the presence of copper destroys all free cyanide through chemical oxidation. Weak acid dissociable cyanide is also oxidised during the process. On oxidation, cyanide yields simple carbon and nitrogen compounds.

Limestone and ferric chloride are added to all four water streams to facilitate metals precipitation and removal. Metals tend to occur in a soluble form when the pH of water is low and raising the pH with limestone in the presence of ferric chloride causes insoluble hydroxides and carbonates to form. Following mixing and retention a polyelectrolyte (flocculant) is added along with more limestone to form flocs that can be settled out.

Clarifiers at the end of the treatment process allow the suspended solids and metals to be removed from the water. The suspended solids and metals fall to the bottom of the clarifiers forming a slurry. The slurry is pumped to the TSF1A via a thickener. Carbon dioxide is added to the clean water overflow from the clarifier to reduce the pH of the water to meet the compliance limits.

There are two polishing ponds that hold the treated water for approximately 16 hours prior to discharge to the Ohinemuri River. This provides time for the treated water to be tested, and the results to be received and interpreted prior to the water discharging to the river.

Water that meets the discharge criteria is discharged to the Ohinemuri River. If the water does not meet the discharge criteria, it is recycled back through the WTP, used in processing, or pumped to the TSF's.

2.6.6.3 Consented Activities

The Processing Plant and WTP were authorised by ML 32 2388 and LUC 97/98-105. As outlined in Section 2.6.2 above, the activities authorised by each permit are grandfathered into the Hauraki District Plan via permitted activity rules that apply in the Martha Mineral Zone.

OGNZL also holds several resource consents from the WRC for various activities undertaken at the Processing Plant and WTP. These are documented in **Appendix 3** to this AEE and include:

- The discharge of contaminants to air;
- The damming of a watercourse for the construction of collection ponds;
- The diversion and discharge of natural water (farm water run-off and intercepted groundwater) around the Processing Plant;
- The placement and use of discharge structures in the Ohinemuri River;
- The discharge of treated water from the WTP into the Ohinemuri River via two discharge points; and
- The abstraction of up to 430 m^3/day of water for elution water purposes.

These resource consents expire in July 2037, with the exception of the elution water take which expired in July 2017 (and is currently authorised in accordance with Section 124 of the RMA while a new resource consent application is processed by the WRC).

2.6.7 Rock Stockpiles and Tailings Storage Facilities

Mining activities generate rock and tailings which require disposal in safe permanent storages. As such, OGNZL operates the Central, Northern and Eastern Stockpiles and two TSF's (known as TSF1A and TSF2) to the east of the Ohinemuri River. The general layout of the Central, Northern and Eastern Stockpiles and the TSF's is shown in Figure 2.10 below.

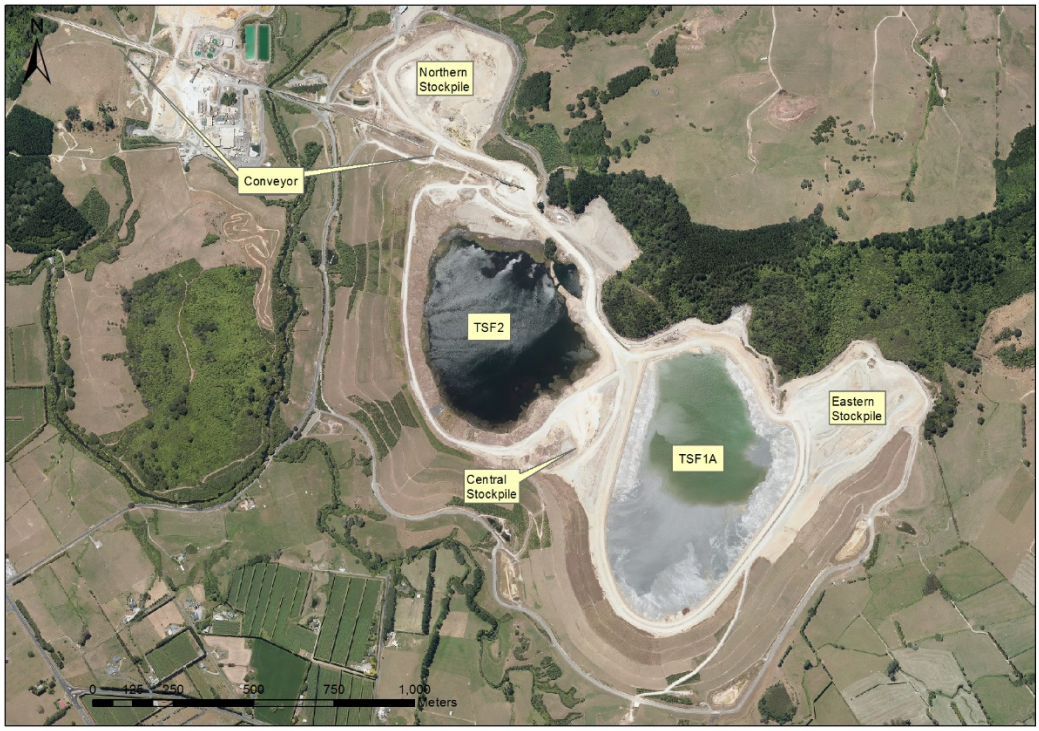

Figure 2.10.

Rock has also been used to construct some of the embankments of the TSF's. These facilities are authorised to accommodate material originating anywhere in the Waihi Epithermal District, which includes Project Martha.

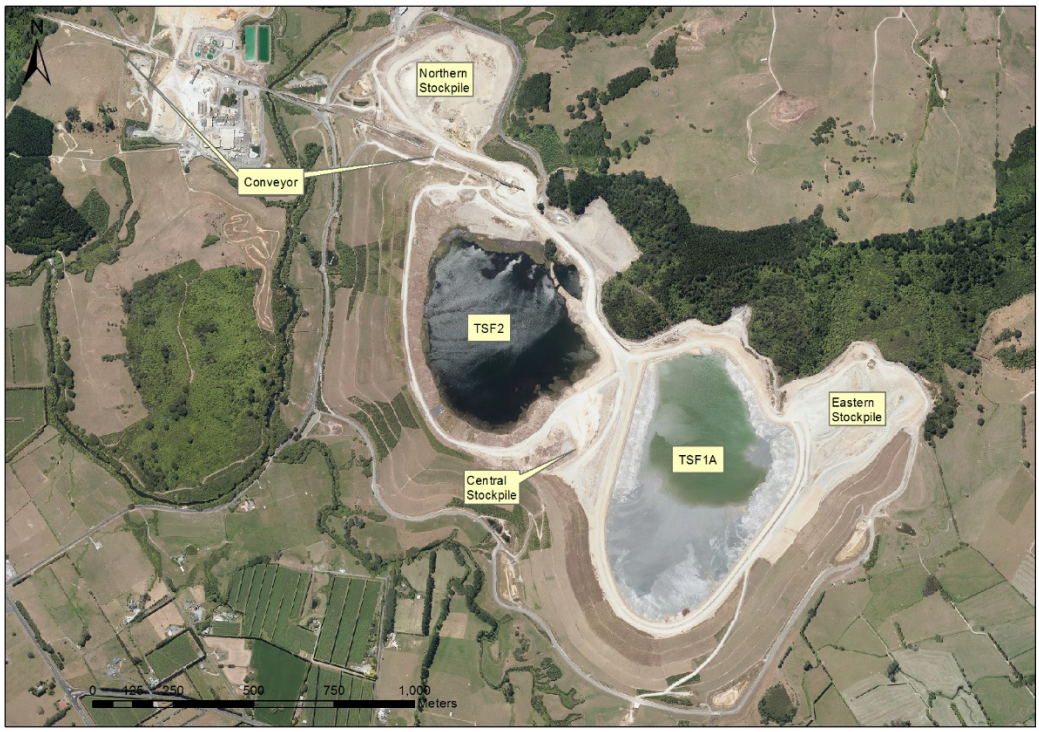

Figure 2.10: Rock Stockpiles and Tailings Storage Facilities

Tailings disposal operations occur 24 hours per day, seven days per week. However, rock disposal only occurs between the hours of 0700 and 2100 on Monday to Friday, and between 0700 and 1200 on Saturday.

Rock is delivered to an area adjacent to the Northern Stockpile by the conveyor. To allow flexibility in the selection of materials on site, material is hauled and placed by trucks or scrapers from a loading facility at the conveyor termination point.

The Central, Northern and Eastern Stockpiles and TSF's were authorised by ML 32 2388 and LUC 97/98-105. As outlined in Section 2.6.2 of this AEE, the activities authorised by each permit are grandfathered into the Hauraki District Plan via permitted activity rules for the Martha Mineral Zone.

OGNZL also holds several resource consents from the WRC for various activities at the Central, Northern and Eastern Stockpiles and the TSF's. These are documented in **Appendix C** to this AEE and include:

- The damming of unnamed watercourses in order to construct an impoundment structure for the containment of tailings from mining operations;
- The discharge of tailings into the TSF's;
- The diversion of unnamed tributaries of the Ohinemuri River;
- The discharge of seepage from the TSF's to ground;
- The discharge of water from silt ponds and collection ponds to the Ohinemuri River and the Ruahorehore Stream; and

- To discharge water from the tailing ponds following rehabilitation into an unnamed tributary (Unnamed Stream 2 of the Ohinemuri River.

These resource consents expire between 2026 and 2034.

2.6.8 Rehabilitation

2.6.8.1 Rehabilitation Concept

OGNZL is required to rehabilitate the Martha Mine in accordance with an approved Rehabilitation and Closure Plan. The plan envisages the following rehabilitation occurring:

- The Martha Pit is to be transformed into a pit lake and surrounding parkland facility for recreation use;
- If, at or after the end of mining operations the Processing Plant or WTP is dismantled, the area formerly occupied by and surrounding the dismantled plant is to be contoured, and as far as is reasonably practicable restored in a manner that will protect water quality and avoid soil erosion;
- The conveyor route is to be restored to its former condition unless the HDC requires that it be left for use as a public walkway or other useful amenity provided the cost of doing so does not exceed the cost of restoration to the former condition; and
- The TSF's are to be rehabilitated using a range of vegetative covers (e.g. grass, native plants and vegetation and wetlands) as appropriate.

The Rehabilitation and Closure Plan for the Martha Pit is shown in Figure 2.11 below.

The pit lake filling would be supplemented by water taken from the Ohinemuri River, and once full, would discharge any overflow water via a tunnel and outlet structure to the Mangatoetoe Stream.

2.6.8.2 Bonds

In accordance with LUC 97/98-105, OGNZL must maintain two bonds in favour of the WRC and HDC. These are:

- A rehabilitation bond; and
- A capitalisation bond.

Rehabilitation Bond

The purpose of the rehabilitation bond is to provide the WRC and HDC with unencumbered access to a source of funds sufficient to close and rehabilitate the mine site in the event that OGNZL fails to fulfil its closure obligations.

Figure 2.11: Current Rehabilitation and Closure Plan for the Martha Pit

The scope of works from which the closure cost is derived includes:

- Demolition and removal of plant and buildings;
- Rehabilitation of areas of mine disturbance;
- A period of site aftercare that typically includes care and maintenance of newly vegetated areas, weed management, water treatment and environmental and geotechnical monitoring; and
- Management and administration costs throughout the rehabilitation and aftercare periods.

The method of estimating the closure costs to complete the rehabilitation is well established. It involves:

- Establishing a list of the tasks and activities required to rehabilitate the site from its current state to one that meets the closure obligations;
- Estimating the quantity (e.g. volume, area and hours) of work involved in completing each task or activity; and
- Assigning a unit rate to each measurement of quantity (e.g. dollars per unit measure of volume, area and time).

The total closure cost estimate is calculated from the resulting schedule of quantities by multiplying the component quantities and unit rates to derive a cost for each activity then summing the activity costs.

Capitalisation Bond

When closure is achieved, ownership of the areas of land disturbed by surface mining will pass to a charitable trust called the Martha Trust. The Martha Trust is not yet active.

The areas of land that will pass to the Martha Trust is defined in LUC 97/98-105 and includes:

- Land to the north and east of the Martha Pit;
- The WTP; and
- The Central, Northern and Eastern Stockpiles and the TSF's.

The Martha Trust will be for responsible for the maintenance of this land in a safe and stable condition in perpetuity.

Once the mine site is fully rehabilitated, OGNZL will settle funds on (capitalise) the Martha Trust to a level sufficient for it to fulfil its responsibilities. The fund is called the capitalisation sum. Until the capitalisation sum is settled on the Martha Trust, the conditions of consent require that OGNZL maintains a capitalisation bond - the quantum of which equals the capitalisation sum. The bond will provide the Martha Trust with the necessary funding in the event that OGNZL defaults on its obligation to do so.

The scope of works from which the capitalisation sum is derived includes:

- The cost of maintaining and managing the land;
- Monitoring;
- Trust operating expenses; and
- A contingent liability fund to cover the occurrence of possible risk events that could occur and that, if left unattended, would result in ongoing environmental impairment.

The method of estimating the first three components is the same as that used to derive the rehabilitation bond quantum. The risk cost is derived from the outcomes of a quantitative risk assessment that identifies and quantifies (in terms of likelihood and costs to remediate).

Bond Review

The quantum of each bond is able to be reviewed annually.

The rehabilitation bond quantum is adjusted at each review to take account of new areas of disturbance, areas of completed rehabilitation, and corrections to unit rates (e.g. for inflation) over the following 12-month period.

The capitalisation bond is also similarly reviewed and amended for changes in scope and unit rates. The risk assessment is reviewed and updated as required to ensure that changes that occur on site and that might affect the post-closure residual risk are accounted for.

The latest rehabilitation bond quantum, which covers the closure costs for the 2016-17 period is $43.48M. The latest capitalisation bond quantum was assessed at $5.34M, although current security provides for $10.4M.

2.7 LANDSCAPE CONTEXT AND CHARACTER

An assessment of the existing landscape and visual amenity values around Project Martha is provided in Boffa Miskell (2018a). This assessment is attached as **Appendix D** to this AEE.

2.7.1 Site Location

As already noted in this AEE, the Martha Pit is established within the urban area of Waihi and there is a strong mining influence within the town. However, despite its close proximity, mining activities have not resulted in major visual impacts on adjoining areas due to the topography and vegetation which maintains an effective screen along the pit rim.

The wider landscape which contains the Martha Pit encompasses the foothills of the Coromandel Range. Pukewa (Martha Hill), within which the Martha Pit is now located, previously formed part of this broader foothills landform and now forms part of an established working landscape associated with Waihi.

To the southeast of Waihi, the landscape undergoes a transition into primary production lowlands adjoining the foothills of the Coromandel Range. This area is generally flat to gently undulating and comprises of pasture, shelter belts, clumps of exotic trees, horticultural lots, hedges and glasshouses. A series of steep domed shaped hills extend to the east of Waihi, which include the vegetated forms of Union Hill and Black Hill.

No outstanding natural landscapes or features have been identified or classified in the relevant statutory planning documents, and none are likely to occur in this area when the criteria specified in Appendix 12 of the RPS are applied.

2.7.2 Land Form

Martha Pit forms a distinctive topographic feature in Waihi, the base of which is currently some 220 m below the surrounding ground level and approximately 100 m below sea level. The northern edge of the pit forms the highest part of the mine and culminates at an elevation of 164 m asl.

The urban area surrounding the Martha Pit is typically flat to gently undulating between 80 and 160 m asl, sloping away from the area where the extension of the Martha Pit is proposed. This surrounding landform is also bisected by the meandering form of the Mangatoetoe Stream, which passes to the west and south of the pit prior to flowing into the Ohinemuri River.

2.7.3 Land Cover

The urban area of Waihi covers a total area of approximately 250 ha and includes established residential and commercial development in close proximity to the Martha Pit, and residential development above, and in close proximity to, the Correnso Underground Mine. Low density residential development has been established to the northwest of pit and transitions into rural lifestyle and rural development which extends into the lower foothills of the Coromandel Range.

The southern edge of Martha Pit skirts the periphery of the town centre and includes an area of open space which accommodates the relocated Cornish Pumphouse. Beyond the area adjoining the north wall, the pit rim walkway extends along the perimeter of the pit rim, in places overlooking the existing mine.

The rural land use surrounding Waihi predominantly comprises of a patchwork of exotic pasture and cropping interspersed with shelter planting and orchard trees. Established mining activity including the Processing Plant, Central, Northern and Eastern Stockpiles and TSF's also contribute to the established land cover within the area to the east of the township beyond Union Hill.

2.8 TRANSPORT NETWORK

An assessment of the existing road network around Project Martha is provided in TDG (2018). This assessment is attached as **Appendix E** to this AEE.

2.8.1 The Road Network

The general layout of the site and key road links is shown in Figure 2.12. Key elements include:

- Baxter Road;
- State Highway 2 ("***SH2***");
- The Baxter Road / SH2 Intersection;
- SH25;
- The mine access off SH25; and
- Bulltown / Cambridge Roads.

Figure 2.12: Key Road Links

2.8.1.1 Baxter Road

Baxter Road is classified as a local road in the Hauraki District Plan and has an open road speed limit. It is a no exit road that is approximately 1.2 km long and has a nominal width of 7 m. It is primarily used to access the Processing Plant, Central, Northern and Eastern Stockpiles, TSF's and underground mine portals.

Baxter Road is marked with a centre line and edge lines. Baxter Road is in flat terrain and has a curvilinear alignment. It includes a one-lane bridge located approximately 960 m from its intersection with SH2.

2.8.1.2 State Highway 2

SH2 in the vicinity of Baxter Road has an open road speed limit. It has a typical sealed width of 12.7 m and is marked with a centre line and edge lines.

Data published by the New Zealand Transport Agency ("***NZTA***") indicates an annual average daily traffic ("***AADT***") volume of 10,952 vehicles at the nearest count site, which is located approximately 100 m south of Baxter Road. Hourly traffic volumes for this location are shown on Figure 2.13. This data was recorded during the week ending 31 March 2017.

The NZTA have publicised a safe roads programme for SH2 from Waihi to Omokoroa. It is understood that various safety improvements may be completed over the next ten years.

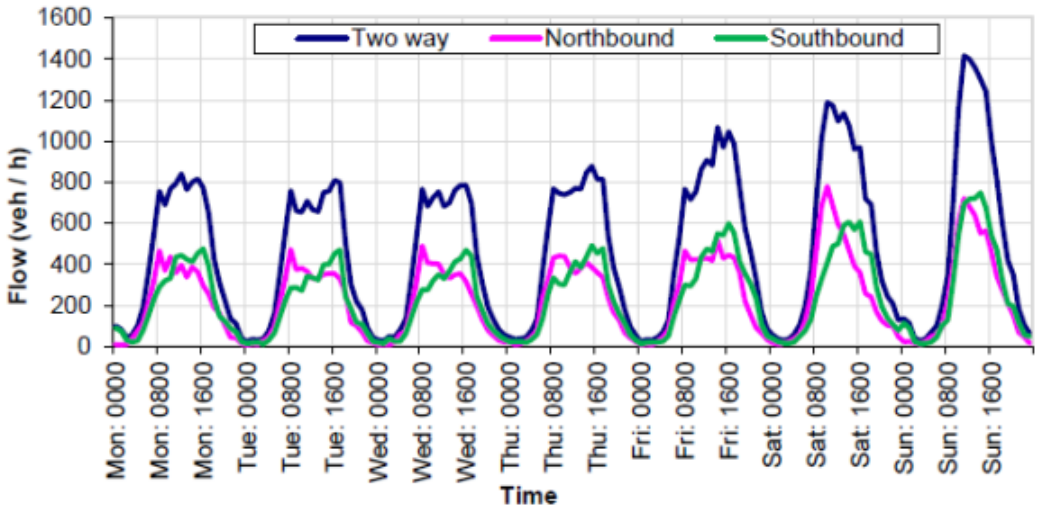

Figure 2.13: Hourly Traffic Flows on State Highway 2

The data indicates that the busiest times on this part of SH2 are Sunday afternoons and Saturday late morning, with two-way flows of 1,400 vehicles per hour ("***veh/h***") and 1,200 veh/h respectively.

Typical day time two-way flows during the rest of the week are in the 700 to 1,000 veh/h range.

2.8.1.3 State Highway 25

SH25 in the vicinity of the site access is a two-lane urban arterial route with a 50 km/h posted speed limit.

An NZTA count site located approximately 1.5 km north of the access (just outside the urban limit) recorded an AADT of 2,606 vehicles. Hourly flow data for the same site recorded in August 2017 is shown on Figure 2.14.

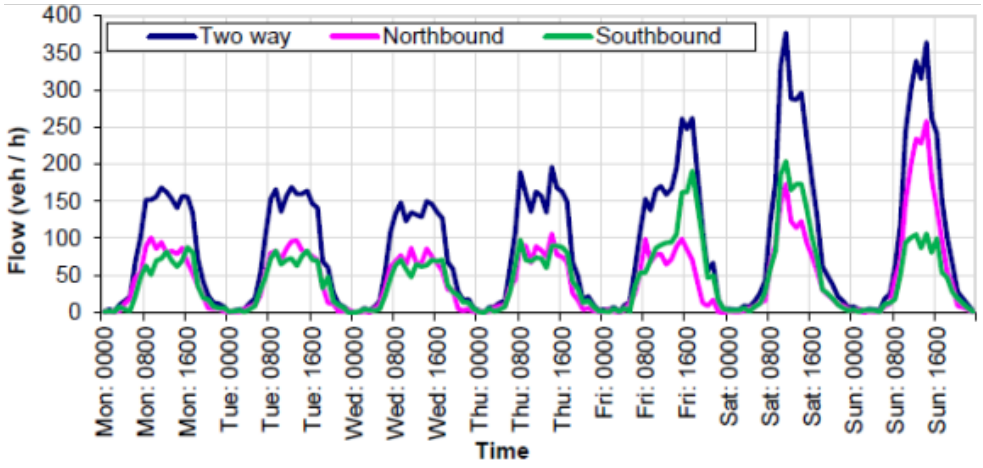

Figure 2.14: Hourly Traffic Flows on State Highway 25

The data indicates that the busiest times on this part of SH25 are Sunday afternoons and Saturday lunchtimes, with two-way flows of 360 to 380 veh/h respectively.

Typical day time two-way flows during the rest of the week are in the 150 to 250 veh/h range.

2.8.1.4 Bulltown / Cambridge Roads

Bulltown / Cambridge Roads are classified as Collector Roads in the Hauraki District Plan (between Savage Road and William Street) and traverse the northern side of the Martha Pit, as shown on Figure 2.15 below. The western end (Cambridge Road) is similar in nature to Savage Road, with an approximately 10 m carriageway with kerb and channel and is marked with a centre line.

At the eastern end of Cambridge Road the carriageway continues as Bulltown Road, with Bulltown Road forming a short cul-de-sac on the south side of the intersection. The main alignment of Bulltown Road is narrower than Cambridge Road, with a seal width reducing to approximately 6 m. Bulltown Road is more rural in nature, with no kerb or channel, and grass berms on both sides.

Figure 2.15: Bulltown / Cambridge Roads in the vicinity of Martha Pit

2.8.1.5 Baxter Road / State Highway 2 Intersection

Baxter Road intersects SH2 approximately 1.2 km south of Waihi and forms a stop-controlled T-intersection. On the opposite side of State Highway 2 approximately 50 m to the south is located Crean Road, also a side road intersecting the state highway at a T-intersection.

Sight distances exceed 250 m in each direction, meeting safe intersection sight distance requirements for a 100 km/h speed environment.

The intersection has a widened shoulder of 2.9 m opposite Baxter Road on the highway to assist northbound highway traffic to pass a vehicle that has slowed or stopped to turn right into Baxter Road. A 3 m left-turn` deceleration lane is provided on the highway for southbound traffic turning into Baxter Road.

2.8.1.6 SH25 / Barry Road Intersection (Martha Pit Access)

Figure 2.16 shows the layout of the Martha Pit mine access on SH25.

Figure 2.16: Barry Road and State Highway 25 Intersection

The site access is located on the outside of a horizontal curve. A right-turn lane is provided for westbound traffic turning right into the site. The available sight distance to the north-east from the access is approximately 160 m. To the south the available sight distance is in excess of 250 m. The mine security gate is located approximately 43 m back from the SH25 carriageway.

2.8.1.7 Other Site Access Points

The two main site access points are:

- A gate at the eastern end of Baxter Road, which in turn provides access onto SH2 (refer to Section 2.8.1.4 above); and
- A gate onto SH25, which provides access from the Martha Pit (see Section 2.8.1.6 above).

There are several other minor access gates. These are used very infrequently and include:

- Moore Street - used in cases where an oversize or heavy load cannot use one of the main accesses. It is also used as an alternative to the Baxter Road access on occasions when the Ohinemuri River is in flood;
- Clarke Street – used very infrequently for over-weight or over-dimension vehicles;
- An access gate off Grey Street, 200 m south of King Street; and
- Two access gates off Golden Valley Road.

All staff and day-to-day access is via the two main gates. Over-weight and over-dimension vehicles also use the main gates wherever possible, with other accesses being used only when access via the main gates is impractical.

2.8.2 Road Safety

A search of any crashes recorded near the site accesses and the proposed road realignment has been undertaken. The search identified a total of nine crashes, all of which were non-injury crashes.

A trend is apparent with southbound drivers losing control in wet conditions on SH25 in the vicinity of the access to the Martha Pit. However, none of the crashes involved vehicles turning into, or out of, the site and it is not expected that traffic movements associated with Project Martha would exacerbate this trend.

No crashes have been reported that relate to traffic turning on to, or off, the state highways at either of the main site access locations.

Nor have any crashes been identified on the section of Bulltown / Cambridge Roads to be realigned.

2.9 NOISE

An assessment of the existing noise environment around Project Martha is provided in Hegley (2018). This assessment is attached as **Appendix F** to this AEE.

While there has been minimal work in the Martha Pit in the last few years, the existing noise environment in relation to mining is represented by the activities authorised by a resource consent (i.e. LUC 97/98-105) and the permitted noise standards in the Hauraki District Plan (including the incorporation of ML 32 2388 in Rule 5.17.4.1 (P1)).

In considering the application for ML 23 2388 the Planning Tribunal (now Environment Court) reported

> *"... we find that the average day-time L_{10} values range from 40 to 55dBA in residential areas of Waihi which are not affected by traffic noise. The levels remain relatively steady from before 7.00am to after 6.00pm (and 9.00pm if traffic noise is not excluded), and there is no significant difference at weekends".*

ML 23 2388 established a noise limit for the operation of the pit during the daytime of 55 dB L_{AEQ}.

LUC 97/98-105 requires that the noise level at any point outside the 55 dB and 50 dB control boundaries shown in Figure 2.17 below to not exceed those limits from 0700 – 2100 Monday – Friday and 0700-1200 on Saturday. At all other times noise levels are not to exceed 40 dB L_{AEQ}.

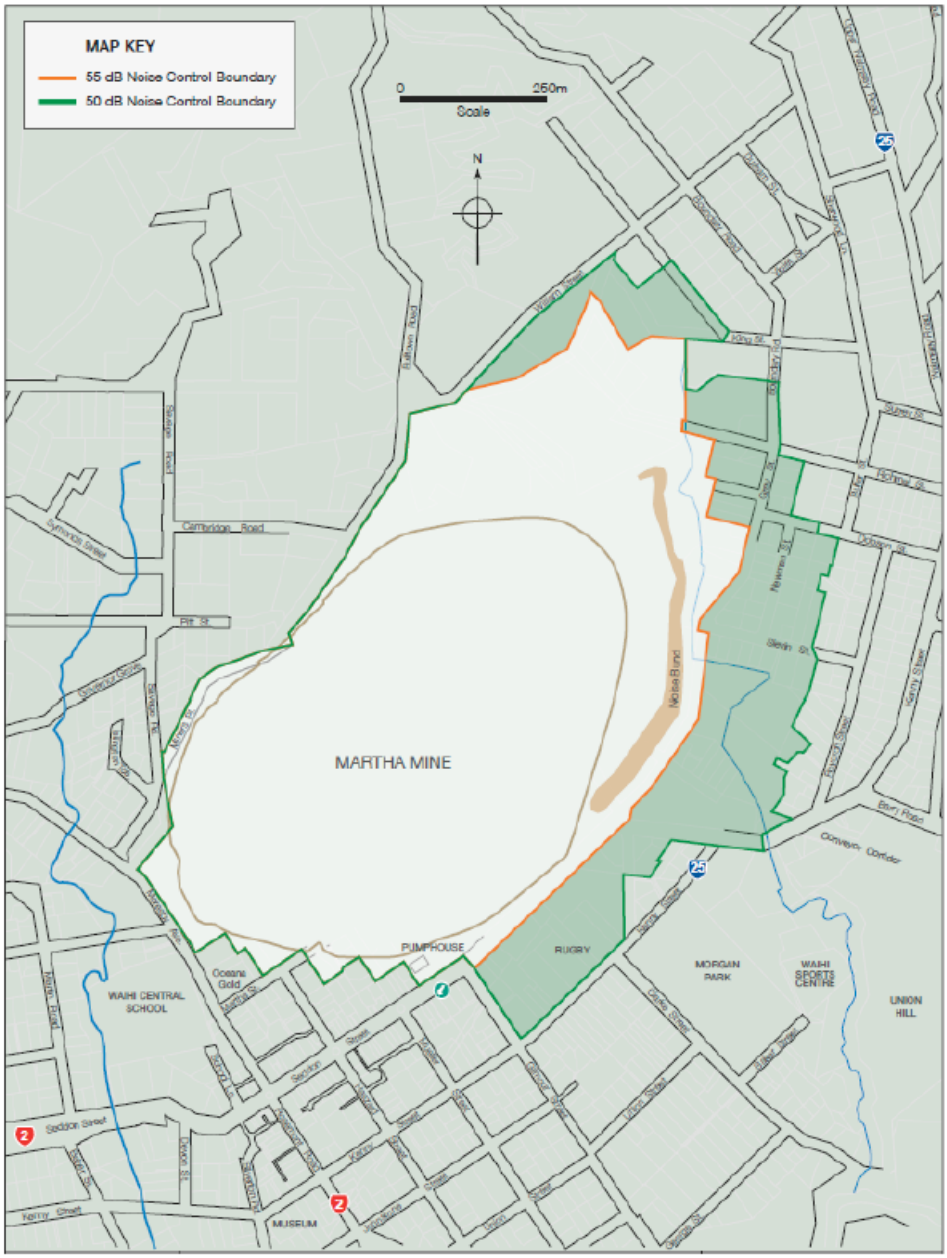

Figure 2.17: Existing Noise Control Boundaries – Martha Pit

Further context on the level of noise that could be expected in the areas surrounding the Martha Pit, based on the standards in the Hauraki District Plan, is provided in Table 2.1 below.

Table 2.1: Hauraki District Plan Noise Standards.

Zone Experiencing Noise	Standard	7.00am – 10.00pm	10.00pm – 7.00am
Residential and Low Density Residential	All activities in each of the Residential and Low Density Residential Zones shall be conducted to ensure that the following noise levels shall not be exceeded within any other site contained within that zone.	50dB $L_{Aeq(15min)}$	40dB $L_{Aeq(15min)}$ 65dB L_{AFmax}
	All activities undertaken in the Industrial or Town Centre Zones shall be conducted to ensure that noise from the site as measured within the zone boundary of a Residential or Low Density Residential Zone shall not exceed the following levels.	Mon – Sat 50dB $L_{Aeq(15min)}$ Sunday & Public Holidays 45dB $L_{Aeq(15min)}$	40dB $L_{Aeq(15min)}$ 65dB L_{AFmax}
Town Centre Zone	All activities in these zones shall be conducted to ensure that the following noise levels shall not be exceeded within any other site contained within that zone.	55dB $L_{Aeq(15min)}$	40dB $L_{Aeq(15min)}$ 65dB L_{AFmax}
	All activities undertaken in the Industrial Zone shall be conducted to ensure that noise from the site as measured within the zone boundary of the Town Centre Zone shall not exceed the following levels.	55dB $L_{Aeq(15min)}$	45dB $L_{Aeq(15min)}$ 65dB L_{AFmax}
Active Reserve	All activities undertaken in the Industrial Zone shall be conducted to ensure that noise from the site as measured within the zone boundary of the Active Reserve Zone shall not exceed the following levels.	55dB $L_{Aeq(15min}$	45dB $L_{Aeq(15min)}$ 65dB L_{AFmax}
Passive Reserve	All activities undertaken in the Industrial Zone shall be conducted to ensure that noise from the site as measured within the zone boundary of the Passive Reserve Zone shall not exceed the following levels.	55dB $L_{Aeq(15min)}$	55dB $L_{Aeq(15min)}$

2.10 VIBRATION

An assessment of the existing vibration environment is provided in Heilig (2018). This assessment is attached as **Appendix G** to this AEE.

The vibration levels in the receiving environment over the life of Project Martha could include:

- Vibration permitted by the Hauraki District Plan; and
- Vibration caused by the currently authorised mining activities set out in Section 2.4 of this AEE, including the Martha Pit and the Correnso and Slevin Underground Mines and the MDDP (which are authorised to operate until 2025).

A summary of the authorised vibration levels from those activities is provided in Table 2.2 below.

Table 2.2: Authorised Vibration Levels.

Source of Vibration	Window	Number of Blast Events	Vibration amplitude at residences not owned by OGNZL	Blast Event Duration
District Plan permitted activities other than one using explosives or similar impulsive and energetic material.	Mon – Sat 0700 – 1800	No limit	5mm/second peak amplitude (Vmax)	No limit
	At all other times	No limit	1mm/second Vmax	No limit
District Plan permitted activities using explosives or similar impulsive and energetic materials	Mon – Sat 0700 – 1800	3 per day, separated by an interval of not less than 10 minutes between blast events, and no more than 21 within a calendar year.	5mm/second Vmax	1 second.
Martha Pit	Mon – Fri 1000 – 1500 Sat 1000 - 1200		95% compliance with 5 mm/s Vmax of 10 mm/s.	No limit.
Correnso and Slevin Underground Mines	Mon - Sat 0700 – 2000 (until 2025)	3 blast events per day.	95% compliance with 5 mm/s. 2 mm/s on average for development blasts. 3 mm/s on average for production blasts.	No blast event shall have a duration of more than 18 seconds.

2.11 HYDROGEOLOGY

The geological and hydrological setting of the site is detailed in GWS (2018). A copy of this assessment is provided in **Appendix H** to this AEE.

2.11.1 Geology

An overview of the geology of the Waihi area is shown in Figure 2.18 and Figure 2.19 below.

The ore body to be mined comprises near-vertical quartz veining with relatively elevated permeability and storage within an andesite rock mass of lower permeability and storage.

The andesite rock mass is overlain, in part, by younger volcanic materials comprising rhyolitic tephras and ignimbrite flows, breccias and tuffs. Paleosols and sedimentary deposits are occasionally interspersed or located at the base of these deposits. These deposits infill a paleo-valley system between the outcropping andesite highs. This paleo-valley system extends from beneath Waihi east, and passes between Martha Hill and Union Hill.

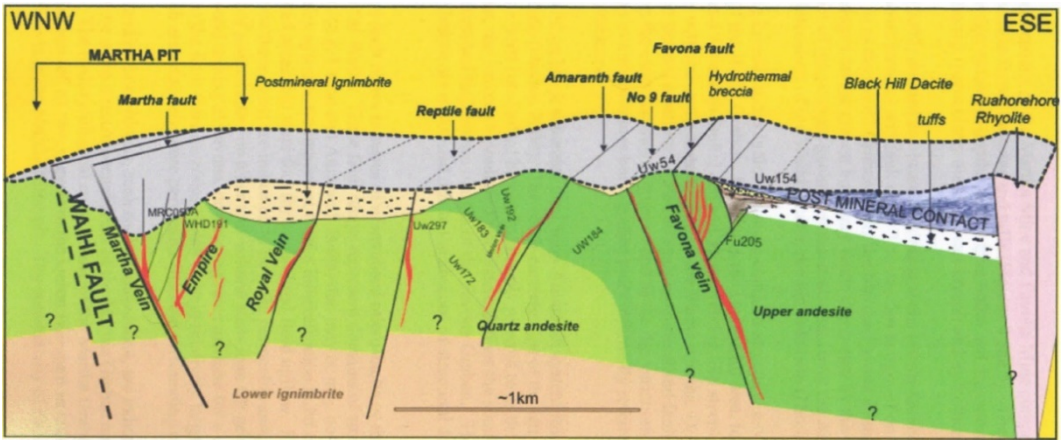

Figure 2.18: Generalised Geology in the Waihi Area

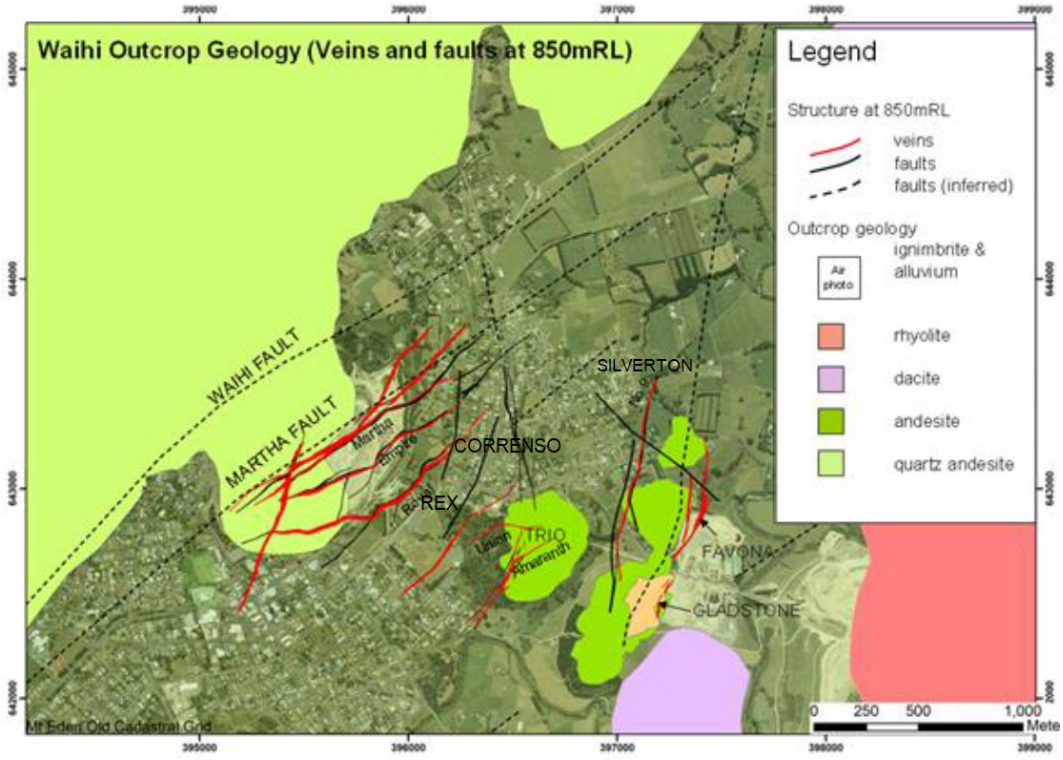

Figure 2.19: Aerial View of Waihi Outcrop Geology, Veins and Faults

2.11.2 Groundwater

A conceptual water balance model for the Waihi area is shown in Figure 2.20.

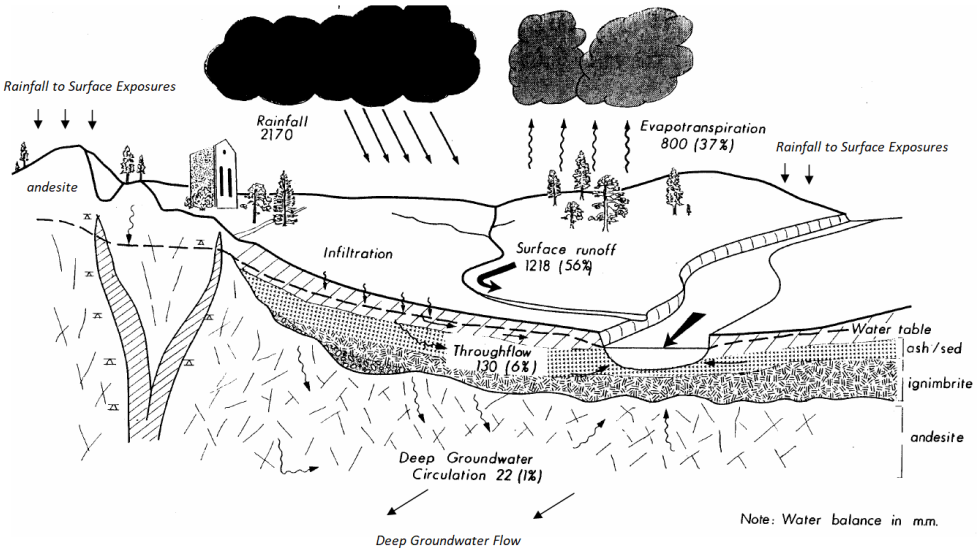

Figure 2.20: Conceptual Water Balance for the Waihi Area

Groundwater recharge in Waihi is from direct rainfall infiltration to the shallow groundwater system. The rainfall that infiltrates the ground surface enters the shallow groundwater

system and, after some residence time in the aquifer, discharges locally as springs and base flow to streams.

The groundwater in the younger volcanic deposits is separated from the deeper groundwater in the andesite rock by a weathered lower permeability upper layer of the andesite rock mass. As a result, infiltration to the deep groundwater system is a small proportion of the water balance and is a result of direct rainfall infiltration where the andesite is exposed at the surface, and due to some leakage from the shallow groundwater system.

Vein and fault intersections provide interconnections between the underground mines. These intersections have been enhanced by the mine developments. The Favona Underground Mine was initially hydrologically separate from the other mines. However, a level drive now provides connection to the other mines above 831 m RL.

As a result of the interconnections, dewatering of one vein also dewaters the interconnected veins to a similar elevation, but the andesite rock mass is dewatered to a lesser degree such that steep hydraulic gradients develop between the veins and the rock mass.

This dewatering effect is substantially attenuated by the low permeability layer at the top of the andesite rock mass.

While the current dewatering level of the Martha, Trio and Correnso vein systems is at approximately 770 m RL, historical dewatering has been undertaken to approximately 540 m RL. Current mine dewatering has been ongoing since 1989, although groundwater level monitoring has shown that water pressures in the younger volcanic rocks and the upper parts of the andesite rock mass have remained stable since the early to mid-1990's (when dewatering level in the veins dropped below the base drainage elevation of the younger volcanic rocks.

Modelling has also demonstrated that dewatering of the veins has little impact on the water pressures in the overlying younger volcanic materials.

Currently, water is pumped from the Correnso Underground Mine using a number of pumps and lifts to the WTP via the Favona Decline. Pumping rates in excess of 15,000 m^3/d have been recorded, but are currently approximately 10,000 m^3/d. The water pumped from underground comprises:

- Water sourced from storage within the interconnected old workings, vein systems, and where present, from post mineralisation faulting;
- Water released from groundwater storage in the surrounding country rock;
- Rainfall within the Martha Pit (which enters the historical workings from the pit floor); and
- Water inflow to the Favona Underground Mine from country rock.

2.12 SURFACE WATER

Information on the hydrology and surface water characteristics of the Ohinemuri River is provided in GHD (2018) and Boffa Miskell (2018b). Copies of these assessments are provided in **Appendix I** and **Appendix J** to this AEE respectively.

2.12.1 Catchment Overview

Waihi is located in the upper catchment of the Ohinemuri River, which has a total catchment area of 290 km^2. The eastern parts of the upper catchment consist of predominantly flat farmland. Numerous tributaries join the Ohinemuri River as it flows west, with the upper catchments becoming steep and forested further inland.

The Ohinemuri River then flows through the Karangahake Gorge prior to joining the Waihou River near Paeroa.

Other notable waterbodies in the vicinity of the Waihi include the Ruahorehore Stream, Eastern Stream and the Mangatoetoe Stream. Each is shown in Figure 2.21 below.

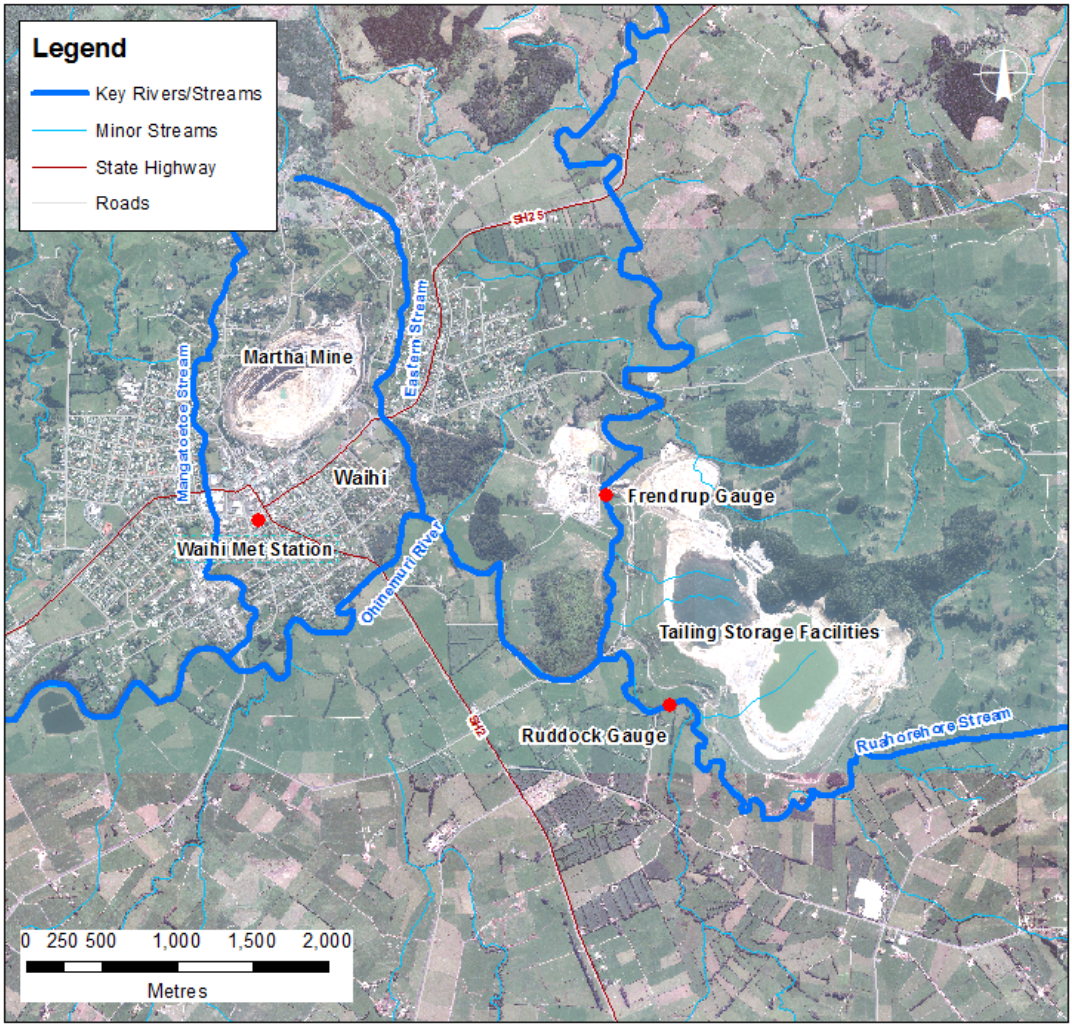

Figure 2.21: Ohinemuri River and Tributaries

2.12.2 Hydrology

Low flow and flood flow estimates for the Ohinemuri River (at the Queens Head flow gauge) and Ruahorehore Stream (at the Frendrup flow gauge) are provided in Table 2.3 and Table 2.4 below.

Table 2.3: Low Flow Estimates for the Ohinemuri River and Ruahorehore Stream

Factor	Frendrups	Queens Head
Catchment Area	50 ha	135 ha
MALF	0.303 m^3/s	0.657 m^3/s
Q_5	0.263 m^3/s	0.514 m^3/s

Table 2.4: Flood Flow Estimates for the Ohinemuri River and Ruahorehore Stream

Flood Return Period	Frendrups Flow Estimate (m^3/s)	Queens Head Flow Estimate (m^3/s)
5 year	80	267
20 year	108	370
100 year	147	485

2.12.3 Water Quality

2.12.3.1 Ohinemuri River

Summary water quality data provided by the WRC from recent sampling is provided in Table 2.5 below.

Table 2.5: Summary Statistics for Water Quality – Ohinemuri River[14]

Site	SH25	Queen's Head	Karangahake Gorge	Trigger level (ANZECC 2000)#	NPSFM Attribute State (for rivers)	WRC Water Quality Categories$
Sample period	01/2013-01/2018	01/2013-01/2018	01/1994-02/2015			
Dissolved Oxygen	10.5 (8.8-11.7), 61	10.4 (8-13) 61	10.3 (9.7-10.8) 6		A=>8.0	E=>90% S=80-90% U=<80%*

[14] Data shows median values, with range in parentheses, followed by the number of samples. All units g/m^3 except where otherwise stated.

pH (pH units)	7.2 (6.4-7.8), 61	7.1 (6.7-8.3) 61	7.2 (7.0-7.8) 6	7.2-7.8		E=7-8 S=6.5-7 or 8-9 U=<6.5 or >9
Turbidity (NTU)	1.04 (0.55-41), 61	1.1 (0.4-16.6) 61	1.48 (0.74-2.1) 6			E=<2 S=2-5 U=>5
Ammonia (NH4)	0.023 (0.01-0.049), 61	0.071 (0.011-0.29) 61	0.03 (0.015-0.037) 6	0.021	A=<0.03 B=>0.03-<0.24	
TKN	0.13 (0.06-1.02), 61	0.25 (0.09-0.79) 31	0.19 (0.13-0.28) 6			
TON (NNN)	0.45 (0.067-0.97), 61	0.95 (0.042-1.84) 61	0.68 (0.182-0.84) 6			
Total Phosphorus	0.011 (0.004-0.162), 13	0.01 (0.004-0.076) 61	0.009 (0.004-0.011) 6	0.033		E=<0.01 S=0.01-0.04 U=>0.04
DRP	0.005 (0.004-0.031), 61	0.005 (0.004-0.015) 61	0.0045 (0.004-0.005) 6	0.001		

* Default trigger levels for physical and chemical stressors in New Zealand for slightly to moderately disturbed ecosystems (ANZECC, 2000); E=Excellent, S=Satisfactory, U=Unsatisfactory. For Dissolved oxygen the WRC guidelines are expressed in percent saturation, and the monitoring results as g/L. The conversion of empirical units to percent saturation for dissolved oxygen in water is dependent on the water temperature and elevation at the site. However, median dissolved oxygen levels of >10 g/L would be expected to be >90% saturated and therefore be in the Excellent category.

Land, Air, Water Aotearoa ("***LAWA***")[15] reports the water quality of the Ohinemuri River at SH25 and the Karangahake Gorge (upstream and downstream of both the proposed abstraction point, and the existing treated WTP discharge) as within Category A attribute state in the National Policy Statement for Freshwater Management ("***NPSFM***") for dissolved oxygen, ammoniacal nitrogen, total nitrogen and *E.coli*, but that trends were indeterminate or improving (especially for total phosphorus).

It is noted that at the Queens Head site (downstream of the OGNZL site), the LAWA site reports E. coli, TON and ammoniacal nitrogen (annual median) as also meeting NPS Category A standards, but that the annual maximum for ammoniacal nitrogen is Category B and degrading.

[15] LAWA is a partnership between Local Authorities, Cawthron Institute, and the Ministry for the Environment, and has been supported by the Tindall Foundation and Massey University.

2.12.3.2 Mangatoetoe Stream

Water quality of Mangatoetoe Stream is variable, with neutral pH and generally acceptable dissolved oxygen levels, and with low nutrient levels (nitrates and phosphorus). Based on the WRC water quality categories, for the most part, the Mangatoetoe Stream meets the satisfactory criteria, with some poorer quality reaches reflecting the rural land use in the upper reaches and the urban intensification in the lower reaches (Table 2.6). Although the same parameters are not included in the Mangatoetoe Stream receiving water standards, the rating suggests that there is no reason to revisit these standards.

Table 2.6: Summary Statistics for Water quality – Mangatoetoe Stream[16]

Site	MG1	MG2	MG3	MG4	MG5	WRC Water Quality Categories*
Sample period	01/1994-05/1999	05/1993-05/1999	07/1994-05/1999	01/1994-02/2015	06/2006-02/2015	
Dissolved Oxygen	9.1 (7.1-10.7), 19	8.8 (6.5-10.9), 23	8.4 (6.8-10.8), 19	8.7 (7.2-10.9), 17	9.3 (7.0-11.2), 11	E=>90% S=80-90% U=<80%
pH (units)	7.15 (6.1-7.7), 24	7.0 (6-7.4), 28	6.9 (6.1-7.3), 24	7.1 (6.1-7.4), 23	7.1 (6.14-7.72), 26	E=7-8 S=6.5-7 or 8-9
Total Ammoniacal Nitrogen	0.03 (0.02-0.11), 24	0.02 (0.01-0.1), 28	0.02 (0.01-0.08), 24	0.01 (0.01-0.11), 21	0.01 (0.01-0.02), 20	
TKN	0.12 (0.1-2.1), 18	0.1 (0.1-1.7), 18	0.1 (0.1-1.2), 18	0.1 (0.1-1.6), 14	0.1 (0.1-1.48), 14	
Nitrates	0.765 (0.26-1.88), 24	0.735 (0.28-1.76), 28	0.725 (0.16-1.72), 24	0.45 (0.08-1.33), 21	0.7 (0.3-1.3), 20	
Total Phosphorus	0.03 (0.005-0.656), 18	0.009 (0.004-0.4340, 18	0.013 (0.004-0.244), 18	0.01 (0.004-0.469), 15	0.012 (0.006-0.196), 20	E=<0.01 S=0.01-0.04 U=>0.04

* E=Excellent, S=Satisfactory, U=Unsatisfactory.

2.12.4 Aquatic Ecology

2.12.4.1 Ohinemuri River

The ecological values of the Ohinemuri River in the vicinity are informed by the consent monitoring undertaken by OGNZL. The monitoring programme requires that habitat, algae,

[16] Data shows median (min-max), and number of samples. All units g/m3 except where otherwise stated.

macroinvertebrates and fish are surveyed at regular intervals. The most recent survey data is from 2017 but reports on baseline studies and regular monitoring extend back to 1983.

The key conclusions from the most recent monitoring are:

- Periphyton (benthic algae) was below the threshold for filamentous algae and algal mats as set out in the New Zealand Periphyton Guidelines;
- Algal productivity (measured as Chlorophyll *a* exceeded the New Zealand Periphyton Guidelines at sites upstream and downstream of the discharges from the WTP (Chlorophyll *a* was highest at the upstream site);
- Periphyton was dominated by diatoms followed by filamentous algae;
- Algal standing crop or biomass was below the thresholds set out in the New Zealand Periphyton guidelines. Macroinvertebrate community Index scores (QMCI and MCI) show the Ohinemuri River to range from poor to fair; and
- Shortfin eels and common bullies were the most widespread and common species recorded during monitoring, but longfin eels, Cran's bully and rainbow trout were all recorded during monitoring surveys. Banded kokopu have been recorded in earlier surveys.

Overall, indicators of ecological values suggest that the mid-lower reaches of the Ohinemuri River have moderate ecological values, and that these values increase towards the headwaters of the catchment.

The Ohinemuri River catchment is not identified as a priority catchment or as an outstanding freshwater body (although the Waihou River at Whites Road is listed to be included as outstanding) in the RPS.

2.12.4.2 Mangatoetoe Stream

The macroinvertebrate and periphyton data for Mangatoetoe Stream reflects the water quality with biotic communities in the upper catchment reflecting the better water quality and habitat, and the lower reaches reflecting a poorer degraded water quality and habitat.

2.12.5 Riparian Vegetation

2.12.5.1 Ohinemuri River

Extensive plantings have been undertaken by OGNZL at its Waihi mine site. In total, approximately 467,500 plants have been planted between 1991 and 2016, for a mix of riparian, swamp, gully and hillside enhancements.

Available records show that of these some 91,600 plants covering 18.8 ha of riverbank were planted along the margins of the Ohinemuri River mainstem in the vicinity of the Waihi mines between 1995 and 2005. Given the length of time that has passed since even the last of these plantings, the result is a mature riparian vegetation that contributes greatly to the ecological values of the Ohinemuri River.

In addition to this planting, approximately 107,000 plants (covering 10 ha) have been planted alongside a number of tributaries to the Ohinemuri River, including over 70,000

plants (covering 5.9 ha) alongside the Ruahorehore Stream; likewise contributing to the ecological health and values of the river system as a whole.

2.12.5.2 Mangatoetoe Stream

In April 2015, Habitat Enhancement and Landcare Partnership signed an agreement with the Ministry for the Environment for a three-year project aimed to remove weeds along the banks of the Mangatoetoe Stream and replant with natives. OGNZL donated plants to the project, and funding has been raised from other local sources. During winter 2015 planting of the streambank between SH2 and Station Road was undertaken, with over 6,000 plants put in.

2.13 TERRESTRIAL ECOLOGY

The vegetation around the Martha Pit consists of a narrow strip of mostly planted natives. Exotic and weedy species are present as well, particularly along the western edge (Moresby and Savage Roads) where the vegetation provides a shelterbelt between the pit and surrounding residential areas. Exotic species include bamboo, wattle and pine. These species have little to no ecological value beyond potential habitat for native wildlife.

This thin band of vegetation would experience strong edge effects, such as susceptibility to weed and pest animal invasion, high wind and light levels and temperature fluctuations, all of which would reduce its value as a habitat for fauna.

Some of the larger specimen trees, such as kauri, kahikatea and rimu, are generally isolated from other vegetation of a similar size structure and have functionally become amenity trees - rather than providing any significant ecological value.

The vegetated areas around Martha Pit support very little understory that would provide suitable cover for native lizards, and the habitat quality for native lizards is considered to be generally poor. While it is still possible that some locally common copper skinks may occur in a few places, the available habitat is unlikely to support any significant populations.

Some vegetation may be used occasionally for roosting or nesting by common native birds such as tui, silvereye, fantail and grey warbler. However, edge effects would reduce the quality of these potential habitats particularly given other suitable areas of vegetation in the surrounding landscape.

2.14 HERITAGE VALUES

An assessment of the heritage values in the vicinity of Project Martha is provided in Clough (2018). A copy of this assessment is provided in **Appendix K** to this AEE.

The only identified heritage sites that will be within the area to be physically disturbed by Project Martha are:

- A possible pre-1900 villa at 12 Cambridge Road (NZAA Site No. T13/928); and
- The historical underground workings in the Martha Pit (NZAA Site No. T13/926).

The following items are scheduled heritage sites in the vicinity of Project Martha (but will not be affected by the project).

- Martha Mine No 5. Pumphouse - Relocated in 2007 (NZAA Site No. T13/301, Heritage NZ listed 134, Cat 1 and Scheduled Hauraki District Plan 001, Cat A);
- Waihi Poppet Head replica at Junction with Gilmour Road and Seddon Street (Hauraki District Plan 449, Cat C);
- Grand Junction boiler feeder dam (Hauraki District Plan 255, Cat C);
- Grand Junction mine refinery building and strongroom (NZAA Site No. T13/314; Hauraki District Plan 074, Cat B), as well as truck and girth gear;
- Grand Junction powerhouse and boiler house (NZAA Site No. T13/313; Hauraki District Plan 074, Cat B);
- 3 Haszard Street scheduled miner's cottage (former) (Hauraki District Plan 123, Cat C);
- 1 Martha Street PYE factory (used as a laboratory for PYE radios and television) and currently the OGNZL Waihi office (Hauraki District Plan 091, Cat B);
- Waihi Gold Mining Company Tramways Martha to Victoria Battery ore tramway (Hauraki District Plan 264, Cat C);
- Remains of relocated concrete transformer house fragment opposite the Rugby Club on the pit rim walkway (NZAA Site No. T13/302); and
- Grand Junction Mine Quarry (NZAA Site No. T13/315).

2.15 SIGNIFICANT TREES

The Hauraki District Plan identifies several significant trees as being located in close proximity to the Martha Pit. They are listed in Table 2.7 below.

It is noted that no significant trees will be disturbed or affected by Project Martha.

Table 2.7: Significant Trees in the Hauraki District Plan

Site	Description	Significance Factor
028	One Kauri Tree.	Botanical value, visual amenity.
029	One Rhododendron Tree	Historical / Cultural, visual amenity.
030	Five Liquidambar Trees and one Oak Tree	Visual amenity.
031	One Totara Tree	Botanical value, visual amenity.
125	One Kauri Tree	Botanical value, visual amenity.

2.16 AIR QUALITY, METEOROLOGY AND CLIMATE

2.16.1 Air Quality

An assessment of the air quality effects of Project Martha is provided in Beca (2018). A copy of this assessment is provided in **Appendix L** to this AEE.

The Martha Pit is located within the Waihi Airshed as gazetted by the National Environmental Standards for Air Quality ("***NESAQ***") – see Figure 2.22. The Processing Plant, Central, Northern and Eastern Stockpiles and the TSF's are located within the airshed comprised of all the rural areas of the Waikato Region (and which are not included in a specifically gazetted airshed).

Air quality within the Waihi Airshed is not classified as polluted – as defined in Regulation 17 of the NESAQ. Fine particulate (PM_{10}) concentrations have not been measured in Waihi by the WRC since 2012 as monitoring between 2008 and 2011 indicated that concentrations of PM_{10} were well below the NESAQ 24-hour standard of 50µg/m^3. This monitoring was carried out when the Martha Pit was operating and includes the contribution of the mine to ambient air quality in Waihi.

Air quality within the rural airshed is expected to be typical of other rural areas in New Zealand and well within the NESAQ standards.

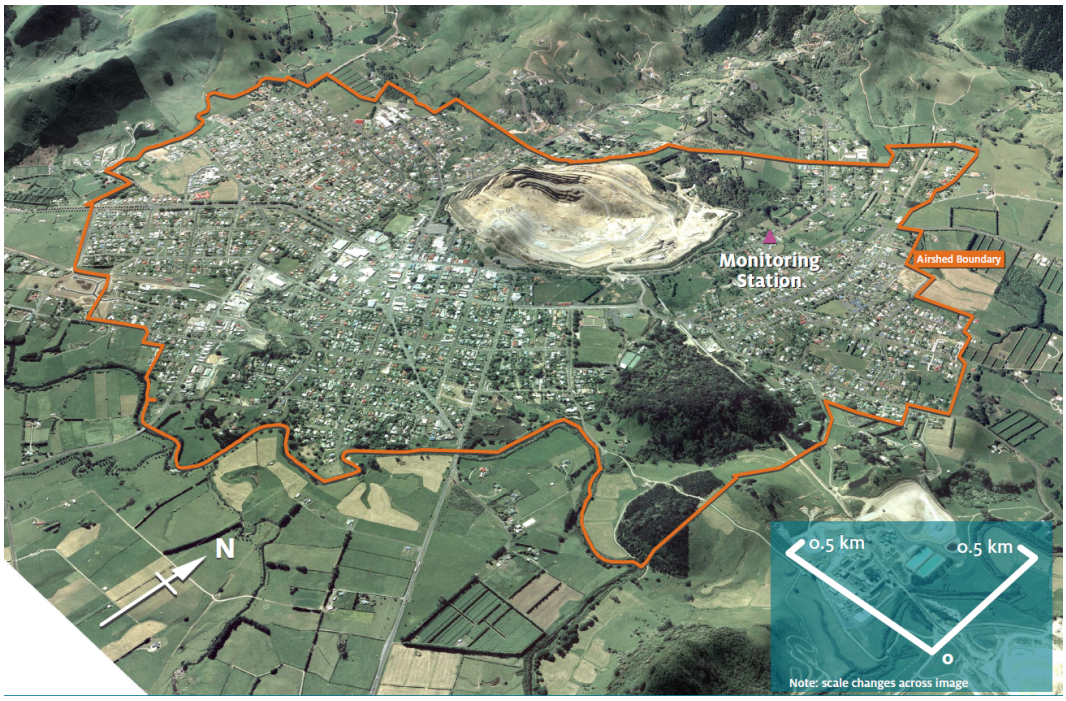

Figure 2.22: Boundaries of the Waihi Airshed

2.16.2 Meteorology and Climate

OGNZL measures meteorological parameters at a climate station located at Barry Road (see Figure 2.22).

A wind rose of hourly average wind speed and directions for 2007 to 2017 is shown in Figure 2.23. The prevailing winds in Waihi come from the west and west-south-westerly directions. The strongest winds also come from these directions. Secondary winds come from the northeast and winds from all other directions are rare.

The average wind speed measured since 2007 is 3.7 m/s and calm conditions occur for 1.65% of the time. Winds which exceed 5 m/s (which is the critical wind speed for the lifting of dust from unconsolidated surfaces) occur approximately 31% of the time.

Wind direction patterns are consistent throughout the year, with spring having the highest average wind speeds and autumn the lowest.

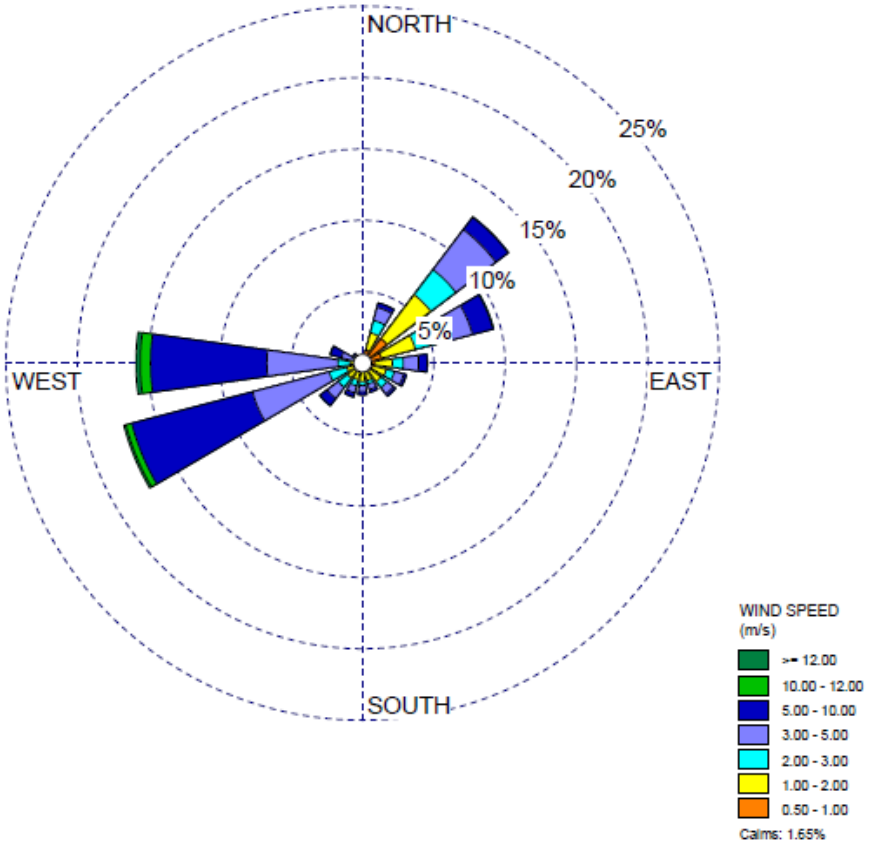

Figure 2.23: Hourly average wind speeds and directions for Waihi 1 January 2007 – 31 December 2017

The annual average rainfall measured by NIWA at Waihi between 2005 and 2017 is 1,913 mm. July is typically the wettest month and January the driest month.

Figure 2.24 shows the average monthly rainfall for the last 11 years recorded by OGNZL.

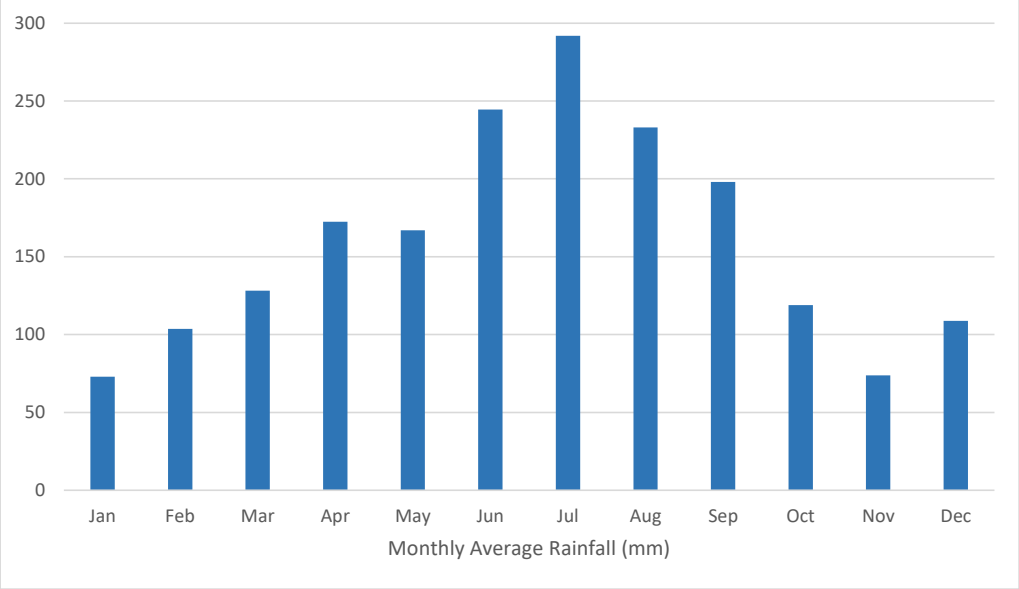

Figure 2.24: Monthly Average Rainfall January 2007 – December 2017

3. PROJECT DESCRIPTION

3.1 INTRODUCTION

As noted in Section 1 of this AEE, Project Martha contains two key components:

- The Martha Underground Mine – which involves new underground mining beneath the Martha Pit and under a small area of residential, reserve and commercial land to the southeast of the pit; and
- The Phase 4 Cutback – which generally comprises a small extension to the north of the Martha Pit to remedy the failure of the north wall in a manner that:
  - Will enable the pit walls to be left in a stable and safe condition at the completion of mining; and
  - Restores access to the remaining consented ore reserve in the pit.

These two respective activities are described in detail in Sections 3.2 and 3.3 of this AEE.

The Phase 4 Cutback and the Martha Underground Mine will provide a total ore tonnage of approximately 4.5M tonnes, which is more than the remaining tailings capacity at the end of the current life of mine plan. OGNZL will decide, based on the prevailing economics at that time, whether to process the feed from the Martha Pit in preference to the feed from the Martha Underground Mine, or alternatively to complete the underground mine in preference to completing the pit.

Much of the existing and consented mining infrastructure operated by OGNZL will likely be used to transport, process, store and dispose of material extracted from the Martha Underground Mine and Phase 4 Cutback. This includes the use of:

- Existing underground portals, access drives, ventilation shafts and other underground facilities and infrastructure to provide access to, and support the operation of, the Martha Underground Mine;
- The SFA to crush ore and rock material;
- The conveyor and surface mine roads to transport ore and rock material;
- The Processing Plant to process ore and temporarily stockpile rock material;
- The stockpiles at the Favona Portal and the Polishing Pond;
- The WTP to manage water from mining and mining operations;
- The Central, Northern and Eastern Stockpiles for the disposal of rock material; and
- The TSF's for the disposal of tailings.

These existing facilities have all been described in Section 2.6 of this AEE.

3.2 MARTHA UNDERGROUND MINE

3.2.1 Overview

The Martha Underground Mine will involve underground mining in, and around, historical underground workings beneath and adjacent to the Martha Pit, and in the Rex orebody (see Figure 1.1 above).

Ore sources for the Martha Underground Mine will comprise:

- New ore development;
- Avoca virgin stopes (see green areas in Figure 3.1);
- Backfilled remnant stopes (see yellow areas in Figure 3.1); and
- Remnant stopes – not backfilled (see red areas in Figure 3.1).

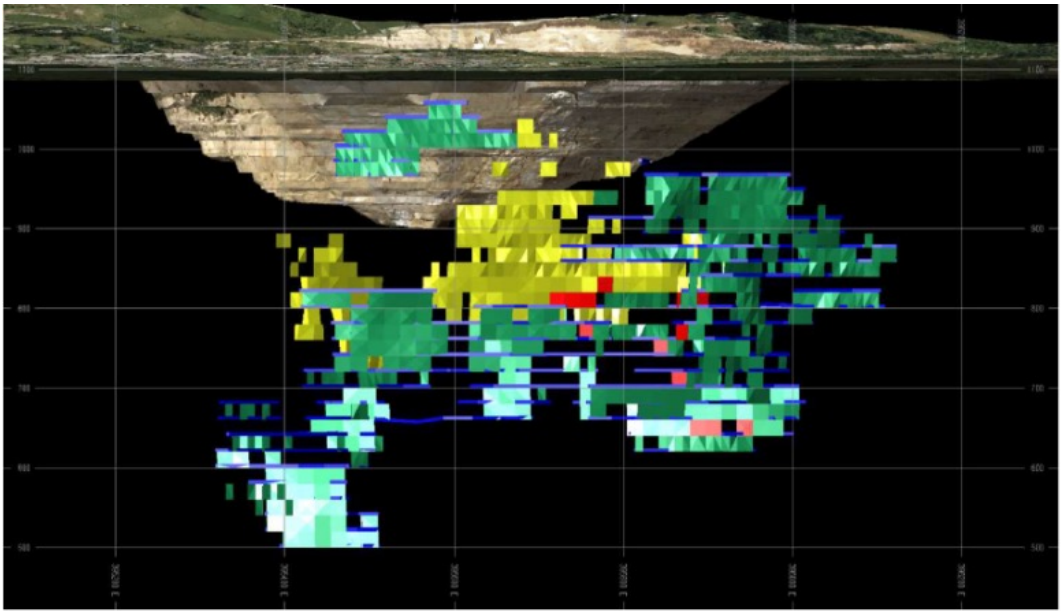

Figure 3.1: Conceptual Long Section of the Ore Sources - Martha Underground Mine

The Martha Underground Mine will operate 24 hours a day, seven days a week. However, development and production blasting will only occur between Monday to Saturday, and within the hours of 7 am to 8 pm.

3.2.2 Access

Access to the Martha Underground Mine will initially be provided via the Corrensa Underground Mine, utilising the Favona Portal and the development drives for the Favona and Trio Underground Mines.

By Year 5 it is expected that sufficient development of the Phase 4 Cutback would have been completed to allow new portals to be established around the south wall of the Martha Pit. These new portals will provide direct access to the Martha Underground Mine.

A stockpile area will also be located outside of the portal in the Martha Pit, near the southern haul road. A mobile crusher may be used at this stockpile area and open pit trucks will also transport material from the stockpile area to the SFA.

Ore and rock will be conveyed to the Processing Plant and the Central, Northern and Eastern Stockpiles by the accessways associated with the Correnso, Favona and Trio Underground Mines and ventilated by existing shafts. As such, OGNZL will need to maintain these shafts and accessways – which may require infrequent and minor blasting for maintenance / safety purposes in these areas.

3.2.3 Mine Development

The Martha Underground Mine is expected to take approximately 10 years to complete.

As noted above, the Martha Underground Mine will initially be accessed from the Correnso Underground Mine with decline development, stockpiling areas and return air accesses developed in Year 1. Approximately 4 km of development will also be undertaken in Year 1.

Development will increase to approximately 8 km over Years 2 to 4. This will then decline through to Year 10, when all development is likely to be completed.

Mining in the Rex orebody is only expected to occur in the first three years of development. Ore development is expected to be completed in Year 2, and stoping will likely be undertaken in Years 2 and 3.

3.2.4 Mining Methods

A combination of different mining methods will be used for the Martha Underground Mine in light of the different ore sources noted in Section 3.2.1 above.

The specific mining methods to be utilised will be confirmed as the planned investigations, drilling and development occurs. However, AMC (2018) notes that any such mining methods will ensure that underground and surface stability is not compromised and will be consistent with commonly adopted practices for other underground mines around the world. A copy of this assessment is provided in **Appendix M** to this AEE.

The proposed mining methods will involve stope excavations that have a high level of assurance of stability. Stopes will be filled without delay on completion (Modified Avoca), or in the case of Avoca stoping on a continuous basis. Where historical open stopes are encountered and it is intended to recover some of the adjacent resources, it is proposed that the voids will be filled with suitable materials before stoping commences.

Further discussion on possible mining methods in each of the ore sources is provided in the subsections below.

3.2.4.1 Avoca Virgin Stopes

Approximately half of the mining inventory, including all of the Rex orebody, will be Avoca virgin stopes. This inventory will most likely be extracted using similar methods to those employed at the Favona, Trio and Correnso Underground Mines, which include:

- Avoca stoping (see Figure 3.2 below);
- Floor benching; and
- Overhand cut and fill.

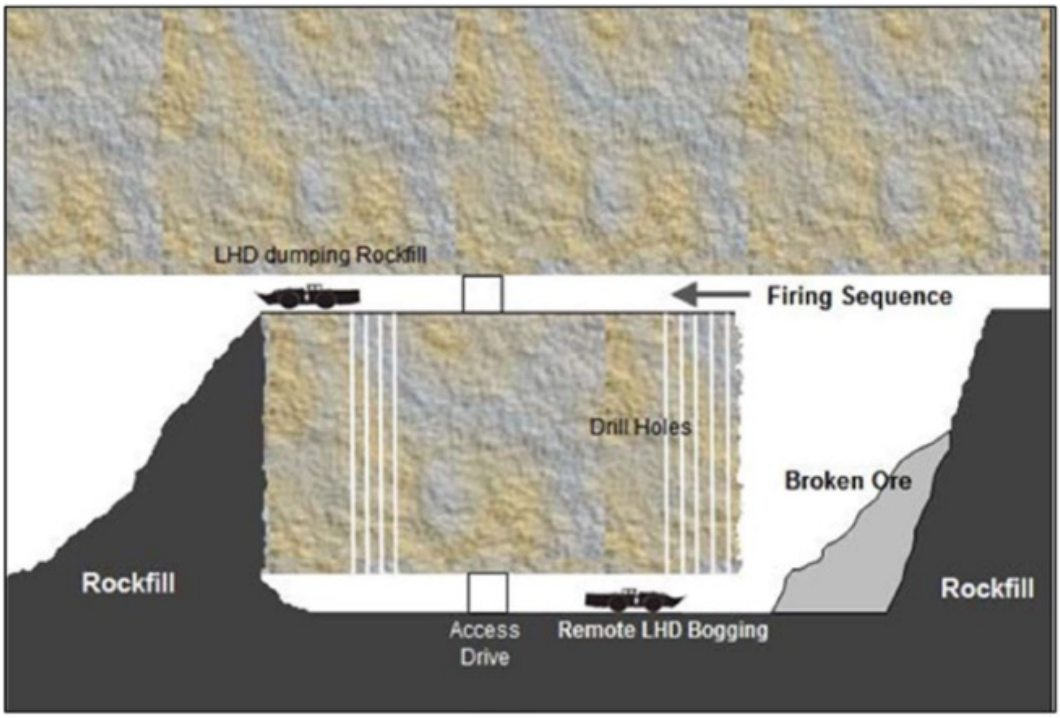

Figure 3.2: Avoca Stoping Method

3.2.4.2 Backfilled Remnant Stopes

Approximately 30% of the potential mining inventory will involve the extraction of remnant ore skins in the footwall of previously mined stopes, or the extraction of both remnant ore skins and historical backfill.

A possible mining method for the extraction of these skins is a non-entry method termed the 'side-ring method'. The side-ring method utilises remote drilling and loading methods, combined with remote load haul dump equipment for ore extraction.

A top-down mining sequence would be undertaken in the remnant mining areas, with a portion of the stope back fill consisting of Cement Aggregate Fill ("***CAF***"). This method requires footwall levels to be developed at 18 – 20 m vertical intervals to provide access for drilling, blasting and ore extraction. Draw points will be driven into the stope, and mined through the historical fill, to the hanging wall remnant ore contact. Drilling will be carried out from the footwall level drive, with holes drilled through the footwall rock, terminating at the backfill contact or if possible into the backfill.

A conceptual side ring is shown in Figure 3.3.

Blast hole charging will be carried out from the footwall drive. The holes will be sequenced to slash the ore into the void created by the draw point development.

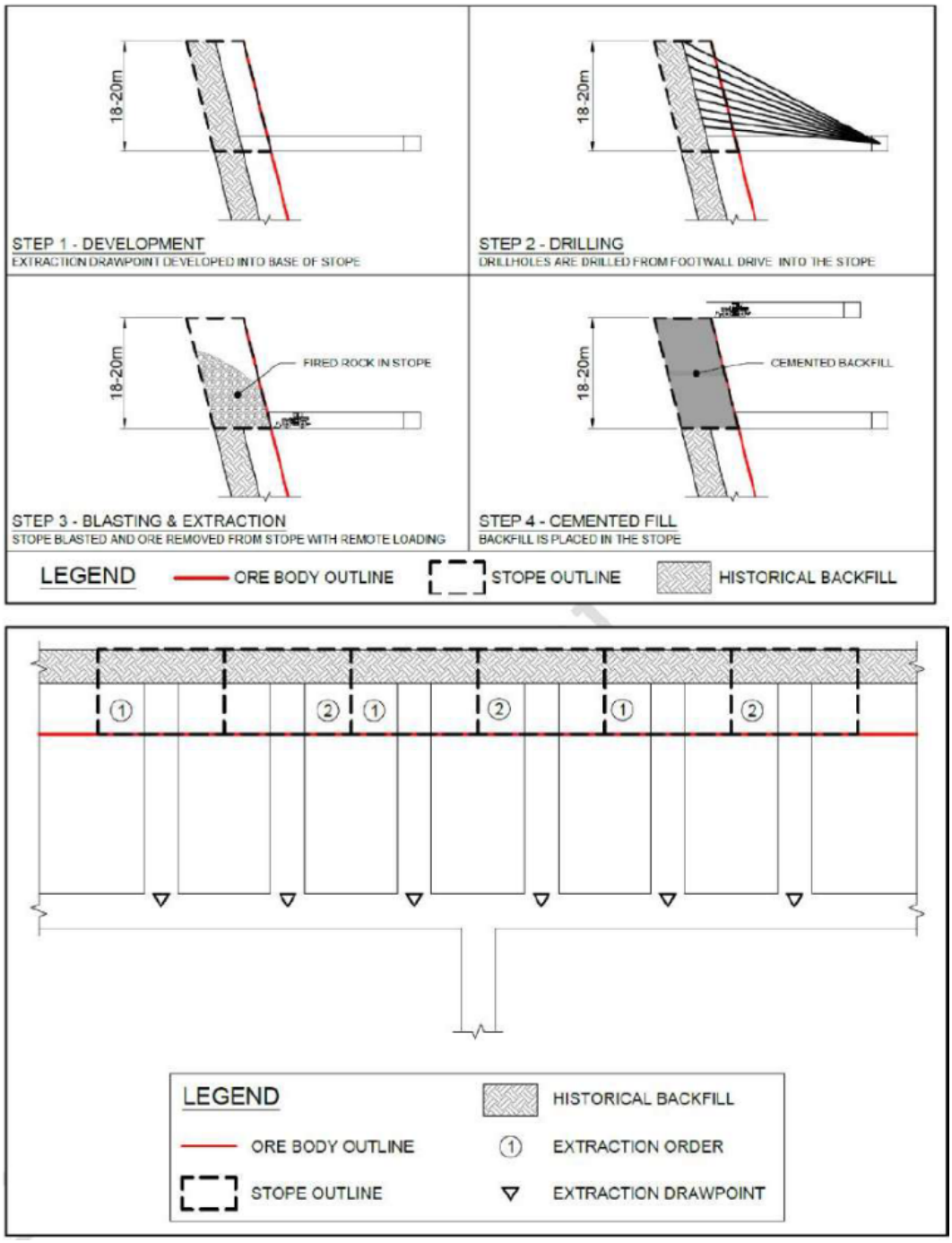

Figure 3.3: Conceptual Schematic of the Side Ring Method

Ore will be extracted from the draw point using load haul dump equipment. Conventional loading may be possible for some portion of ore extraction if the stope brows can be adequately supported. Alternatively, remote loading can be used to remove the ore.

Backfill will be placed from the level above and will likely include both CAF and rockfill – depending on the location of nearby planned stopes.

Depending on the results of geotechnical investigations, variations on this method may involve locating the footwall drives or hanging wall drives further away or closer to the backfilled historical stopes, elimination of selected cross cuts and blast hole drilling parallel to the historical stopes. The methods selected will allow the primary / secondary stope lengths to be adjusted to suit the ground conditions encountered and also to allow for progressive backfilling of voids to occur.

It is expected that the side-ring method will be initially trialled in selected mine areas to initially define the operating parameters, including offset distances for the footwall drive, the ability to drill rings from the cross cuts or parallel with the hanging wall footwall, the placement of CAF, the spacing of crosscuts and the stope panel heights / widths.

3.2.4.3 Backfilling Previously Unfilled Stopes

Previous geotechnical studies have stated mining near unfilled stope voids may be unfavourable and a stand-off distance of 10 m from unfilled stope voids has been applied. Where existing unfilled voids are identified that are closer than the 10 m stand off, OGNZL plans to backfill these voids with CAF and rockfill prior to adjacent stopes being mined.

Other 2D geotechnical studies have identified potentially unfavourable changes in stress when mining in the footwall parallel with historical workings or close to crown pillars. It is considered that ongoing geotechnical investigations and stress modelling will identify areas of potential instability and it will be planned to backfill these historical voids.

Figure 3.4 shows the existing unfilled historic stopes and which of these stopes is expected to be filled.

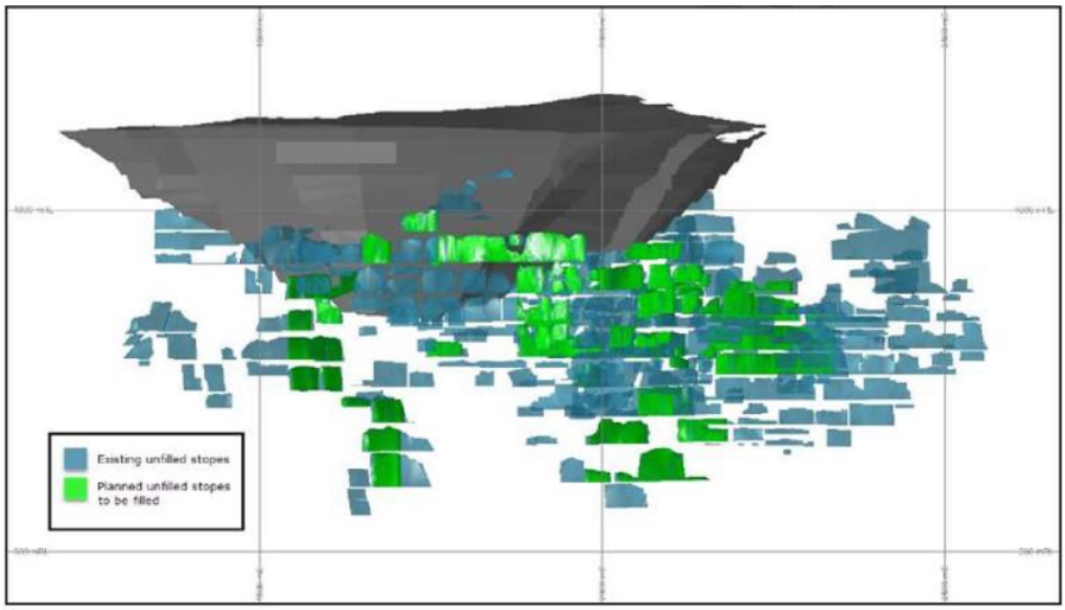

Figure 3.4: Indicative Extent of Unfilled Stopes to be Filled

Approximately 490,000 m^3 of backfill may be placed into the historical voids as part of this mining method (noting that the total figure of backfill can only be calculated once mining commences). This would comprise approximately:

- 150,000 m^3 of backfill in the Royal lode;
- 180,000 m^3 in the Empire lode;
- 107,000 m^3 in the Edward lode; and
- 53,000 m^3 in the Martha lode.

This will leave approximately 1,000,000 m^3 of void remaining compared to the current unfilled volume of approximately 1,500,000 m^3. Figure 3.5 shows the stopes backfilled by vein and by level and the remaining void volume.

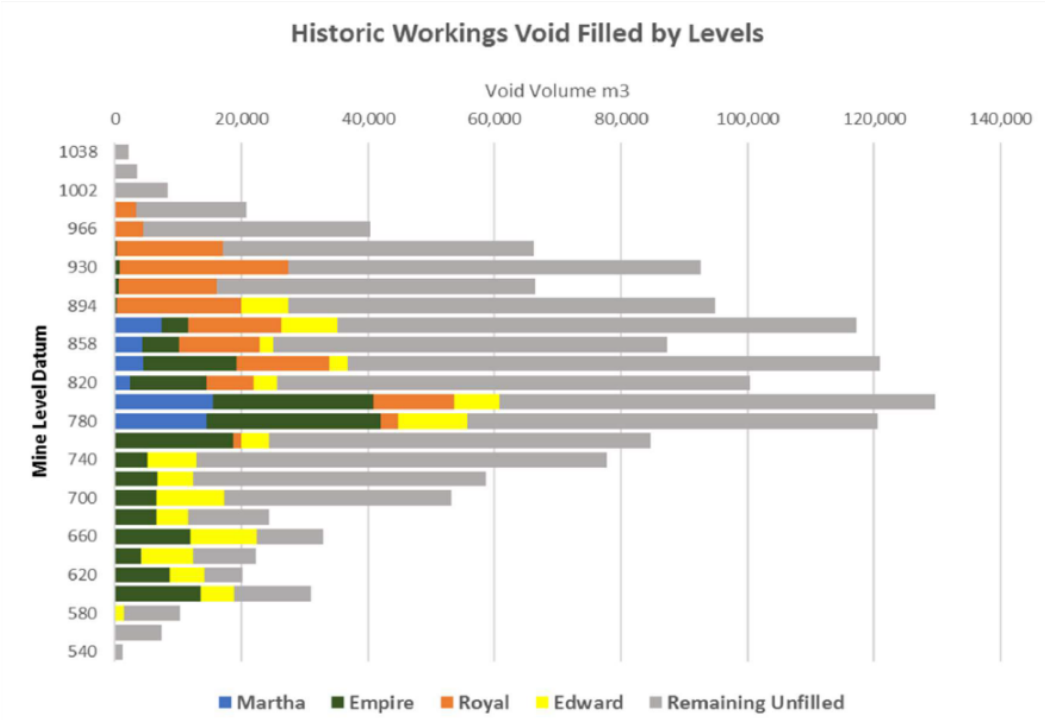

Figure 3.5: Unfilled Voids to be Filled by Level

3.2.4.4 Ore Development

Approximately 18% of the potential mining inventory will involve ore development – largely from Avoca sill drives and mineralised footwall drives and crosscuts associated with the side-ring method.

3.2.5 Blasting

Blasting will be undertaken in the Martha Underground Mine – in a manner similar to that undertaken for the Correnso, Favona and Trio Underground Mines. It will involve:

- Development blasting – which is small scale in terms of the blast hole diameter, blast hole length, explosive weight and overall yield of broken rock; and
- Production blasting – which is larger scale, although less than the amount of rock broken by an open pit blast. Production blasting is significantly more detailed in design than open pit blasting.

As noted previously, development and production blasting in the Martha Underground Mine will occur between Monday to Saturday, and within the hours of 7am to 8pm. There will be up to three blast events per day, with a peak particle velocity of 5 mm/s at the 95th percentile.

Blasting for maintenance / safety purposes will occur as, and when, required – but will be limited to a peak particle velocity of 1 mm/s at the 95th percentile

More detail on the proposed blasting is provided in Section 5.12 of this AEE, which addresses the vibration effects of the proposed blasting regime.

3.2.6 Management of Ore and Rock

The Martha Underground Mine entails the excavation of rock material with the same geological composition of the rock that has been mined from the Martha Pit over the past 30 years.

The Martha Underground Mine is expected to involve the removal of up to approximately 3.5M tonnes of ore and approximately 1.6M tonnes of rock. Whenever possible, rock from the mine will remain underground and be directly placed as backfill. However, for the early stages of the mine it will be necessary to provide temporary storage of rock until there is a need for the backfilling of stopes. Stockpiling of material will, therefore, occur to enable rock production to be scheduled in accordance with backfilling requirements.

The existing stockpile area at the Favona Portal (see Figure 2.8 above), which can contain more than 100,000 tonnes of material, will be used for the temporary storage of ore waiting processing. In addition, the existing stockpile area at the Polishing Pond will be utilised. It is expected that these stockpile areas will have adequate capacity to provide temporary storage of rock from the Martha Underground Mine.

In Years 1 and 2 there will be an excess in tonnes mined compared to backfill tonnes. During this time some rock may be hauled to surface and stockpiled at the stockpile areas at the Favona Portal and the Polishing Pond, before subsequently being returned as underground backfill in the Martha Underground Mine.

It is also expected that after Year 5 some ore will be removed via the portals into the Martha Pit. This ore will be hauled during the operating hours of the pit to the SFA, and then to the Processing Plant by the conveyor. A mobile crusher may also be used in the Martha Pit at this time.

3.2.7 Material for Stope Backfill

As noted in the Section 3.2.4 above, a combination of rock and CAF will be required to backfill the stopes in the Martha Underground Mine.

The volumes required for backfill exceed the mined volume from the Martha Underground Mine. Rock will, therefore, be sourced from the Martha Pit in Years 3 through to Year 10 and will be delivered to the Favona Portal via the crushing and conveyor system or by a waste pass located close to the Martha Pit. Alternatively, rock will be delivered to a stockpile within the Martha Pit located adjacent to a portal (as noted above).

900,000 tonnes of CAF may be required for backfilling. This will be sourced from the concrete batching plant which is already consented to be located close to the Favona Portal as part of the resource consents issued by the HDC for the Correnso Underground Mine (although the plant is not yet constructed).

The concrete batching plant may require imported crushed rock from the Waitawhata Quarry. As per its proposed operation in conjunction with the Correnso Underground Mine, the concrete batching plant will require some space for stockpiling of aggregate.

A typical mobile batch plant of the type proposed, and the indicative location of the plant is shown in Figure 3.6.

Figure 3.6: Typical Batching Plant and Proposed Location at the Processing Plant

3.2.8 Ventilation

Initially ventilation will be through exhaust adits broken through into the southwestern and southern walls of the Martha Pit, with the main exhaust fans located inside the Martha Underground Mine. The exhaust shaft permitted for the Correnso Underground Mine may also be developed by raise borer from the surface into a drive from the Correnso Underground Mine in order to increase air flow.

The ventilation circuit will require a capacity of approximately 200 m^3/s to allow for adequate productivity and flexibility from the Martha Underground Mine.

3.2.9 Surface Works

All new surface works for the Martha Underground Mine will be located within the Martha Pit. They include one fresh air portal, one return air portal and one return air ventilation shaft located at approximately 1003 m RL, 925 m RL and 1,000 m RL respectively (see Figure 3.7 below).

The ventilation shaft and return air portal will discharge the emissions from development and production blasting, and the operation of underground vehicles associated with the Martha Underground Mine. The fresh air portal will also serve as an escapeway.

Figure 3.7: New Surface Expressions for the Martha Underground Mine

3.2.10 Mining Equipment

The Martha Underground Mine will require a range of mining equipment during its operating life. This includes:

- Haulage trucks (e.g. CAT AD45B);
- Load hauling dumps (e.g. CAT R1700G);
- Jumbos (e.g. Sandvik DD421);
- Production drills (Sandvik DL331);
- Shotcrete mixers;
- Graders; and
- Mobile crushers.

3.2.11 Dewatering

The Martha Underground Mine will extend to approximately 500 m RL. Therefore, the water level will need to be lowered a further 200 m below the currently consented level for the Correnso Underground Mine.

Dewatering will be achieved by the installation of stage pumping chambers within the Martha Underground Mine that pump into the Correnso Underground Mine dewatering system at 780 m RL. Figure 3.8 shows indicative stoping horizons by time – based on a commencement date of January 2020 for the Martha Underground Mine.

GHD (2018) has completed detailed analysis of the dewatering requirements for Project Martha. They conclude that dewatering can be managed using the WTP and in accordance with the existing resource consent conditions that apply to its operation and discharge of

water. As such, pumped groundwater will be piped from the Martha Underground Mine to the WTP for treatment and subsequent discharge to the Ohinemuri River.

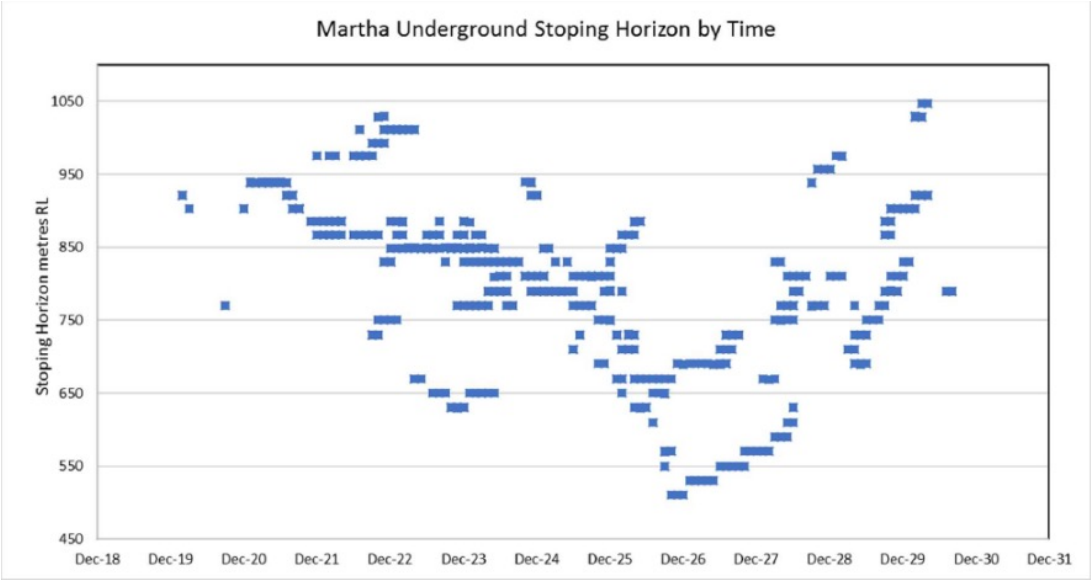

Figure 3.8: Expected Stoping Horizons by Time

3.2.12 Amenity / Support Facilities

An amenity facility (e.g. toilets, showers and staff room), magazine, storage yard and workshop have been established for the Favona, Trio and Correnso Underground Mines. Project Martha will use these facilities. However, a similar facility may also be developed around the Martha Pit.

3.2.13 Hazardous Substances

Table 3.1 lists the hazardous substances that will be stored underground for use as part of the Martha Underground Mine. This is a continuation of the current and approved practices for the Favona, Trio and Correnso Underground Mines.

The emulsion and gasser are combined in blast holes to form the required explosive. As separate components, they are not inherently explosive. These are stored underground as they commonly degrade when exposed to sunlight. Initially, detonators, primers and packaged explosives will continue to be stored in the Martha or Favona Magazines on the surface and transported underground only as required but an underground magazine may be constructed which would be certified for set quantities to comply with Hazardous Substances and New Organisms Act 1996 (and its associated regulations).

Table 3.1: Hazardous Substances for the Martha Underground Mine

Substance	Quantity
Emulsion	40 tonnes
Gasser	3,000 litres
Oil	3,000 litres
Grease	100 kg
Diesel	4,500 litres
Packaged explosives, class 1.1D	5,000kg
Detonators	8,000 units

3.2.14 Closure and Rehabilitation

Closure of the Martha Underground Mine will involve the removal of all underground infrastructure (e.g. pumps, storage facilities).

Backfilling will occur as a part of stoping and the portals and all necessary vent shafts will be plugged or otherwise blocked off.

Flooding of the workings will occur naturally from groundwater recharge once dewatering required for the Martha Underground Mine has ceased and will be accelerate by the addition of water from the Ohinemuri River as part of the pit lake formation.

3.3 PHASE 4 CUTBACK

3.3.1 Overview

The Phase 4 Cutback will be undertaken in a single top down sequence. The subsequent location of the pit crest relative to the existing pit crest and the surrounding residential area is shown in Figures 2.1 and 2.2 above.

The various activities associated with the Phase 4 Cutback are described below.

3.3.2 Preparatory Works

3.3.2.1 Summary

The following preparatory works will be undertaken to accommodate the Phase 4 Cutback:

- The adjustment of the boundaries of properties owned by OGNZL and road reserve by way of a subdivision;

- The re-alignment of approximately 250 m of Bulltown / Cambridge Roads and relocation of networks utilities in the road reserve;
- The relocation of the dwellings located at 12 Cambridge Road and 77 Bulltown Road;
- The demolition of the dwelling located at 85 William Street;
- The construction of new noise bund and a fence;
- The re-alignment of the Pit Rim Walkway;
- The relocation of security fencing around the Martha Pit; and
- The re-alignment of Magazine Road (internal mine road in the vicinity of the Martha Pit).

Figure 3.8 below shows the general configuration of the re-alignment of Bulltown / Cambridge Roads, Magazine Road and the noise bund.

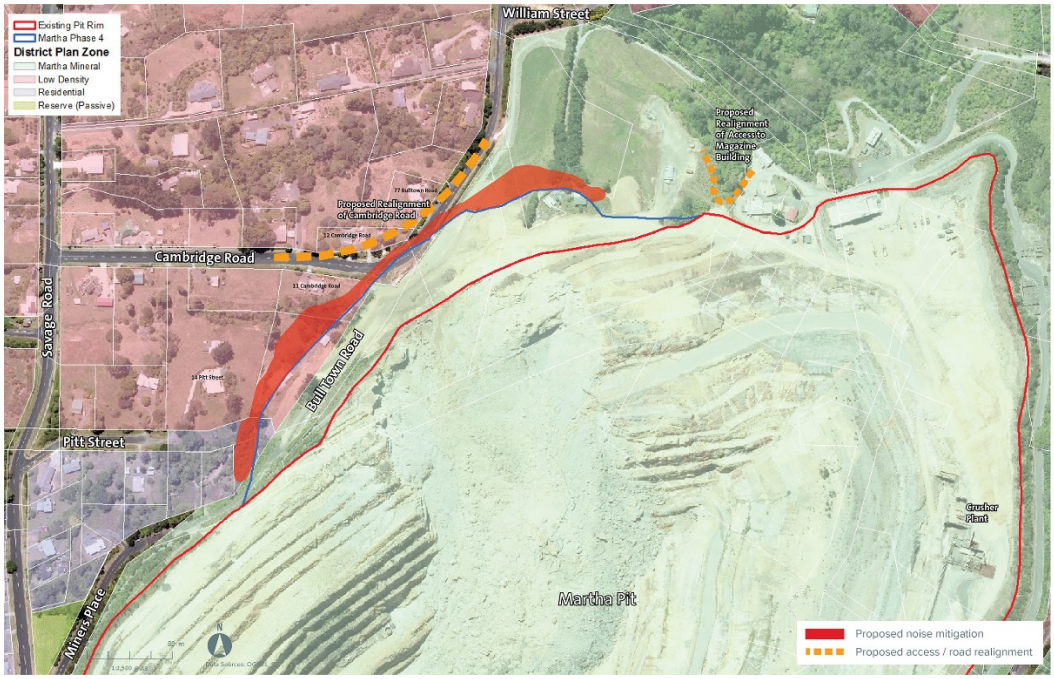

Figure 3.8: Proposed Road Re-Alignment and Noise Bund

3.3.2.2 Re-Alignment of Bulltown / Cambridge Roads

TDG (2018) has prepared a concept design for the re-alignment of Bulltown / Cambridge Roads which meets the requirements of the HDC Engineering Manual. The key design parameters adopted are:

- The re-alignment of Bulltown / Cambridge Roads comprises a 20 m wide legal road corridor. The re-aligned road will have a nominal seal width of 9 m to match the existing carriageway, and will taper slightly at the eastern end to match the existing carriageway width of Bulltown Road (approximately 6 m);
- Geometric elements have been designed in accordance with the Austroads Guide to Road Design Part 3: Geometric Design;

- The existing reverse curve will be significantly improved;
- Minimum horizontal radius curves are 140 m and are larger radius than existing curves;
- The realignment will improve the horizontal geometry and improve the relatively sudden change in carriageway width at the urban / rural boundary which is present in the current alignment;
- Cut slopes have been shown at 1:3 and fill slopes at 1:4;
- The re-alignment has been designed to minimise earthworks, and to completely avoid the need for any earthworks which would affect 10 Cambridge Road and 79 Bulltown Road; and
- The proposed realignment will incorporate a crossing point for pedestrians in the vicinity of 10 Cambridge Road and a short section of footpath on the southern side of the road (which will connect to the Pit Rim Walkway).

The concept design for the re-alignment of Bulltown / Cambridge Roads is provided in Figure 3.9 below.

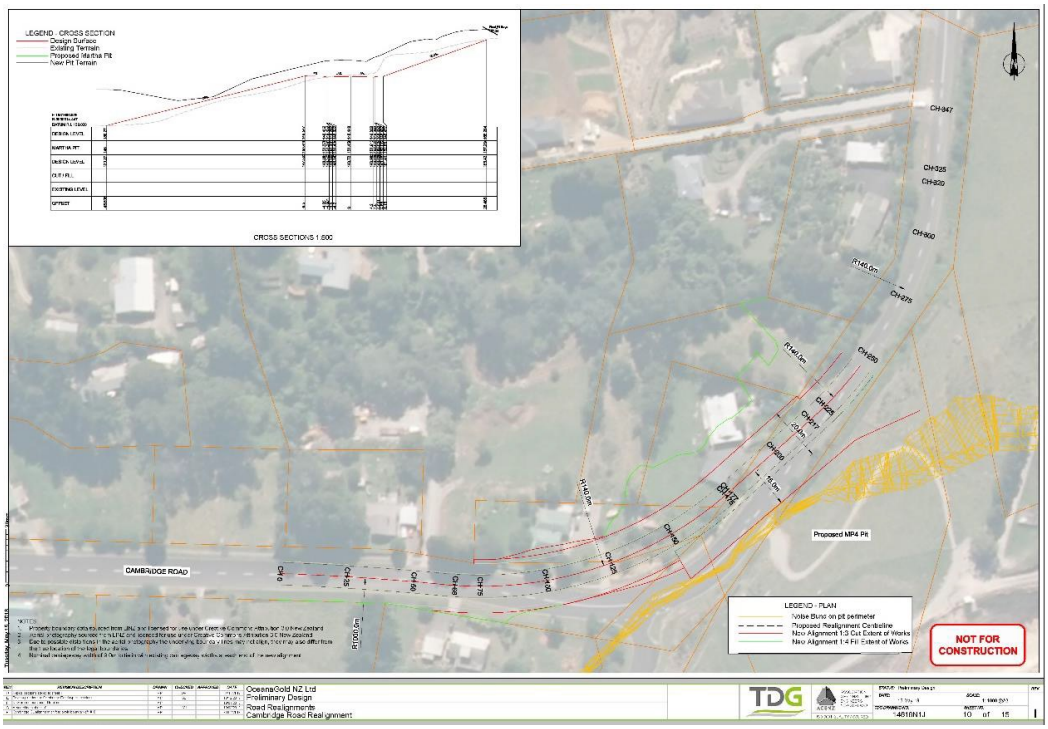

Figure 3.9: Concept Plan for the Re-Alignment of Bulltown / Cambridge Roads

Water and wastewater infrastructure within the road reserve of Bulltown / Cambridge Roads will also be re-aligned as part of the road re-alignment works. The re-alignment of this infrastructure will be undertaken in accordance with HDC development requirements.

3.3.2.3 Subdivision for the Re-Alignment of Bulltown / Cambridge Roads

In order to accommodate the re-alignment of Bulltown / Cambridge Roads, OGNZL is proposing to subdivide 12 Cambridge Road (Lot 1 DPS 88853), 77 Bulltown Road (Lot 2 DPS 28618) and 79 Bulltown Road (Lot 3 DPS 78565) into two new lots.

A proposed survey plan for the subdivision that is required for the re-alignment of Bulltown / Cambridge Roads is provided in **Appendix N** to this AEE. In summary, the two new lots will be as follows:

- Lot 1 – 3,495 m^2; and
- Lot 2 – 3,490 m^2.

3.3.2.4 Noise Bund and the Pit Rim Walkway

OGNZL is proposing to construct a noise bund and noise barrier adjacent to the northern and northwestern sections of the Martha Pit in order to mitigate the propagation of noise associated with the initial cutback of the north wall of the pit.

The location of the proposed noise bund is shown in Figure 3.8 above. The noise bund will be constructed using a combination of an earth bund with a noise barrier on top. The noise barrier would be constructed with a solid material having a surface density of at least 10 kg/m^2.

Cross sections of the proposed noise bund are provided in **Appendix D** to this AEE. These cross sections also illustrate that the pit rim walkway will be re-aligned to travel along the top of the noise bund approximately between Pitt Street and Bulltown Road – before travelling at ground level adjacent to Bulltown Road.

3.3.3 Phase 4 Cutback Works

The intended, and general, extent of works associated with the Phase 4 Cutback is shown in Figure 3.10 below. The Phase 4 Cutback will be mined in a single top down sequence and will likely consist of three general stages which are described below.

It should also be noted that other minor works within the Martha Pit may also occur during the Phase 4 Cutback. These works will be undertaken within the existing footprint of the pit and within the parameters authorised by ML 32 2388 and LUC 97/98-105.

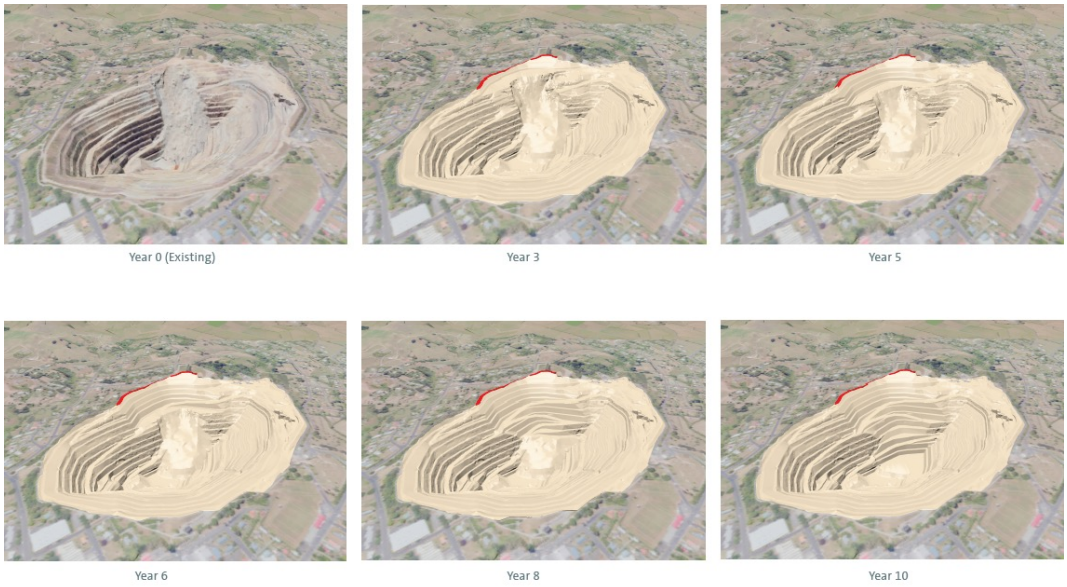

Figure 3.10: Phase 4 Cutback Staging

In Cutback 1, the Martha Pit will be developed to 1120 m RL via access from the east wall / Magazine Road and a temporary ramp developed to the existing haul road at 1090 m RL. At this point large open pit mining equipment can be used.

In Cutback 2, the temporary ramp in Cutback 1 will be removed and the northern ramp established to 1070 m RL and the southern haul road will be opened-up. A temporary ramp will be developed from 1070 m RL to 995 m RL via two switchbacks to connect into the lower haul road.

The final cutback will remove part of the temporary haul road constructed as part of Cutback 2 and continues to mine the pit to its target depth.

3.3.4 Mining Methodology

As has previously occurred at the Martha Pit, surface mining and mining operations will be undertaken using conventional drill, blast, load and haul methods. Rock will be categorised into potentially acid forming ("***PAF***") or non-acid forming ("***NAF***") rock.

All ore and rock will be loaded via large mining excavators into large rigid axle rear dump trucks, and then trucked and tipped to a jaw crusher or stamler breaker station. Small quantities of ore and rock may be stockpiled close to the jaw crusher.

Except for selected rock that is sent to the Martha Underground Mine to backfill stopes and voids, all ore and rock will be crushed at the SFA. A mobile crusher may also be located on the southern haul road to crush rock from the Martha Pit to a suitable size before it is sent to the Martha Underground Mine.

Ore from the Martha Pit will be conveyed approximately 1.5 km to the Processing Plant and placed in a stockpile. The stockpile area adjacent to the Polishing Pond will also be available to store excess ore. Rock will be conveyed approximately 2 km to the Central, Northern and Eastern Stockpiles (or to the stockpile area adjacent to the Favona Portal for storage).

The southern haul road will be accessed late in Year 5 of the Phase 4 Cutback and will not be used for haulage until Year 8. During this period, it is likely that underground ore will be hauled to the southern portal and stockpiled, and selected rock will be stockpiled on the southern haul road and hauled underground as backfill.

3.3.5 Blasting

Blasting will be undertaken as part of the Phase 4 Cutback in a manner similar to that previously undertaken in the Martha Pit. In this regard, it is likely that blasting will be undertaken using emulsion and electronic detonators.

The blasting for the Phase 4 Cutback will employ drill and blast techniques typical of those near to residential areas. Benches with a height of up to 5 m will be drilled with small diameter blast holes and loaded with bulk explosives. Maximum explosive quantities per blast hole are expected to vary up to approximately 10 kg. Best practices will continue to be followed with respect to controlling potential environmental effects of vibration, overpressure and fly rock.

Blasting as part of the Phase 4 Cutback will occur between Monday to Friday, and within the hours of 10 am to 3 pm. In addition, blasting will be allowed between 10 am and 12pm on Saturdays.

The peak particle velocity for blasting will be 5 mm/s at the 95th percentile.

3.3.6 Hours of Work and Schedule

The Martha Pit will generally operate:

- Monday – Friday: 7 am – 7 pm; and
- Saturday: 7 am – 12 pm.

Operations within the pit may occur between 7pm and 9pm on Monday – Friday if they are of an urgent nature and necessary for the effective operation of mining activities.

Martha Pit will not operate on Sundays or public holidays.

However, light vehicles will need to operate in the pit outside of these hours in order to access the Martha Underground Mine (which will operate 24 hours a day and seven days per week).

3.3.7 Mining Equipment

The Phase 4 Cutback will require a range of mining equipment during its operating life. This includes:

- 50 to 190 tonne excavators;
- Production drills;
- Compactors;
- Bulldozers;
- Loaders;

- 50 to 85 tonne trucks;
- Graders;
- Service vehicles;
- Light vehicles.

3.3.8 Lighting

Permanent lighting is installed around the crushers, conveyors workshops and office block and this will be maintained. In pit lighting will be re-established for the works within the Martha Pit in accordance with the previous configurations.

3.3.9 Hazardous Substances

Hazardous substances will continue to be stored at the surface magazine close to the north wall of Martha Pit in quantities shown in Table 3.2 below.

Table 3.2: Hazardous Substances for the Phase 4 Cutback

Substance	Quantity
ANFO	8,000 kilograms
Ammonium nitrate	25,000 kilograms
Electronic detonators	15,000 units
Nonel detonators	1,000 units

Emulsion will be delivered as required and is not stored on site. Ammonium Nitrate is stored on site and will be mixed as required. Detonators and primers will continue to be stored in the magazine separately on the surface and transported only as required.

The storage of hazardous substances will continue to be in accordance with relevant New Zealand Standards and Codes of Practice.

3.3.10 Dewatering

The Martha Pit will be dewatered by the operations required as part of the Correnso and Martha Underground Mines. In this regard, as the floor of the pit is 875 m RL no additional dewatering or lowering of groundwater will be required.

Any water contained in the base of the Martha Pit will be removed by in-pit pumping to the WTP for treatment. The discussion provided in Section 3.2.11 of this AEE with respect to the utilisation of the WTP also applies with respect to the Phase 4 Cutback.

The walls of the Martha Pit have been depressurised using horizontal drain holes, which are generally 20 m long (but can extend up to 80 m in length). Drain holes in the east wall

of the pit have extracted up 60 l/s during drilling and this dewatering has been monitored with piezometers around the perimeter of the pit.

This practice will continue as part of the Phase 4 Cutback.

3.3.11 Closure and Rehabilitation

3.3.11.1 Overview

As is outlined in Section 2.6.8 of this AEE, OGNZL is required to rehabilitate the Martha Pit at the completion of mining activities in accordance with an approved Rehabilitation and Closure Plan. The centre piece of the concept plan is a pit lake and surrounding parkland facility for recreation use.

No changes to the overall rehabilitation concept for the Martha Pit are proposed as part of Project Martha. However, the pit lake will be larger due to the Phase 4 Cutback and additional landscape mitigation is noted in the figures in **Appendix D** to this AEE.

3.3.11.2 Pit Lake Filling

To enable the pit lake to be filled in an expedient manner, OGNZL propose to abstract water from the Ohinemuri River at the completion of Project Martha for a period of approximately 9.5 years (being the approximate timeframe for the completion of lake filling). This will require the construction of a water intake structure on the true-right bank of the river in a location already authorised by the HDC and the WRC.

The intake structure will be screened and include a pressure pipeline along the alignment of the paper road. The pipeline will then run along the conveyor corridor to the SFA and may include an offtake to the Favona Portal in order to enable the balancing of the rate of underground re-watering with that of the pit.

In light of the above, OGNZL is seeking to change its currently consented water abstraction regime from the Ohinemuri River. In this regard, OGNZL propose to abstract up to 20% of the river flow when the flow rate is above 2 × Mean Annual Low Flow ("***MALF***"). Based on the assessment undertaken by GHD (2018) it is considered that approximately 15,000 m^3/d will be diverted to the pit lake.

3.3.11.3 Pit Lake Discharge

The level of the pit lake has been set at 1104 m RL since 1996 and will not be changed as part of Project Martha. The level of the pit lake was set to provide a 2 m buffer depth to the nearest known historic adit level. While no direct connections to this adit are known, this buffer has been applied as a contingency against uncontrolled discharge from the adit.

The pit lake will overflow to the Mangatoetoe Stream through a piped outlet – which has also been previously authorised by the HDC and the WRC. The outlet will most likely comprise a control structure, a single pipe that is jacked or bored under the west wall of the Martha Pit and Moresby Avenue.

The outlet structure will conclude on the true left bank of the Mangatoetoe Stream and will include a wing / end wall and apron from which an armoured open channel section will discharge to the Mangatoetoe Stream.

The peak discharge from the pit lake outlet is predicted to be 4.32 m^3/s. This is based on 72-hour duration rainfall, with an additional 20% allowance for climate change (which is considered to be an extreme and unlikely storm event).

3.4 TAILINGS STORAGE AND ROCK DISPOSAL

Project Martha activities will generate rock and tailings which require disposal in safe permanent storages.

The Northern, Eastern and Central Stockpiles and TSF's described in Section 2.6.7 of this AEE will be used for the disposal of rock and tailings. This activity will be undertaken in accordance with the existing consents and authorisations issued by the HDC and the WRC for these facilities.

Table 3.3 below outlines the proposed disposal locations for rock from Project Martha. The expected cumulative amount of rock disposal occurring at each location over the life of the Project Martha is shown in Figure 3.11.

Table 3.3: Anticipated Disposal Locations for Rock

Location	Volume
Stope backfilling in the Martha Underground	2.39M m^3
The Central and Eastern Stockpiles	2.48M m^3
Northern Stockpile or capping for TSF1A	0.1M m^3

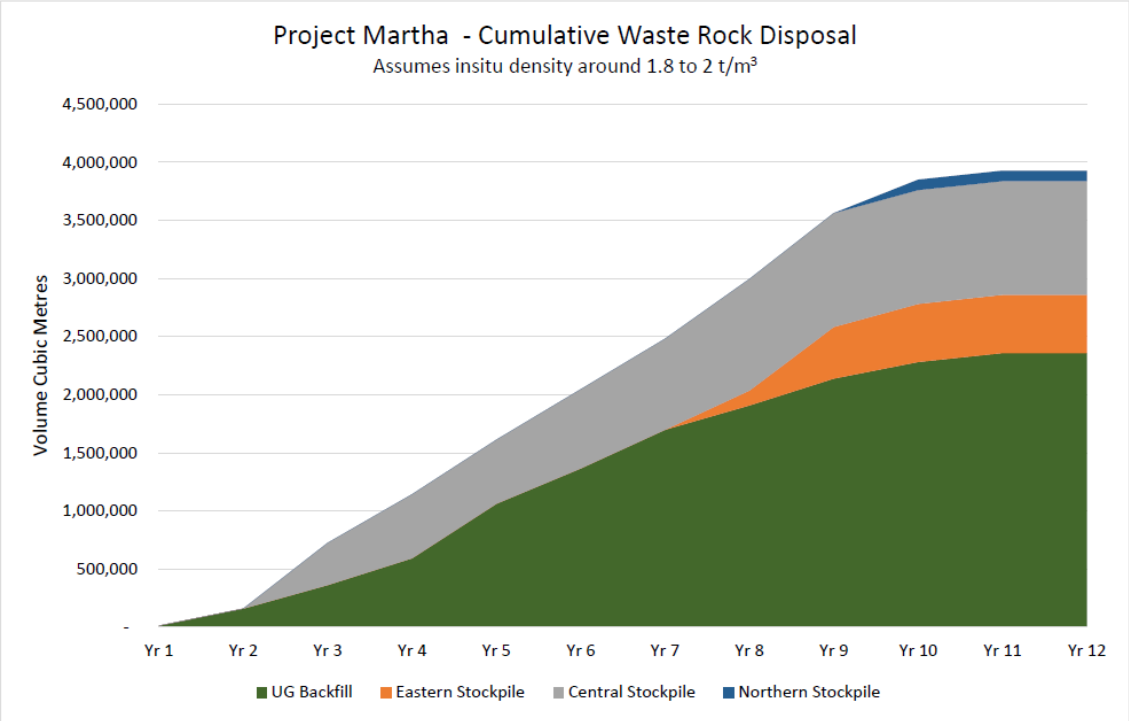

Figure 3.11: Anticipated Rock Disposal Schedule

TSF1A is expected to have spare capacity of 1.7M m^3 once constructed to the consented 177.25 m RL following the current life of mine. A 5 m raise on TSF2 will provide for a further 1.64M m^3 of tailings.

The combined capacity of TSF1A and TSF2 over the life of Project Martha relative to the cumulative tailings produced is shown in Figure 3.12 below.

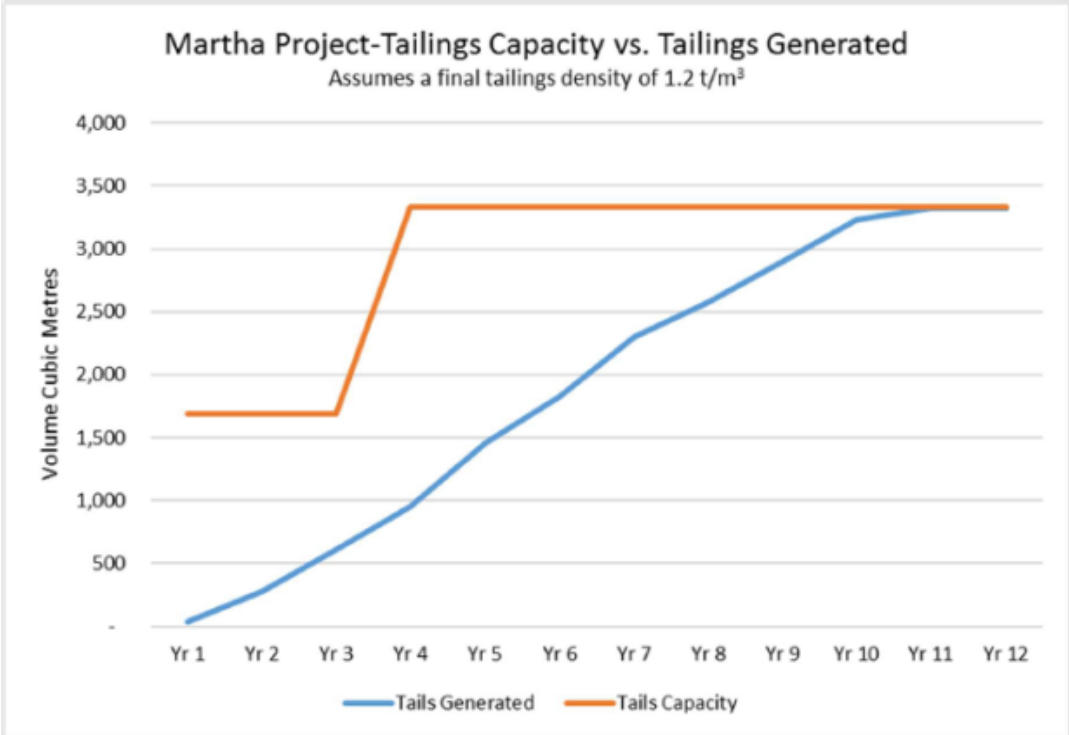

Figure 3.12: Tailing Storage Facility Capacity – Project Martha

3.5 PROJECT SCHEDULE

Project Martha is expected to be an approximately 12-year project. An indicative project schedule outlining the key activities undertaken over that 12-year life of Project Martha is provided in Table 3.4.

Table 3.4: Indicative Project Milestones

Year	Production / Development
1	› Development of Martha Underground Mine commences. › Development of the Rex orebody and spiral decline.
2	› Phase 4 Cutback preparation works commence, including re-alignment of Bulltown / Cambridge Roads and the construction of the noise bund. › Rex orebody stoping commences.
3	› North wall stripping commences. › Underground mining of Rex orebody completed and all stopes backfilled. › Exhaust from Martha Underground Mine into the Martha Pit commissioned.
4	› Martha Underground Mine achieves full production.
5	› Martha Underground Mine is accessed through the Martha Pit.

Year	Production / Development
6	
7	
8	Surface mining of ore from the Phase 4 Cutback commences.
9	
10	Phase 4 Cutback completed.
11	Martha Underground Mine complete.
12	Contingency

3.6 WORKFORCE

Project Martha will require between 250 and 350 full time employees. It will also require between 50 and 100 contractors with skills in open pit mining, underground mining, operations and maintenance, environmental monitoring and remediation (see Figure 3.13 below).

Much of the existing workforce for the Correnso Underground Mine, as well as the current workforce employed by OGNZL, will likely transfer to activities associated with Project Martha as current operations wind down.

Existing employees involved in administration and support functions associated with the Correnso Underground Mine will also likely transfer to Project Martha.

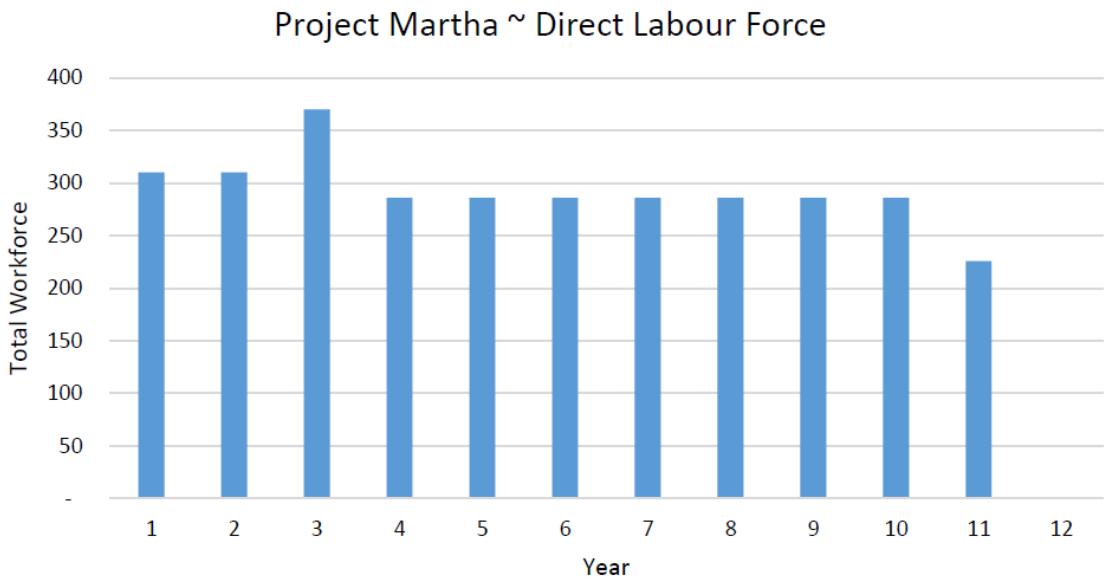

Figure 3.13: Estimated Direct Employment for Project Martha

4. RESOURCE CONSENT REQUIREMENTS

4.1 HAURAKI DISTRICT COUNCIL

4.1.1 Overview

OGNZL is seeking all necessary resource consents from the HDC to authorise all construction, operation, maintenance and rehabilitation activities associated with Project Martha.

Table 4.1 identifies the activities associated with Project Martha which it is considered require resource consent in accordance with the Hauraki District Plan. Table 4.1 also identifies those activities which will be undertaken in accordance with an existing resource consent held by OGNZL or will be undertaken in accordance with a permitted activity rule in the Hauraki District Plan.

Table 4.1: Project Martha Consent Requirements (HDC)

Activity	Resource Consent Required and Activity Status	Comment
Martha Underground Mine		
Underground mining associated within the Martha Underground Mine, including, but not limited to: › Sill drive development; › Drilling, blasting, earthworks and the removal of rock material and ore; › Stockpiling of rock material from underground mining in the Martha Pit; › The establishment and use of a Return Air Portal, Return Air Shaft and Fresh Air Portal in the Martha Pit; and › Backfilling of stopes with rock and CAF, and flooding of the workings.	Yes. Discretionary activity.[1]	The Martha Underground Mine is a new underground mine and will occur within the Martha Mineral, Residential, Town Centre and Reserve (Active) Zones. The definition of underground includes surface disturbance associated with underground mining – which is considered to include portals / shafts and the stockpiling of rock material from underground mining in the Martha Pit.

[1] Martha Mineral Zone: Rule 5.17.4.4(D2). Residential Zone: Rule 5.7.4.4(D4). Town Centre Zone: Rule 5.11.4.4(D7). Reserve (Active) Zone: Rule 5.15.4.4(D6).

Activity	Resource Consent Required and Activity Status	Comment
The use and storage of hazardous substances in the Martha Underground Mine.	Yes. Non-complying activity.[2]	The Martha Underground Mine is defined as a new hazardous facility in the Hauraki District Plan. It is subject to the hazardous facility rules in Section 7 of the Hauraki District Plan and is a non-complying activity given that the Martha Mineral Zone is not identified in the Hazardous Facilities Screening Procedure Consent Status Matrix.
The use, maintenance and rehabilitation of existing and consented portals, access drives, ventilation shafts and other underground facilities and infrastructure outside of the Martha Underground Mine, which are currently authorised as part of the Favona Underground Mine, Trio Underground Mine, Correnso Underground Mine, Slevin Underground Mine and Martha Drill Drive Project.	Yes. Discretionary activity in the Martha Mineral and Rural Zones.[3] Non-complying activity in the Residential, Reserve (Active) and Reserve (Passive) Zones.[4]	The use of existing underground mine facilities for access purposes and ventilation is authorised by land use consents which are specific to existing projects. It is also noted that the land use consent for the Correnso Underground Mine expires in 2025 (i.e. before the Martha Underground Mine will be complete). A new resource consent is, therefore, sought to use existing underground facilities and infrastructure in accordance with the conditions that apply to those facilities. This activity is deemed to be mining operations in the Hauraki District Plan, given that these existing underground mine facilities will principally be used to transport ore and rock material out of the Martha Underground Mine.
Phase 4 Cutback		
Mining operations associated with the Martha Pit, including, but not limited to: › The re-alignment of Bulltown / Cambridge	Yes. Discretionary activity in the Martha Mineral Zone.[9] Non-complying activity in the Residential and Low	The following activities would be undertaken in the Residential and / or Low Density Residential Zone: › The re-alignment of Bulltown / Cambridge Roads and the relocation of network utilities;

2 Rule 7.7.10(1).

3 Martha Mineral Zone: Rule 5.17.4.4(D2). Rural Zone: 5.1.4.4 (D14).

4 Residential Zone: Rule 5.7.4.5(NC1). Reserve (Active) Zone: Rule 5.15.4.5(NC1). Reserve (Passive) Zone: Rule 5.16.4.5 (NC1).

9 Rule 5.17.4.4(D2).

Activity	Resource Consent Required and Activity Status	Comment
Roads and the relocation of network utilities;[5] › The establishment of a new noise bund and fencing; › The re-alignment of the pit rim walkway and associated landscaping; › The realignment of Magazine Road (internal mine road); › The formalisation of a vehicle access off Grey Street (unformed road);6 › The removal of overburden and rock from the Martha Pit, and the stacking and storage of that material within the pit; › The use of machinery and vehicles on haul roads and along pit walls, including for the provision of access to the Martha Underground Mine; › The use of a mobile crusher within the Martha Pit; › The use of the SFA to process and stockpile material from the Martha Pit and Martha Underground Mine; › Rehabilitation of the Martha Pit by way of the creation of a lake and associated recreation facilities and landscaping, including the	Density Residential Zone.[10] Discretionary activity in the Rural Zone.[11]	› The establishment of a new noise bund and fencing; › The realignment of the pit rim walkway and associated landscaping; and › A small section of the Phase 4 Cutback. There is no existing resource consent or permitted activity rule in the Hauraki District Plan which authorises mining operations associated with Project Martha in these areas. It is noted that part of the new noise bund and fencing would be located inside the Martha Mineral Zone, and in an area covered by LUC 97/98-105. However, LUC 97/98-105 does not authorise the establishment of a noise bund in this location. Therefore, a resource consent is required as a discretionary activity in the Martha Mineral Zone. Most of the Phase 4 Cutback is located within the Martha Mineral Zone and in the area covered by Rule 5.17.4.1 (P1) of the Hauraki District Plan or LUC 97/98-105. However, the dimensions of the Phase 4 Cutback are larger than authorised by these rules / consents. It is also not certain that LUC 97/98-105 permits the use of the SFA to stockpile and crush rock and overburden which originates from that part contained outside the Martha Mineral Zone. Therefore, OGNZL is seeking a new land use consent covering all mining operations within and around the Martha Pit associated with Project Martha, and its subsequent rehabilitation. Finally, it is noted that the intake structure on the Ohinemuri River (and associated pipeline route) and discharge structure to the Mangatoetoe Stream are currently authorised by LUC 97/98-105. While all activities

5 Rules 7.4.5.4(D8) and 7.9.5(3).

6 Rule 7.9.5(3).

10 Low Density Residential Zone: Rule 5.8.4.5(NC1). Residential Zone: Rule 5.7.4.5(NC1).

11 The intake structure and section of the pipeline route requiring resource consent is located in the Rural Zone.

Activity	Resource Consent Required and Activity Status	Comment
establishment of a limestone storage silo and pump unit; › The establishment of an intake structure on the margin of the Ohinemuri River and an associated pipeline route;[7] › The establishment of a discharge structure for overflow water from the pit lake.[8]		authorised by LUC 97/98-105 within the Martha Mineral Zone will become permitted activities in accordance with Rule 5.17.4.1 (P2) of the Hauraki District Plan in October 2019, the intake structure and discharge structure are located in the Rural and Residential Zones – and will not be captured by the permitted activity rule. As such, they need to be authorised by a new resource consent as part of Project Martha.
Surface mining in the Martha Mineral Zone.	Yes. Discretionary activity.[12]	Surface mining conducted in accordance with ML 32 2388 is a permitted activity in accordance with Rule 5.17.4.1 (P1) of the Hauraki District Plan. However, the dimensions of the Phase 4 Cutback are considered to be larger than those authorised by Rule 5.17.4.1 (P1). Therefore, OGNZL is seeking a new land use consent for surface mining in the Martha Mineral Zone.
Subdivision of land to accommodate the re-alignment of Bulltown / Cambridge Roads.	Yes. Non-complying activity.[13]	
Removal and demolition of dwellings.	Yes. Discretionary activity.[14]	The existing dwellings to be moved or demolished are located in the Low Density Residential Zone and Martha Mineral Zone. The removal or demolition of these dwellings in the Low Density Residential Zone is a permitted activity in accordance with Rule 5.8.4.1(P8) of the Hauraki District Plan – and will also comply with the relevant standards in Sections 6, 7 and 8.

7 Rule 5.1.4.4(D14).
8 Rule 5.7.4.5(NC1).
12 Rule 5.17.4.4(D2).
13 Rule 9.2.2(2)(d).
14 Rule 5.17.4.4(P2).

Activity	Resource Consent Required and Activity Status	Comment
		However, the removal or demolition of a dwelling in the Martha Mineral Zone is not covered by a permitted activity rule, is considered to be mining operations, and is a discretionary activity under Rule 5.17.4.4(P2).
Use of Existing Above Ground Infrastructure		
Use of the stockpiles at the Favona Portal and Polishing Pond for the temporary stockpiling of ore and rock, and for the temporary stockpiling of imported crushed rock.	Yes. Discretionary activity.[15]	These stockpiles were initially authorised by the land use consent for the Favona Underground Mine,[16] which has an unlimited term. However, the consent is specific to the Favona Underground Project. As has occurred for all other underground mining projects in Waihi, consent is sought to use these existing stockpile facilities (which are located in the Rural Zone and the Martha Mineral Zone) for Project Martha.
Use of the concrete batching plant (consented but not yet constructed).	Yes. Discretionary activity.[17]	The land use consent which currently authorises the erection and operation of the Concrete Batching Plant in the Rural Zone is associated with the Correnso Underground Mine which expires in 2025. This is prior to Project Martha concluding. As such, a new resource consent is sought for the Concrete Batching Plant in association with Project Martha.
Use of other existing mine infrastructure which was authorised by ML 32 2388 or is currently authorised by LUC 97/98-105.	No. Already authorised by LUC 97/98-105 or are a permitted activity under the Hauraki District Plan.[18]	The use of these existing facilities is either already authorised by LUC97/98-105 or are a permitted activity under Rule 5.17.4.1 (P1) of the Hauraki District Plan.

15 Rural Zone: Rule 5.1.4.4(D14). Martha Mineral Zone: Rule 5.17.4.4(D2).

16 Issued by Consent Order ENV A00009/04.

17 Rule 5.1.4.4(D14).

18 Rule 5.17.4.1(P1).

4.1.2 Mining / Mining Operations

As noted above, the Phase 4 Cutback necessitates the pit crest encroaching into the Residential and Low Density Residential Zones. However, the material to be removed from within the Residential and Low Density Residential Zones contains no ore.

It is considered that the proposed works in the Residential and Low Density Residential Zones constitute mining operations, rather than surface mining, as per the definitions of those terms in the Hauraki District Plan. This is an important distinction because in those zones:

- Mining operations is a non-complying activity; but
- Surface mining is a prohibited activity for which no resource consent can be sought.

The Hauraki District Plan definitions of surface mining and mining operations are as follows (emphasis added):

> *'Surface Mining' means taking, winning or extraction of naturally occurring minerals from under or on the land surface utilising open pit, open cast or other recognised surface mining techniques, methods and equipment. It does not include minor surface activities (e.g. removal of boulders from the surface of land) which are provided for separately under the "Earthworks" provisions.* ***It excludes "Mining Operations" (refer to separate definition)****.*
>
> *'Mining Operations' means operations in connection with mining (for any mineral), and shall include the following:*
>
> *(a) the transport, treatment, processing and separation of any mineral; and*
>
> *(b) the construction, maintenance and operation of any works, structures and other land improvements, and of any machinery and equipment connected with such operations; and*
>
> *(c) the removal of overburden and waste rock, by mechanical or other means and the stacking, deposit, storage and treatment of any substance considered to contain any mineral; and*
>
> *(d) the deposit or discharge of any mineral, material, debris, tailings, refuse or wastewater produced from or consequent on any such operation; and*
>
> *(e) the doing of all lawful acts incidental or conducive to any such operations.*

Of relevance, mining is also defined in the Hauraki District Plan. It states that it has the same meaning as in Section 2 of the Crown Mineral Act 1991, which is as follows:

> *Mining*
>
> *(a) means to take, win, or extract, by whatever means,*
>
> *(i) a mineral existing in its natural state in land; or*
>
> *(ii) a chemical substance from that mineral existing in its natural state in land; and*
>
> *(b) includes*
>
> *(i) the injection of petroleum into an underground gas storage facility; and*
>
> *(ii) the extraction of petroleum from an underground gas storage facility; but*

(c) does not include prospecting or exploration for a mineral or chemical substance referred to in paragraph (a)]

The earthworks are clearly required in connection with mining in the sense that they are necessary to stabilise the north wall of the Martha Pit, and the pit exists to allow the ore to be mined. The works constitute the removal of overburden and rock. This activity is, therefore, clearly contemplated in paragraph (c) of the definition of mining operations in the Hauraki District Plan. It also follows that it is not surface mining since that definition expressly excludes mining operations.

The alternative interpretation (i.e. that any earthworks in the Martha Pit is surface mining) cannot be supported on the plain wording of the definitions in the Hauraki District Plan. Were this correct, paragraph (c) of the definition of mining operations definition would not have been included. The removal of overburden and rock is clearly an activity that occurs in relation to the pit activities, and is an activity that is expressly excluded from the definition of surface mining. To put it another way, if all earthworks associated with the pit are surface mining then paragraph (c) of the mining operations definition becomes meaningless.

4.1.3 Lapse of Consent and Term of Consent

In accordance with Section 125 of the RMA, OGNZL seeks a lapse date of five years for all of the resource consents sought for Project Martha from the HDC.

OGNZL is also seeking that the resource consents sought for Project Martha from the HDC be granted on an unlimited term in accordance with Section 123(b) of the RMA.

An unlimited term has been sought as some of the activities for which OGNZL is seeking resource consent will be permanent modifications to the environment (e.g. the realignment of Bulltown / Cambridge Roads) or will need to occur well into the future as part of the rehabilitation of the pit lake.

In light of the above, it is not considered appropriate to apply a fixed duration to the exercise of the resource consents sought for Project Martha.

4.2 WAIKATO REGIONAL COUNCIL

4.2.1 Overview

OGNZL is seeking all necessary resource consents from the WRC to authorise the construction, operation, maintenance and rehabilitation activities associated with Project Martha.

Table 4.2 identifies the activities associated with Project Martha which it is considered require resource consent in accordance with the Waikato Regional Plan.

Table 4.2: Project Martha Consent Requirements (WRC)

Activity	Resource Consent Required and Activity Status	Comment
Activities Associated with the Construction, Operation and Rehabilitation of Project Martha		
To discharge contaminants to air from the area of the Martha Pit located outside the geographic area covered by RC124859, to discharge contaminants to air from the ventilation shafts and fresh air portals associated with the Martha Underground Mine, and the discharge of contaminants to air from the Concrete Batching Plant.	Yes. Change to the conditions of RC124859 (discretionary activity)[19].	RC124859 authorises various discharges to air from within the Martha Pit and the Golden Link Project Area. However, it does not cover the discharge from the new ventilation shafts and fresh air portals, nor those parts of the Phase 4 Cutback located outside of the boundary of ML 32 2388 and LUC 97/98-105. In addition, the discharge of contaminants to air from the Concrete Batching Plant is limited to the manufacture of cement for underground mines in the Golden Link Project Area. As such, a change to the conditions of RC124859 is sought so it authorises discharges from the new areas / activities.[20]
To take groundwater to dewater the Martha Pit and Martha Underground Mine (including any surface water which has seeped into the ground from the Martha Pit).	Yes. New water permit (discretionary activity).[21]	The Martha Underground Mine will require dewatering 200 m lower than what is authorised by RC124860. It is also understood that groundwater intercepted as part of the Martha Underground Mine may have a temperature that exceeds 30^{0}C, which means such groundwater will also be classified as geothermal water. It is noted that the relevant rules in the Waikato Regional Plan provide for the take of 30 tonnes of geothermal water per day from a small geothermal system as a permitted activity, which would be complied with for Project Martha. But as OGNZL is not proposing to discharge the water via soakage or reinjection it is considered that the activity is to be

19 RMA s127.

20 Refer to the application forms for the changes sought to the conditions of RC124859.

21 Rules 3.3.4.24 and 7.6.5.2.

Activity	Resource Consent Required and Activity Status	Comment
		considered under Rule 7.6.5.2 of the Waikato Regional Plan.
To discharge material to land within, and adjacent to, the Martha Pit, including stockpiled material and material for the creation of the noise bund.	Yes. New discharge permit (discretionary activity).[22]	An existing resource consent authorises this activity in the Martha Pit, but its expiry date is prior to the completion of Project Martha. Therefore, a new resource consent is required with a longer consent term, and which also covers the Phase 4 Cutback.
To remove vegetation and carry out earthworks and contouring of land for mining and mining operations (including rehabilitation) in a high-risk erosion area (being the pit walls).	Yes. New land use consent (discretionary activity).[23]	As above.
To place rock and CAF into land in the Martha Underground Mine as backfill and to allow groundwater to discharge from the flooded workings in the Martha Underground Mine into the surrounding ground post closure.	Yes. New discharge permit (discretionary activity).[24]	OGNZL holds existing resource consents authorising this activity in its existing underground mines located to the east of the Martha Underground Mine. But those consents do not apply to the Martha Underground Mine. As such, a new resource consent is being sought by OGNZL.
Activities Associated with the Pit Lake		
To take surface water from the Ohinemuri River and use it for the flooding of the Martha Pit and associated underground workings.	Yes. New water permit (discretionary activity).[25]	RC124862 authorises the take of 15,000 m^3/day to accelerate flooding of the pit and underground workings on completion of the Golden Link Project. A new resource consent is sought so water from the Ohinemuri River can be used for this purpose on the completion of Project Martha. The application seeks the ability to take water at a greater rate

22 Rule 5.2.5.3.
23 Rule 5.1.4.15.
24 Rules 3.5.4.5 and 5.2.5.3
25 Rule 3.3.4.23(4).

Activity	Resource Consent Required and Activity Status	Comment
		and as a greater percentage of river flow.
To discharge surface water from the Ohinemuri River and treated water from the WTP to the Martha Pit to create the pit lake, and to flood underground workings.	Yes. New discharge permit (discretionary activity).[26]	RC124863 authorises the discharge of water to ground to flood underground workings on completion of the Golden Link Project and to accelerate filling of the pit lake. A new resource consent is sought so the water can be used for this purpose on the completion of Project Martha.
To discharge limestone to the pit lake.	Yes. New discharge permit (discretionary activity.[27]	As is discussed in Section 5 of this AEE, the discharge of limestone to the pit lake may be necessary as a mitigation measure to ensure appropriate water quality in the long term.
To discharge overflow water from the pit lake to the Mangatoetoe Stream.	Yes. New discharge permit (discretionary activity).[28]	RC971293 currently authorises the discharge of overflow water from the pit lake at a maximum rate of 2,700 l/s. Resource consent is sought to discharge overflow water at a greater maximum rate due to the larger pit lake area.
To construct an intake structure in the Ohinemuri River.	Yes. New land use consent (discretionary activity).[29]	RC124864 authorises the construction and placement of a water intake structure in the Ohinemuri River to facilitate accelerated flooding of the underground workings and filling of the pit lake upon completion of the Golden Link Project. A new resource consent is sought so this same structure can be used for this purpose on the completion of Project Martha.

[26] Rule 3.5.4.5.
[27] Rule 3.5.4.5.
[28] Rule 3.5.4.5.
[29] Rule 4.2.4.4.

Activity	Resource Consent Required and Activity Status	Comment
To construct an outlet structure in the Mangatoetoe Stream.	Yes. New land use consent (discretionary activity).[30]	RC971292 authorises the construction of the outlet structure and expires in 2046. However, it lapses in 2020. A new resource consent is sought so this same structure can be constructed and operated on the completion of Project Martha.
To divert groundwater during the construction of the outlet structure in the Mangatoetoe Stream.	Yes. New water permit (discretionary activity).[31]	RC971290 authorises this activity and expires in 2021. The new consent is sought on the same terms as RC971290 given that the construction of the outlet structure will now not occur before 2021.
To discharge groundwater during the construction of the outlet structure in the Mangatoetoe Stream.	Yes. New discharge permit (discretionary activity).[32]	RC971291 authorises this activity and expires in 2021. The new consent is sought on the same terms as RC971291 given that the construction of the outlet structure will now not occur before 2021.

4.2.2 Commencement, Lapse and Term of Consent

OGNZL is seeking to adopt a similar approach to lapse date and consent term as apply to the existing resource consents issued by the WRC for mining activities at Waihi, particularly in relation to those activities associated with the formation of the pit lake.

Table 4.3 below identifies the lapse date and term of consent sought for the resource consents required from the WRC for Project Martha.

Table 4.3: Commencement, Lapse and Term of Consent Sought

Consent	Commencement Date	Lapse Date	Consent Term
To take groundwater to dewater the Martha Pit and Martha Underground Mine (including any surface water which has	5 years from the date of grant (unless the consent holder nominates an	5 years from the date of commencement if not exercised prior.	25 years from the date of commencement.

[30] Rule 4.2.4.4.

[31] Rule 3.5.4.4.

[32] Rule 3.5.4.5.

Consent	Commencement Date	Lapse Date	Consent Term
seeped into the ground from the Martha Pit).	earlier commencement date).		
To discharge material to land within, and adjacent to, the Martha Pit, including stockpiled material and material for the creation of the noise bund.	5 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	20 years from the date of commencement.
To remove vegetation and carry out earthworks and contouring of land for mining and mining operations (including rehabilitation) in a high-risk erosion area (being the pit walls).	5 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	20 years from the date of commencement.
To place rock and CAF into land in the Martha Underground Mine as backfill and to allow groundwater to discharge from the flooded workings in the Martha Underground Mine into the surrounding ground post closure.	5 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	25 years from the date of commencement.
To take surface water from the Ohinemuri River and use it for the flooding of the Martha Pit and associated underground workings.	15 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	20 years from the date of commencement.
To discharge surface water from the Ohinemuri River and treated water from the WTP to the Martha Pit to create the pit lake, and to flood underground workings.	15 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	20 years from the date of commencement.

Consent	Commencement Date	Lapse Date	Consent Term
To discharge limestone to the pit lake.	25 years from the date of grant (unless the consent holder nominates an earlier commencement date).	15 years from the date of commencement if not exercised prior.	35 years from the date of commencement.
To discharge overflow water from the pit lake to the Mangatoetoe Stream.	25 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	35 years from the date of commencement.
To construct an intake structure in the Ohinemuri River.	15 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	10 years from the date of commencement.
To construct an outlet structure in the Mangatoetoe Stream.	20 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	10 years from the date of commencement.
To divert groundwater during the construction of the outlet structure in the Mangatoetoe Stream.	20 years from the date of grant (unless the consent holder nominates an earlier commencement date).	5 years from the date of commencement if not exercised prior.	10 years from the date of commencement.
To discharge groundwater during the construction of the	20 years from the date of grant (unless the consent holder	5 years from the date of commencement	10 years from the date of commencement.

Consent	Commencement Date	Lapse Date	Consent Term
outlet structure in the Mangatoetoe Stream.	nominates an earlier commencement date).	if not exercised prior.	

4.2.3 Existing Resource Consents

As outlined in Section 2 of this AEE, the common ancillary facilities will be used to transport, process, store and dispose of material extracted from the Martha Pit and Martha Underground Mine. This includes:

- The use of the conveyor and surface mine roads;
- The use of the Processing Plant and associated stockpile areas;
- The use of the WTP and existing mine water management system; and
- The use of the Central, Northern and Eastern Stockpiles and TSFs.

No new resource consents are being sought for these activities from the WRC as part of Project Martha. OGNZL holds a number of existing resource consents for these activities (refer to Table 4.4 below), which will continue to be relied on to authorise those activities during Project Martha.

It is noted that some of these existing resource consents will expire prior to the completion of Project Martha in 2031.[33] New resource consent applications for those activities will be made as, and when, they are required. However, the need to obtain these resource consents is not considered to impact on the viability and operation of Project Martha.

Table 4.4: Existing Resource Consents Being Relied on During Project Martha

Consent	Activity	Expiry Date
Ancillary Activities		
RC124859.01.02	To discharge contaminants into the air relating to all activities within the Golden Link Project Area.	16.7.2037
RC118633	To continue the diversion of an un-named ephemeral tributary of the Eastern Stream around the perimeter of the Surface Facilities Area for stormwater management purposes	16.7.2017

[33] It is noted that three of these resource consents expired on 10 July 2017. OGNZL has made applications for new replacement resource consents for these activities and is currently undertaking these activities in accordance with Section 124 of the RMA.

Consent	Activity	Expiry Date
Conveyor Activities		
W1742 / W1743	To discharge stormwater from the conveyor trench via silt ponds.	15.7.2017
Processing Plant and Water Treatment Plant		
RC971313.	To place and use structures across a watercourse for constructing a collection pond for the WTP.	13.10.2034
RC971314.	To dam a watercourse for the construction of a collection pond for the WTP.	13.10.2034
RC971315.	To discharge water from the WTP collection pond to the Ohinemuri River.	13.10.2034
RC971316	To divert natural water (farm water run-off and intercepted groundwater) to the south on the western side of the Processing Plant.	13.10.2034
RC971317	To discharge natural water (farm run-off and intercepted groundwater) diverted to the south on the western side of the Processing Plant.	13.10.2034
RC971318	To discharge treated water from the WTP into the Ohinemuri River via two discharge points.	13.10.2034
RC971319 RC971320	To place and use structures in the Ohinemuri River for the discharge of treated water from the WTP into the Ohinemuri River.	13.10.2034
RC114554	To take up to 430 m^3/day of water for elution water purposes.	10.7.2017
Rock Storage Area and Tailings Storage Facilities		
W1749	To dam unnamed water courses within the designated area for TSF2 in order to construct an impoundment structure for the containment of tailings from mining operations.	1.10.2026
W1750	To dam unnamed water courses within the designated area for TSF1 in order to construct an impoundment structure for the containment of tailings from mining operations.	1.10.2026

Consent	Activity	Expiry Date
W1751	To dam unnamed water courses in order to construct a perimeter bund and access road around the north, west and south edges of the designated areas for TSF1 and 2 for waste and tailings disposal.	1.10.2026
W1761	To discharge natural water containing waste onto the land and into the ground beneath TSF2 and the holding pond adjacent to Baxter Road, near Black Hill Reserve.	1.10.2026
RC971304.01.10	To discharge tailings into TSF1A (discharge to land).	13.10.2034
RC971305.01.10	To discharge seepage from TSF1A into the ground.	13.10.2034
RC971296	To divert natural water (farm run-off and intercepted groundwater) around Oxidised Stockpile N2.	13.10.2034
RC971297	To discharge natural water (farm run-off and intercepted groundwater) diverted around Oxidised Stockpile N2 at the northern end of TSF2 into an unnamed tributary (Unnamed Stream) of the Ohinemuri River.	13.10.2034
RC971298	To divert an unnamed tributary (Unnamed Stream 2) of the Ohinemuri River at the northern end of Storage 2.	13.10.2034
RC971299	To divert part of an unnamed tributary (Unnamed Stream 1) of the Ohinemuri River by way of culverting at the northern end of TSF2.	13.10.2034
RC971300	To divert natural water (farm run-off and intercepted groundwater) around the surplus soil stockpiles via the southern diversion drain.	13.10.2034
RC971301	To discharge natural water (farm run-off and intercepted groundwater) diverted around the surplus soil stockpiles via the southern diversion drain into an unnamed tributary.	13.10.2034
RC971302	To divert an unnamed tributary (Unnamed Stream 3) of the Rauhorehore Stream around the eastern end of the stockpile (eastern diversion drain).	13.10.2034
RC971306	To divert groundwater from within the footprint of TSF1A into subsoil drains.	13.10.2034
RC971307	To divert natural water (farm run-off and intercepted groundwater) around the eastern side of TSF1A via the southern diversion drain.	13.10.2034

Consent	Activity	Expiry Date
RC971308	To discharge natural water (farm run-off and intercepted groundwater) diverted around the eastern side of TSF1A into the southern diversion drain and thence to an unnamed tributary (Unnamed Stream 3) of the Ruahorehore Stream.	13.10.2034
RC971309	To divert natural water (farm run-off and intercepted groundwater) around Storage 2 (and part of Storage 1A) via the northern diversion drain.	13.10.2034
RC971310	To discharge diverted natural water (farm run-off and intercepted groundwater) around TSF2 (and part of TSF1A) via the northern diversion drain into an unnamed tributary (Unnamed Stream 2) of the Ohinemuri River.	13.10.2034
RC971311	To discharge settled stormwater from the silt ponds into the Ohinemuri River and the Ruahorehore Stream.	13.10.2034
RC971312	To discharge water from the collection ponds within Area D into the Ohinemuri River and to the Ruahorehore Stream.	13.10.2034
RC971323	To discharge water from the tailing ponds following rehabilitation into an unnamed tributary (Unnamed Stream 2) of the Ohinemuri River.	23.10.2042

5. ASSESSMENT OF EFFECTS

5.1 INTRODUCTION

This section addresses the actual and potential effects of Project Martha.

A number of technical assessments have been prepared to inform this assessment. These technical assessments are referenced, as relevant, in Sections 5.2 – 5.20 below which address the following matters:

Section 5.2 Permitted baseline;

Section 5.3 Positive / economic effects.

Section 5.4 Effects on landscape, visual amenity and natural character;

Section 5.5 Geotechnical matters;

Section 5.6 Geochemistry and acid rock drainage;

Section 5.7 Groundwater and settlement effects;

Section 5.8 The pit lake;

Section 5.9 Noise effects;

Section 5.10 Blasting and vibration effects;

Section 5.11 Air quality effects;

Section 5.12 Roading and traffic effects;

Section 5.13 Effects on lighting;

Section 5.14 Effects on heritage;

Section 5.15 Effects on terrestrial ecology;

Section 5.16 Hazardous substances;

Section 5.17 Effects on public access and recreation;

Section 5.18 Effects on cultural values;

Section 5.19 Social impacts; and

Section 5.20 Conclusion.

A number of measures to avoid, remedy or mitigate the actual and potential effects of Project Martha are identified in this section of the AEE, as are additional actions proposed by OGNZL which are intended to further minimise or compensate for any residual potential adverse effects of the project. These measures are also summarised in Section 6 of this AEE and it is expected that they will form the basis of resource consent conditions for

Project Martha. This is reflected in the proffered resource consent conditions which are included in **Appendix O** to this AEE.

5.2 PERMITTED BASELINE

Section 104(2) of the RMA affords a consent authority discretion to disregard a potential adverse effect of allowing Project Martha if the relevant plan permits an activity with that effect:

> ***Section 104***
>
> ...
>
> *(2) When forming an opinion [on any actual and potential effects on the environment of allowing the activity], a consent authority may disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect.*

This discretion is particularly relevant to the Phase 4 Cutback because, as previously noted, the Hauraki District Plan permits surface mining and mining operations activities in the Martha Mineral Zone when undertaken in accordance with the relevant terms and conditions of ML 32 2388 and LUC 97/98/105 – after these approvals expire. As already noted in this AEE, ML 32 2388 has expired and LUC 97/98/105 will expire in 2019.

Applying Section 104(2) of the RMA to the Phase 4 Cutback means it is only those effects that would be in excess of or different in character to those that are permitted by ML 32 2388 and LUC 97/98-105 that are relevant when considering the activities associated with the Phase 4 Cutback.

While application of the permitted baseline is discretionary, it is considered this is an example of where it is clearly appropriate to do so because:

- The relevant permitted activity rules apply to the subject site;
- The activities permitted by the Hauraki District Plan are directly comparable to the surface mining and mining operations proposed as part of Project Martha, with the only difference being Project Martha will include earthworks in a small area outside the areas covered by permitted activity rules in the plan; and
- The effects on the environment that are permitted by Rules 5.7.4.1(P1) and 5.7.4.1(P2) of the Hauraki District Plan are clearly articulated in ML 32 2388 and LUC 97/98-105, as are the comparative effects of Project Martha in this AEE, and it is relatively straightforward to compare them.

5.3 ECONOMIC EFFECTS

An assessment of the economic effects of Project Martha is provided in Sense Partners (2018), which is provided in **Appendix B** to this AEE.

To understand the economic impact of Project Martha, Sense Partners (2018) reviewed the current economic impact of the Waihi mines, and compared that with a scenario assuming the mine were to close in 2020. Sense Partners (2018) considered both national and local perspectives – as economic benefits are felt differently at different levels of geographic

aggregation. For example, exports are a more meaningful measure at the national level, than a local level.

As set out in Table 5.1, Sense Partners (2018) expect the economic gains from Project Martha will average approximately $73M a year. For context, the Waihi mine added $98M to the national GDP in 2017. This amounts to 15% of the economy of the Hauraki District, and 32% of the economy of Waihi.

Table 5.1: Waihi Mines Contribution to the New Zealand Economy – With and Without Project Martha

Parameter	Average per year, 2020 – 2031, $2017	NPV, 2020 – 2031, @6% discount rate
Project Martha Expenditure:		
Operating Spending	$77M	$640M
Capital Spending	$24M	$238M
Total Spending	**$101M**	**$878M**
Economic Value Added:		
Scenario with Project Martha from 2020	$73M	$629
Scenario with mine closure from 2020	$1M	$9M
Difference due to Martha	**$72M**	**$620M**

Compared to the mine closing, Sense Partners (2018) also consider Project Martha will:

- Increase New Zealand exports by around $112M a year at current prices. The increase will be a net addition to national exports as Project Martha will not significantly displace other means of production;
- Create annual employment opportunities averaging around 300 FTEs over the next decade. The average wage is nearly $120,000 per employee and closure of the mine would equate to around $36M of wages per annum. foregone;
- Inject around $326M (in 2017 prices) of cumulative new investment into New Zealand that would otherwise not occur; and
- Boost economic activity and productivity of the region, noting that mining sector productivity is very high compared to other industries.

In this context, Project Martha would inject significant additional economic activity into the local economy that would not otherwise occur. It would result in both national and local

economic gains, including gains in economic activity and employment, increases in exports, attraction of new investment in the economy, and provision of a strong core for the regional economy.

Sense Partners (2018) consider the economic benefits provided by Project Martha would be difficult to replace with an alternative industry, and note, for example, that regional tourism would need to increase five-fold to replace the mine's economic contribution. They also consider the additional life of the mine to be a benefit to local business, in terms of providing them time to plan for the mine's closure, noting that currently, half of all businesses expect the mine to continue and have not actively planned for life after the mine.

The expected benefit to local business is also reflected in Telfer Young (2018) (**Appendix X** to this AEE), where it is noted that the market value of commercial property in Waihi is expected to be higher with than without Project Martha.

5.4 LANDSCAPE, VISUAL AMENITY AND NATURAL CHARACTER

An assessment of the potential effects of Project Martha on the landscape, visual amenity and natural character values of the surrounding environment is provided in Boffa Miskell (2018a), which is provided in **Appendix D** to this AEE.

The activities associated with Project Martha with the potential to impact on landscape, visual amenity or natural character values are:

- The Phase 4 Cutback;
- Temporary steam clouds from the new fresh air portal and return air shaft to be located within the Martha Pit as part of the Martha Underground Mine;
- The construction of an intake structure on the Ohinemuri River and outfall structure on the Mangatoetoe Stream;
- The abstraction of water from the Ohinemuri River to fill the Martha Pit; and
- The discharge of overflow water from the pit lake to the Mangatoetoe Stream.

Except for the aforementioned steam clouds, the Martha Underground Mine will have no discernible impact on Waihi's wider landscape or associated views.

An overview of the Boffa Miskell (2018a) assessment is provided below.

5.4.1 Visual Amenity

For most people living in Waihi, the Martha Pit will remain visually concealed. This occurs because of both intervening landform and vegetation, and the in-pit nature of the works associated with the Phase 4 Cutback - which helps ensure there will be no discernible increase in visual effects.

At the commencement of the Phase 4 Cutback, moderate-low adverse visual effects may occur from adjoining residential properties to the northwest of the Martha Pit as earthworks, road re-alignment and the noise bund are established. However, once operational, the potential for adverse visual effects will reduce as planting is re-established

along this area of the pit rim and activities within the open pit will remain visually well contained below the pit rim.

Boffa Miskell (2018a) has recommended landscape mitigation to ensure the resultant changes along the pit rim retain an appropriate residential scale. This is addressed further in Section 5.4.3 below, and includes planting associated with noise bunds and realignment of the pit rim walkway to provide amenity improvements. To provide further context, Figure 5.1 shows how the view of the Martha Pit from Cambridge Road is expected to change with the implementation of the recommended landscape mitigation. Note that this view shows both the visual aspects of the noise mitigation along the north wall of the pit, and also the realignment and improvement in the formation of the road in this location.

Figure 5.1: Visual simulation of the View from Cambridge Road

From areas to the south-east of Waihi, including the town centre, there will be no noticeable changes beyond views afforded along the pit rim walkway. Where visible from the pit rim walkway, views towards the Phase 4 Cutback will entail reconfiguring the existing slip visible along the north wall with batters and haul roads normally expected within an operational mine (see Figure 5.2). Such views are considered benign in the context of the wider mine which is visible, and it is noted that people make their way to this viewpoint for the express purpose of viewing the pit and its surrounds.

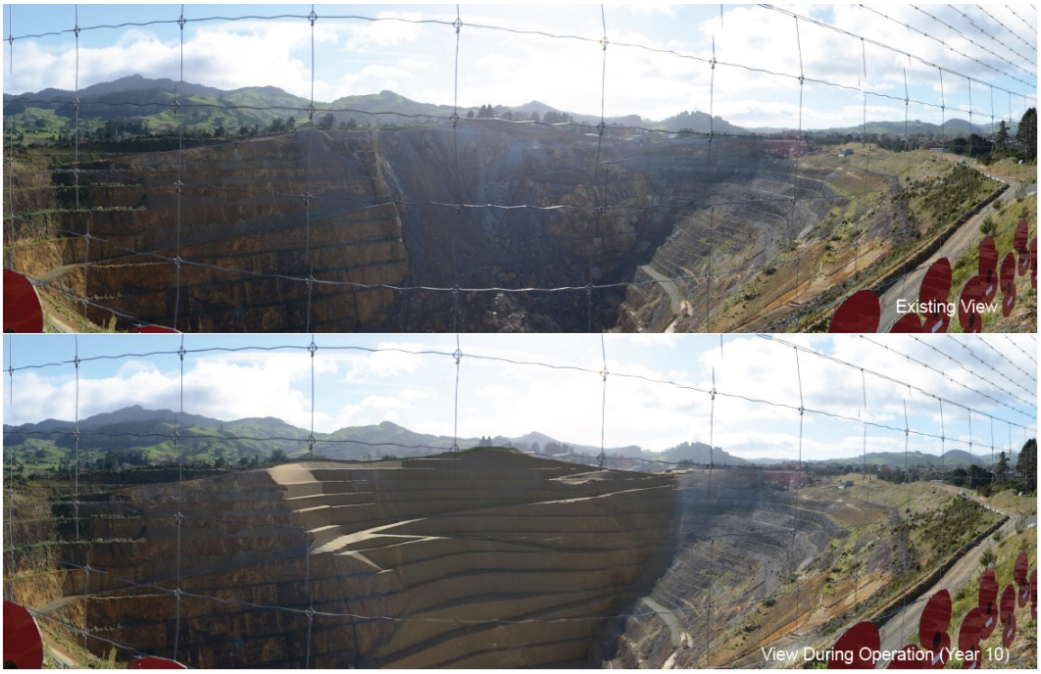

Figure 5.2: Visual simulation of the change in view of Martha Pit from the Pump House

To the northeast and further southeast of Waihi any views of the Martha Pit and the Phase 4 Cutback will remain long distance, and predominantly obscured beyond intervening vegetation seen against a backdrop of the Coromandel Range. As such, there will be low and very low neutral effects. Similarly, any views of water vapour generated from underground mining activity will be limited.

5.4.2 Effects on Landscape

Within the foothills of the Coromandel Range, the extension of Martha Pit will represent a very limited expansion of an existing substantially modified landform. Whilst the configuration of part of the pit rim will be further modified, the resultant mining activities will remain visually well contained and limit the potential for any more significant landscape character effects. From within Waihi, the Martha Pit will remain largely contained and reflects an enduring aspect of Waihi's townscape.

Given this established context within which additional landscape change will occur, Boffa Miskell (2018a) identify Project Martha as only having very low adverse effects on landscape character. They also note that Project Martha will not occupy any identified outstanding natural features and landscapes or amenity landscapes at the regional or district level.

At completion, the extension of Martha Pit will continue to be supported by an appropriate closure plan. Boffa Miskell (2018a) consider this will further improve the context and character associated with mining activity and generate long term beneficial outcomes.

5.4.2.1 Effects on Natural Character

As part of the rehabilitation of the Martha Pit, an intake structure will be constructed on the Ohinemuri River to assist with filling of the pit lake. Similarly, once the lake is filled, a tunnel

will be constructed beneath Moresby Avenue to enable water to overflow from an outlet structure into the Mangatoetoe Stream.

In both instances, disturbance to the existing river bed will be minimised with built structures remaining low key and able to be embedded within surrounding areas of vegetation. Accordingly, Boffa Miskell (2018a) consider these activities will have no more than low adverse natural character effects in the context of the existing levels of natural character apparent in these areas.

5.4.3 Mitigation

During operation, Boffa Miskell (2018a) consider the local effects associated with the Phase 4 Cutback can be readily addressed through implementation and maintenance of an appropriate landscape mitigation plan. Boffa Miskell (2018a) suggest this should be in general accordance with the landscape mitigation plan shown in Figure 5.3 below, and that it should detail the following:

- The relocation of the pit rim walkway between Miners Place and Cambridge Road;
- How all disturbed areas outside the operational mine will be planted to soften changes in landform and complement adjoining areas of vegetation;
- How the water intake and outlet structures will minimise disturbance along stream beds and how any necessary built elements will be softened with planting which appears integrated within adjoining riparian areas;
- The species, size and number of proposed plants within identified planting areas; and
- The maintenance requirements for this first three years following establishment to promote plant survival.

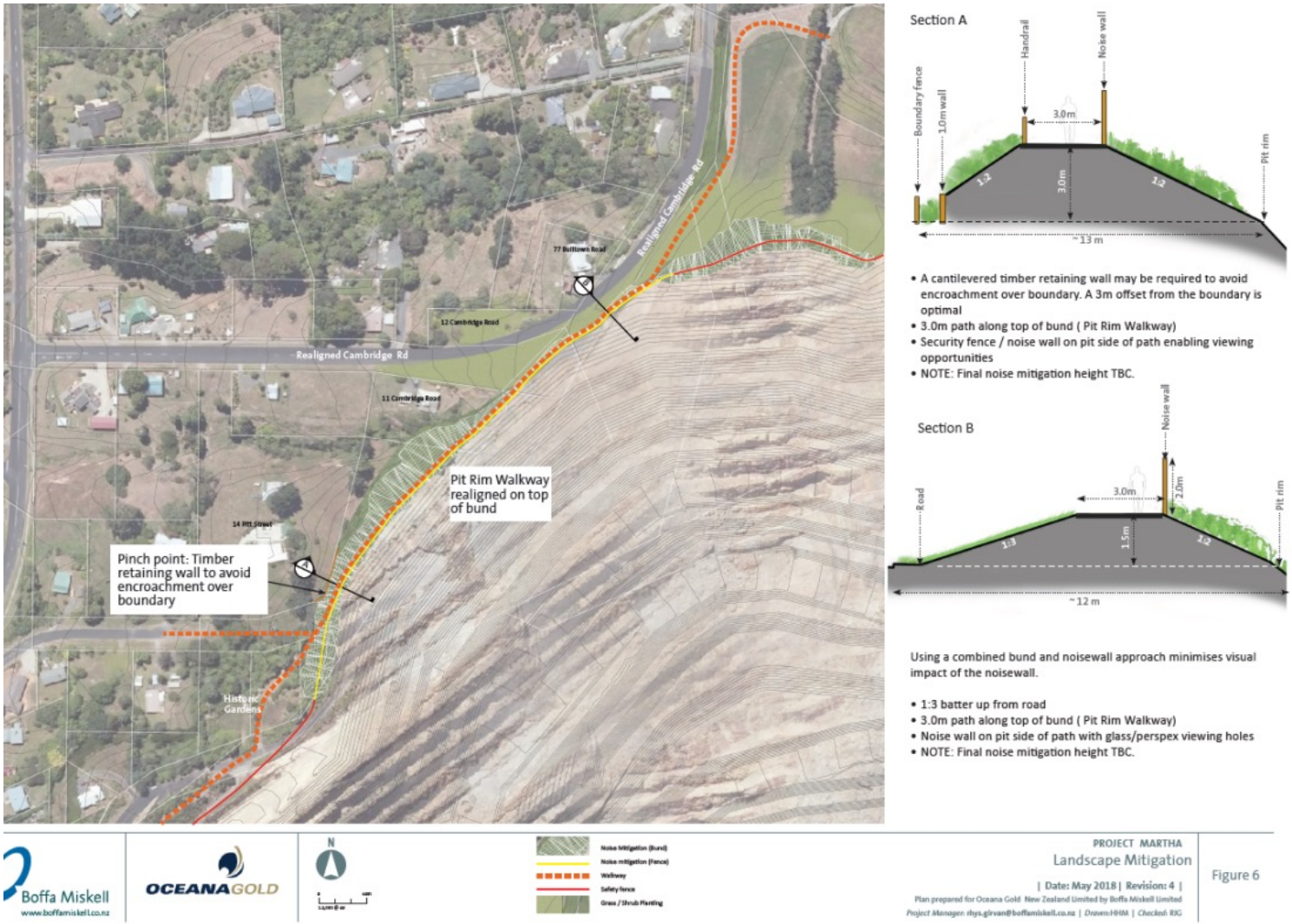

Figure 5.3: Landscape Concept Plan for the Phase 4 Cutback

5.4.4 Summary

The main surface activities associated with Project Martha relate to the Phase 4 Cutback. While this will generate some adverse physical and landscape effects, including traversing the margins of an adjoining area of vegetation and constructing new intake and outlet structures along adjoining watercourses, such effects will be low and occur in a relatively short period of time (the structures have also previously been consented in these locations as part of previous mining projects). Landscape mitigation will ensure the resultant changes along the pit rim are softened by planting and retain an appropriate residential scale and integrate development within existing levels of modification.

At the commencement of the project, moderate-low adverse visual effects may occur from adjoining residential properties as earthworks, road realignment and associated noise mitigation is established. However, once operational, the potential for adverse visual effects will reduce as planting is re-established and mining within the Martha Pit remains visually well contained below the pit rim. Beyond the pit rim, views of activities associated with Project Martha will remain limited generating ephemeral low or very low adverse effects.

Realigning the pit rim walkway to a more appropriate 'pit edge' location will also generate beneficial effects during operation and does not conflict with broader opportunities identified within the Rehabilitation and Closure Plan.

5.5 GEOTECHNICAL MATTERS AND STRUCTURAL INTEGRITY

An assessment of geotechnical matters associated with the Project Martha is provided in

- AMC (2018) – Geotechnical Assessment: Martha Underground Mine. A copy of this assessment is provided in **Appendix M** of this AEE;
- PSM (2018a) – Pit Stability Assessment from the Martha Underground Mine. A copy of this assessment is provided in **Appendix P** of this AEE; and
- PSM (2018b) – Pit Stability Assessment for the Phase 4 Cutback. A copy of this assessment is provided in **Appendix Q** of this AEE.

An overview of those assessments is provided in the sections below.

5.5.1 Martha Pit

The Martha Pit is an existing structure that has already been constructed and its performance has been monitored for over two decades. It does not show large scale pit wall instability movements, and consequently, in engineering terms there has been a mine scale validation of the ultimate material properties used for the design of the pit walls.

All failures to date in the Martha Pit have occurred in sections of the rock mass substantially affected by the historic underground workings, including the north wall failure which occurred in April 2016.

Two previous projects – the South Stability Cutback and the East Layback – were designed and implemented to achieve more stable conditions by moving the new pit walls

and important historic infrastructure as far as practical outside the rock mass zone affected by the historical underground workings. This process has generally been successful.

The Phase 4 Cutback is a continuation of this stabilisation process and will move the pit wall further outside the rock mass zone affected by the historical underground workings. The operational need to incorporate additional haul roads and wide benches has necessitated the Phase 4 Cutback being much flatter than the north wall of the East Layback.

PSM (2018b) has undertaken detailed modelling and analysis of the walls of the Phase 4 Cutback and concludes they will be stable and safe with high factors of safety. Extensive drilling investigations and monitoring completed over the past three years also identifies no geotechnical conditions in the area of the Phase 4 Cutback which could contribute to a north wall type failure in the future.

In addition, PSM (2018b) identifies that the Martha Underground Mine has a number of major benefits for the geotechnical stability of the Martha Pit due to it filling and stabilising unfilled historic stopes located below the pit. However, PSM (2018b) notes that the lower slope of the Phase 4 Cutback may still be potentially affected by underground stopes and disturbed rock mass and recommends that consideration be given to backfilling the stopes in the upper 30 m below the Martha Pit during mining. In accordance with the recommendation of PSM (2018b) the need for this remediation (if any), and its extent, will be determined based on the performance and exposures during mining.

With respect to ongoing monitoring and management of pit works over the life of Project Martha, a continuation of current practice is proposed whereby a Pit Slope Management Plan and associated peer review panel is utilised. This is addressed further in Section 5.5.3.1 below.

5.5.2 Martha Underground Mine

Ground conditions influence underground mining methods, the means of access, and the design of stopes and access tunnels. Factors that influence ground conditions are discussed in detail in AMC (2018) and include the qualities of the various rock types, proximity to old underground workings, and proximity to the Martha Pit. Understanding those conditions is critical so that safe and efficient mining methods and well-informed approaches to developing the mine are used.

Extensive underground mining at Waihi has generated a large body of knowledge and good understanding of the geotechnical conditions that are likely to be encountered by the Martha Underground Mine. Extensive geotechnical investigations have also been undertaken to inform the Martha Underground Mine.

Consistent with mining industry practice at this stage of development, this existing information has been used to develop a preliminary, conceptual approach to the proposed underground mining. This preliminary conceptual approach will be refined and adapted as mining proceeds, and as a more detailed understanding of ground conditions is developed. This will be obtained through further studies and analysis, some of which can only take place when the new areas to be mined are opened up, and as a result of further, progressive investigations, including probe drilling and development.

AMC (2018) notes that is there is currently sufficient information and understanding, to know with confidence, that the ore will be able to be safely accessed and mined, and that the Martha Underground Mine can be established in a manner that will not compromise underground or surface stability. This is on the basis that:

- The proposed designs are appropriate and conservative;
- The planned development, drilling and interpretation will provide additional information at a detailed level and hence provide sufficient opportunity to adjust the design in response to encountered ground conditions; and
- The proposed mining methods involve stope excavations that have a high level of assurance of stability.

AMC (2018) recommends the process for managing the geotechnical hazards associated with the Martha Underground Mine, including the collection of additional information and adaptation of mining methods be formalised. A Void Management Plan is used for this purpose at the Slevin Underground Mine, and it will be reviewed and updated for application at the Martha Underground Mine. This is addressed further in Section 5.5.3.2 of this AEE.

5.5.3 Mitigation and Monitoring

Detailed management plans will be the main mitigation measure for Project Martha in respect of pit stability and geotechnical matters, including:

- Continued use of a Pit Slope Management Plan to manage geotechnical matters in the Martha Pit; and
- Continued use of a Void Management Plan to manage geotechnical matters and stability in respect of the Martha Underground Mine.

Each is addressed below.

In accordance with current practice, it is also proposed to use of an independent peer review panel comprising technical experts in key fields for the peer review of the Pit Slope Management Pan and to advise on pit slope stability at key junctures during Project Martha.

5.5.3.1 Pit Slope Management Plan

OGNZL maintains and implements a Pit Slope Management Plan, which is required to address the following issues:

- Procedures for the investigation, monitoring, excavation and backfilling of old mine stopes where required;
- Specifications for construction and placement of stope pillars where required;
- A monitoring regime focused on monitoring groundwater and pit slope behaviour;
- Procedures for the investigation and remedial measures of old coal seams, and monitoring of the same;

- Location and installation of horizontal drains for the purposes of addressing groundwater and surface water effects;
- Monitoring of Pumphouse stability; and
- Instability contingency response.

The existing Pit Slope Management Plan will be adapted and updated to reflect the requirements of Project Martha.

5.5.3.2 Void Management Plan

AMC (2018) recommends a system be implemented for formally managing the geotechnical hazards associated with the Martha Underground Mine, and that it define how the various management and mitigation measures will be implemented. In this regard, geotechnical hazard management should consist of the following elements:

- A ground control management plan which includes, but is not limited to, the following:
  - Description of the mine design basis;
  - Description of specific geotechnical hazards and how they are managed;
  - Monitoring and data collection requirements;
  - Processes for integrating new data into the mine design;
  - Processes for reporting geotechnical hazards/incidents;
  - Responsibilities of key mine personnel, such as the mine manager, shift supervisors, geologists, geotechnical engineers, surveyors and workforce in general; and
  - A geotechnical hazard register, which includes all current geotechnical hazards including development and stope hazards, the status of each hazard, and the strategy for risk management of each hazard.
- A trigger-action-response plan for managing geotechnical hazards which identifies the required actions and responsible personnel for geotechnical hazards of varying degrees of potential risk.

AMC (2018) notes that the existing Void Management Plan addresses many of these elements in the context of the Slevin Underground Mine and the Martha Drill Drive Project, and recommends it be adapted and updated to reflect the proposed activities at the Martha Underground Mine.

5.5.4 Summary

The extensive underground mining at Waihi, and years of mining and monitoring of the Martha Pit, has generated a large body of knowledge and good understanding of the geotechnical conditions that are likely to be encountered by Project Martha.

Detailed analysis of Martha Pit wall stability has been undertaken in respect of the Phase 4 Cutback. This included an analysis of the north wall failure and other failure events in the Martha Pit. That analysis concludes that the Phase 4 Cutback will leave the pit walls in a

stable and safe condition with high factors of safety, and that no geotechnical conditions of the type which contributed to the north wall failure are likely to be present in the area of the Phase 4 Cutback.

Based on the current understanding of ground conditions, the planned ongoing investigation of conditions as suitable drilling positions become available, and the proposed cautious approach to development using close ground control techniques where required, AMC (2018) is also confident that the proposed Martha Underground Mine can be developed and brought into production without any compromise to underground or surface stability.

In accordance with current practice a robust Pit Slope Management Manual and Void Management Plan will be maintained and implemented to manage geotechnical and stability related matters over the life of Project Martha.

5.6 GEOCHEMISTRY AND ACID ROCK DRAINAGE

An assessment of geochemistry matters relating to Project Martha is provided in AECOM (2018a). A copy of this assessment is provided in **Appendix S** to this AEE, and an overview of that assessment is provided below.

5.6.1 Mineralogy

The relevant ore bodies are considered of similar mineralogy to the existing mines in Waihi, owing to the shared geological setting and mode of mineralisation. As such, AECOM (2018a) have conservatively adopted the existing overburden and ore as representative of material likely to be encountered in Project Martha as the open pit dataset exhibits the highest average and maximum sulphur and maximum potential acidity values, as well as exhibiting a low acid neutralisation capacity.

5.6.2 Management of Acid Rock Drainage

Acid Rock Drainage ("***ARD***") is a broad term incorporating the natural process of sulphide oxidation (which occurs when rocks containing sulphide minerals such as pyrite are exposed to air and water) leading to the formation of acid (i.e. low pH) drainage and metalliferous drainage (which may have a neutral drainage (i.e. pH 6 - 7)).

The potential for environmental effects from ARD due to a depressed pH and / or elevated trace metal concentrations can be managed by overburden characterisation, overburden removal and handling practices, and adopted overburden storage and / or treatment strategies.

The overall overburden management strategy recommended by AECOM (2018a) for Project Martha is based on continued use of the existing storage facilities and the current over burden management practices which have been effective at preventing ARD at Waihi. The specific mitigation to be used will depend on the overburden's source and ultimate end state.

The recommended overburden management strategy for material stored for use in underground backfill (including material stored in Martha Pit, and stockpile areas at the

Favona Portal and Polishing Pond) is to monitor the material and to add limestone if necessary prior to placement.

Based on current data, the requirement to add limestone to underground backfill is expected to be minimal. The potential for ongoing oxidation of overburden placed as underground backfill is also considered negligible. As there is potential for some leaching of sulphate and trace metals into the groundwater, AECOM (2018a) has assessed this potential impact on groundwater quality within the vicinity of the workings by undertaking geochemical equilibrium modelling. However, the results suggest that mixing of acidified porewater with groundwater results in a reasonably unchanged groundwater quality. This is primarily driven by concentrations of sulphate currently being at (or near) the limits of saturation and a high degree of attenuation of trace elements due to sorption to ion-hydroxide minerals.

The overburden management strategy recommended by AECOM (2018a) for material being placed at the Central, Eastern and Northern stockpiles is based on current practices used at that location and will be in accordance with the conditions of the existing RMA authorisations for those activities.

5.6.3 Conclusion

Overburden and ore material excavated from Project Martha will comprise of similar geology to that mined from the Martha Pit over the previous three decades. AECOM (2018a) recommend a continuation of the existing successful management approach for that material during Project Martha, and with those measures in place impacts on groundwater will be minimal and in line with the effects of existing activities.

5.7 GROUNDWATER AND SETTLEMENT

Assessments of the actual and potential effects of Project Martha on the groundwater and surface settlement are provided in GWS (2018) and EGL (2018), copies of which are provided in **Appendix H** and **Appendix R** of this AEE respectively. An overview of the assessments in GWS (2018) and EGL (2018) is provided in the sections below which address:

- Effects of dewatering;
- Post closure effects associated with flooding of Martha Pit and underground workings; and
- Effects on groundwater quality.

5.7.1 Effects of Dewatering

5.7.1.1 Effects on Groundwater Levels and Pressures

The Martha Underground Mine extends to 500 m RL. Therefore, the water level will need to be lowered 200 m below the currently consented level (700 m RL). Dewatering will be achieved by installing stage pumping chambers within the mine that pump into the Correnso Underground Mine dewatering system located at 780 m RL. Water will continue

to be piped to the WTP for treatment and discharge in accordance with existing consent requirements.

Based on observations of existing and past groundwater levels, and detailed modelling undertaken for this project, GWS (2018) expect drawdown associated with Project Martha dewatering to be confined to the andesite rock. Groundwater levels in the overlying younger volcanic deposits are generally not expected to be affected, nor are any changes to the shallow groundwater system expected.

This is consistent with long-term groundwater monitoring data collected at Waihi, which shows shallow groundwater pressures have remained relatively stable during dewatering activities undertaken to this point.

5.7.1.2 Effects on Ground Settlement

EGL (2018) assessed ground settlement effects for seven defined zones (see Figure 5.4 below). The seven zones are intended to represent different areas in which settlements would be expected to be similar.

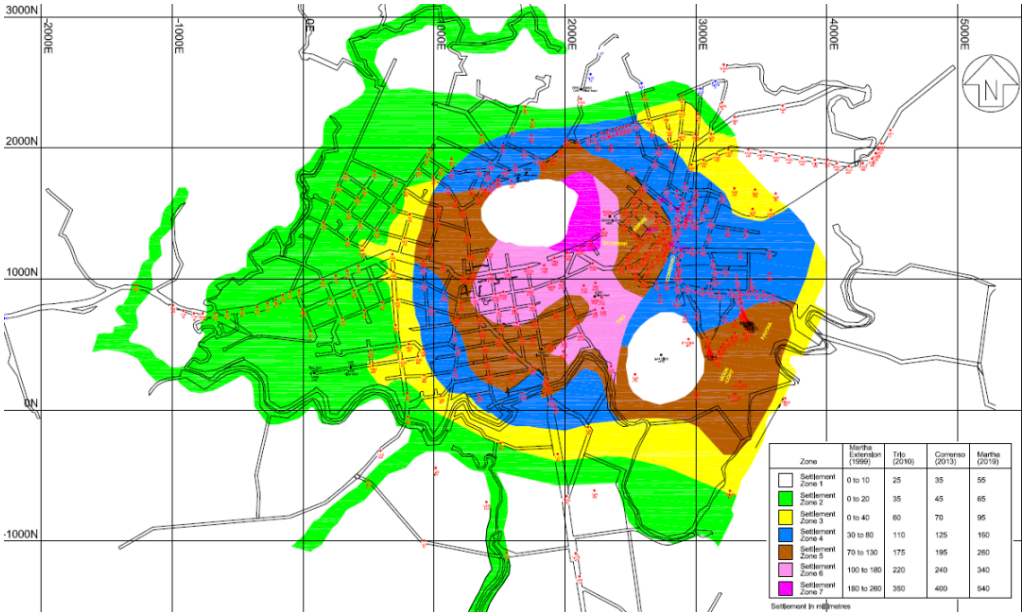

Figure 5.4: Ground Settlement Assessment Zones

The predicted settlement response for each of the seven zones to the proposed dewatering is shown in Table 5.2. Estimated settlements are small, within the scope of settlement that has been observed during past dewatering activities at Waihi and are expected to occur within the andesite rock mass, rather than the shallower younger volcanics (which are closer to the ground surface). Differential settlements (tilt), which are normally the concern for buildings and buried services are expected to be very small and the damage potential is considered to be negligible.

Table 5.2: Estimate Settlement Response to Dewatering for Project Martha[1]

Zone	Typical Settlement Response to Dewatering from 975 m RL to 770 m RL (Dec 1999 to Nov 2017) (mm)	Estimated Settlement Response to Dewatering of Trio and Correnso Projects from 770 m RL to 700 m RL (mm)	Estimated Settlement Response to Dewatering of Project Martha from 700 m RL to 500 m RL (mm)
1	24	12	24
2	24	12	24
3	27	13	26
4	38	19	38
5	68	33	66
6	96	47	94
7	143	70	140

5.7.1.3 Effects on Surface Waters

Monitoring data collected over the period since dewatering began at Waihi has indicated it has no adverse effects on shallow groundwater or base flow to surface waters. This is largely a consequence of the perched nature of the surface water bodies in the shallow groundwater system. The proposed dewatering is not expected to have any additional effect on surface waters.

5.7.1.4 Effects on the Groundwater Resource

GWS (2018) shows that there is sufficient groundwater available in the Waihi Basin deep aquifer system to allow the proposed average daily take of 15,000 m^3 for dewatering to take place. It is also notable that the proposed groundwater take is for dewatering purposes, and that this water will be discharged in to surface waters locally. This water is, therefore, not lost from the catchment, rather it is put back into the Waihi Basin system at a higher level, thereby having a net neutral effect on the catchment water balance.

5.7.1.5 Effects on Other Groundwater Users

Figure 5.5 shows the locations of private water bores as per the WRC database.

[1] The dewatering from RL770 to RL700 began in November 2017 and therefore some of the estimated settlement has already occurred.

Figure 5.5: Private Bores in Waihi

Most bores are indicated to tap younger volcanic materials at shallow depths. However, bores close to the southern side of Union Hill are indicated to have intercepted andesite.

A number of these bores have been monitored during past mining, and no long-term trends are apparent in that monitoring data that could be attributed to dewatering. Monitoring data has also shown that water level responses to mine dewatering in materials overlying the Andesite and in the upper layers of Andesite have been stable since approximately the mid 1990's.

As such, GWS (2018) do not expect the dewatering for Project Martha to have an adverse effect on private bores.

5.7.1.6 Effects on Plant Growth

Plant growth relies on soil moisture retention in the near surface soils, which is a function of rainfall infiltration. Due to the lack of effects on shallow groundwater GWS (2018) consider the proposed dewatering will not alter shallow soil moisture contents and, therefore, will not adversely affect plant growth.

5.7.2 Post Closure Effects

5.7.2.1 Effects on Groundwater Levels and Pressures

Dewatering of the Project Martha will eventually cease and the area will then be allowed to re-flood. The re-flooding will be accelerated using water taken from the Ohinemuri River. Re-flooding will result in the groundwater levels in the andesite and the younger volcanic materials rising back close to their original pre-mining levels.

While the Waihi ore bodies were hydrologically separated from Favona ore bodies prior to mining, the construction of the low-level Trio Incline (800 m RL to 823 m RL) and high-level

Trio Decline (1015 m RL to 1060 m RL) from the Favona Underground Mine to the Trio Underground Mine will result in a combined water level rise within both systems once groundwater level recovers above 823 m RL.

On mine closure, and once refilling of the underground workings and Martha Pit has occurred, the pit lake will discharge to the Mangatoetoe Stream from an outfall structure at 1104 m RL at the western end of lake.

5.7.2.2 Rebound Effects on Landform

Rebound will occur as rising groundwater re-saturates the ground, resulting in a reduction in effective stress within the ground.

Rebound of the ground to its original level because of rising groundwater levels is not expected to occur. Rather, EGL (2018) estimates that rebound will be approximately 50% of the settlement that has occurred during modern mining. EGL (2018) do not expect any property damage to occur as a result. This is consistent with observations following the cessation of historical underground mining in 1952.

5.7.2.3 Seepage from Flooded Workings

There are, potentially, two pathways in the system that are at elevations lower than the proposed pit lake level that may allow some discharge to the surrounding environment. These are:

- Natural pathways through the younger volcanic from the exposure of these rocks in the eastern pit wall to outcrop in eastern stream; and
- Existing historical workings at Union Hill.

The Favona Portal and air shafts are above 1104 m RL elevation and will not become discharge locations.

GWS (2018) identify the most likely potential discharge site for natural seepage through the pit wall to be the bed of the Eastern Stream, where jointed and fractured ignimbrite rock outcrops. GWS (2018) calculate the potential seepage to be approximately 0.5 to 1 l/s. While there may be other potential seepage locations, GWS (2018) assess these discharges as being much smaller than calculated for Eastern Stream.

Given the level of the pit lake and the elevation of known workings at Union Hill, GWS (2018) do not expect any significant seepage to occur from former mine workings. However, as mapping of the historic workings in this area may be incomplete GWS are not certain of this. They recommend site inspections of potential leakage zones be undertaken and suitable mitigation be implemented, if required, including potentially plugging of any historic adits that emerge as seepage pathways.

5.7.3 Groundwater Quality

Project Martha has the potential to impact on groundwater quality via stockpiling and storage of overburden, and the underground disposal of fill and CAF material. As outlined in Section 5.6 of this AEE, AECOM (2018) recommend a continuation of the existing successful management approach for that material during Project Martha, and with those

measures in place impacts on groundwater will be minimal and in line with the effects of existing activities.

5.7.4 Mitigation Measures

5.7.4.1 Dewatering and Settlement Monitoring Plan

The existing mining consents require a Dewatering and Settlement Monitoring Plan be prepared and actioned. The existing Dewatering and Settlement Monitoring Plan combines the monitoring plans for Martha Pit and the Favona, Trio, Correnso and Slevin Underground Mines into one document given their similar monitoring networks and frequencies.

In relation to dewatering and settlement, the plan describes the monitoring regime designed to assess the effects of:

- Mine dewatering on the regional groundwater system; and
- Mine dewatering on settlement.

The objectives of the existing Dewatering and Settlement Monitoring Plan are:

- To outline the monitoring systems in place for dewatering, groundwater and settlement and the requirements for these systems in accordance with the relevant consent conditions;
- To identify trigger limits that will indicate when contingency mitigation and/or monitoring may be necessary; and
- To identify what contingency mitigation and/or monitoring would be undertaken in the event that the trigger levels are exceeded, in order to ensure that adverse environmental effects are avoided, remedied or mitigated.

Both GWS (2018) and EGL (2018) consider the current approach to monitoring and managing effects to be appropriate for managing any dewatering effects that may develop during Project Martha. However, they recommend some specific changes to Dewatering and Settlement Monitoring Plan to incorporate the effects of Project Martha. They are discussed below insofar as they relate to the dewatering and rewatering phases.

Dewatering

When revising and updating the Dewatering and Settlement Monitoring Plan, GWS (2018) recommend regard be had to the following:

- Separately measuring and recording daily the water volume pumped from the Martha Underground Mine and other underground mine areas;
- Sampling the discharge waters from the separate underground mine areas, with a view to using this, together with the volume pumped, to calibrate the pit lake chemistry models; and
- Measuring and recording water levels weekly. This can be done in piezometers drilled underground to intercept veins/historical workings or in the absence of underground

piezometers, in sumps at the lowest elevation in the mine. Both methods have been used during current mining.

While GWS (2018) consider the existing network of piezometers to be adequate to enable observation of dewatering effects related to Project Martha, there are some areas where the monitoring network is less dense, including the area to the south and southwest of the Martha Pit which is shown to be in Settlement Zones 4, 5 and 6 (see Figure 5.4 above). Given the proposal is to extend dewatering by a further 200 m depth, GWS (2018) consider additional multi-level piezometers in these areas would assist with monitoring ongoing settlement and re-bound post-closure. They also recommend the exact locations of these piezometers be included in an updated Dewatering and Settlement Monitoring Plan.

With respect to ground settlement, EGL (2018) recommend that the trigger levels included in the Dewatering and Settlement Monitoring Plan (which indicate when contingency mitigation and/or monitoring may be necessary) should be updated. The revised trigger levels are set out in EGL (2018) and will be incorporated into the updated Dewatering and Settlement Monitoring Plan.

Post Closure / Rewatering

GWS (2018) consider it important that the rate of water level recovery during closure be monitored to validate and update the rewatering model, and to guide the volume of river water diversion needed. With respect to this monitoring, they note:

- The piezometers to monitor recovery should be in place before water level recovery begins; and
- The existing monitoring network should be reviewed to check that it will be suitable to monitor water level recovery in the shallower rock units post-closure.

Once the pit lake water level reaches final elevation, GWS (2018) also recommended that site inspections of potential leakage zones be undertaken. Should any leakage outside the constructed discharge location be identified, GWS (2018) recommend an effects assessment be undertaken and, if necessary, that mitigation measures be designed and implemented. As outlined above they suggest these mitigation measures could include plugging of adits.

5.7.4.2 Other Mitigation Measures

EGL (2018) also recommend that similar conditions as for the Correnso Underground mine be adopted to ensure that the groundwater regime affecting ground settlements is not adversely impacted by Project Martha. These include:

- No stoping above defined levels in the andesite. This is to preserve the integrity of the top of the andesite that acts to maintain the perched groundwater level in the younger volcanics;
- Grouting of all future surface-drilled holes to a depth below the top of the andesite;
- Avoiding intercepting existing drill holes with mine workings; and

- Grouting drill holes from underground where underground development intercepts holes that are making water or geological defects with significant and sustained water flows.

5.7.4.3 Water Management Plan

OGNZL maintains and implements a Water Management Plan at its Waihi mines. Of particular relevance to Project Martha activities it describes the mine de-watering and management of dewatered groundwater.

The Water Management Plan would be reviewed and updated to incorporate the Project Martha activities, including the additional dewatering involved.

5.7.5 Other Measures

While no property damage is anticipated by EGL (2018), OGNZL is committed to a 'we break, we pay' policy to addressing any property damage caused by Project Martha, including ground settlement. Key aspects of this commitment include:

- Sending an appropriately qualified staff member to investigate within five business days of the receipt of a complaint of property damage or as soon thereafter as practicable unless the matter is considered urgent;
- The use of an appropriately qualified independent third party to investigate and report on property damage where there is disagreement on the cause; and
- A commitment to remedy any damage caused by Project Martha at OGNZL's cost as soon as practicable to the reasonable satisfaction of the property owner.

5.7.6 Summary

Dewatering of Project Martha will require a reduction in groundwater from the consented level of 700 m RL to 500 m RL. Drawdown is expected to be confined to the andesite rock, and groundwater levels in the overlying younger volcanic deposits are generally not expected to be affected. Nor are changes to the shallow groundwater system expected.

Estimated ground settlements due to dewatering are small and are also expected to be confined to the andesite rock mass. Differential settlements (tilt), which are normally the concern for buildings as well as buried services, are expected to be very small and so damage potential is considered negligible. In addition, no additional adverse effects on aquifer sustainability, other groundwater users or surface water are expected.

When dewatering is no longer required, groundwater levels are expected to return to their original levels. This will result in rebound of approximately 50% of the settlement that has occurred during modern mining, and no damage is expected to occur as a result.

The general approach to managing dewatering and ground settlement associated with existing dewatering activities, which is based around a detailed Dewatering and Settlement Monitoring Plan, will continue to be the appropriate means of managing effects during Project Martha. However, the technical reports recommend some specific changes to the Dewatering and Settlement Monitoring Plan to accommodate Project Martha effects.

5.8 THE PIT LAKE

The establishment and operation of the pit lake has the ability to impact on surface water. A number of technical reports contain analysis relevant to the effects of establishing and operating the pit lake, including:

- GHD (2018a) which describes the water balance for the pit lake and includes a conceptual filling model. A copy of this assessment is provided in **Appendix I** to this AEE;
- HydroNumerics (2018a) which contains a physical assessment of, and water stratification model for, the pit lake. A copy of this assessment is provided in **Appendix T** to this AEE;
- AECOM (2018b) which assesses the geochemistry of the pit lake and how it can be managed to achieve the desired management outcomes. A copy of this assessment is provided in **Appendix U** to this AEE;
- HydroNumerics (2018b) which assesses likely pit lake nutrient levels, the impacts of water quality on primary production in the pit lake, and its likely trophic condition. A copy of this assessment is provided in **Appendix V** to this AEE; and
- Boffa Miskell (2018b) which assesses the ecological effects of abstracting water from the Ohinemuri River to fill the pit lake, the expected aquatic ecology values of the pit lake, and the effect of the overflow discharge on water quality and aquatic ecology in the Mangatoetoe Stream. A copy of this assessment is provided in **Appendix J** to this AEE.

A summary of the key conclusions of these reports is provided below.

5.8.1 Effects of Taking Water from the Ohinemuri River

As outlined in Section 3.3.11.2 of this AEE, OGNZL propose to abstract up to 20% of the flow of the Ohinemuri River when the flow rate is above 2 × Mean Annual Low Flow ("***MALF***"). This is a change to the currently consented water abstraction regime from the Ohinemuri River and will enable the pit lake to be filled in approximately 9.5 years.

Long term analysis of the pit lake water balance shows a positive mean discharge from the lake of 31 l/s, with potential for the discharge to cease during long dry periods.

Boffa Miskell (2018b) has undertaken a detailed assessment of the effects of the proposed take of water from the Ohinemuri River to fill the Pit Lake and it is summarised below.

5.8.1.1 Effects on Flood or Disturbance Events

To assess the effect of the proposed take on the high flow disturbance regime, Boffa Miskell (2018b) has conducted a detailed analysis of FRE_3. The statistic FRE_3 is derived by calculating three times the median flow, counting the number of occasions that this was exceeded in the flow record and dividing this number by the number of years of record.

FRE_3 is an indicator of flood or disturbance events that cause ecological disturbance, such that a low FRE_3 value (e.g., FRE_3 <5) indicates a stable flow regime (e.g., a spring or lake-fed river).

For the Ohinemuri River, based on 94 years of flow, and considering 3 x median flows alone Boffa Miskell (2018b) notes:

- At the abstraction point the 3 x median flow = 327,435 m^3/d (3,790 l/s);
- Without abstraction this flow is exceeded 16.86% of the time;
- Under current consent conditions (peak extraction of 175 l/s and 10% take above 2 x MALF) the portion of days exceeding 3 x median flow reduces to 15.77%; and
- With peak extraction increased to 270 l/s (15,000 m^3/d pump) and 20% take (above 2 x MALF) the portion of days exceeding 3 x median reduces to 15.17%.

For the FRE_3 statistic Boffa Miskell (2018b) calculates:

- Without abstraction FRE_3 = 14.16 (exceedances/year);
- Under current consent conditions (peak abstraction of 175 L/s and 10% take above 2xMALF), FRE_3 = 14.02; and
- With peak abstraction increased to 270 L/s (15,000 m^3/d pump) and 20% take above 2xMALF), FRE_3 = 13.59.

The FRE_3 statistic for all scenarios places the disturbance regime of the Ohinemuri River in a 'low relief country' flow regime. The difference between the no-extraction (FRE_3=14.16) to the proposed peak extraction (FRE_3 = 13.59) shows a small but insignificant reduction in the FRE_3 value.

As such, Boffa Miskell (2018b) conclude the Ohinemuri River will retain its overall hydrological disturbance regime with the proposed abstraction regime in place. That is because the FRE_3 statistic varies little when the proposed abstraction regime is applied and retains the 'low relief country' flow regime.

In addition, there are unlikely to be any significant changes to the biological character and values of the river as a result of the proposed new abstraction regime because the frequency of high water flow events (as defined by 3 x median flows) will not vary to any great extent. The freshes and floods that typically move bed materials, flush algae from the substrate and re-suspend sediment will still occur within the natural regime for the river. The life-supporting capacity of the river will be safeguarded and there will be no adverse effects resulting from the proposed modifications to the abstraction and the life-supporting capacity of the river will be safeguarded and there will be no adverse effects resulting from the proposed modifications to the abstraction.

5.8.1.2 Effects on Water Quality

The effects of elevated levels of nutrients generally manifest themselves during low flows, particularly during summer, when a combination of low flows, higher temperatures, greater light penetration, nutrient enrichment and suitable habitat can result in excessive growth of algae and macrophytes, which can influence the aquatic biota communities.

At elevated flood flows, the flows play a role in removing the algae and macrophytes (through movements of the bed substrates, uplifting roots and abrasion from movement of bed materials), but also introduce increased volume of sediments and nutrients as direct

run-off from the land. For the most part, under such high flow conditions, the additional nutrients and sediments will be washed downstream and settle once flows recede. Although some nutrient enriched water and sediment load will be removed as part of the abstraction, the proportion is not likely to change the downstream water quality or ecological characteristics of the river.

As there is minimal change to the high flow disturbance regime of the river, Boffa Miskell (2018b) consider there will be no effect on the water quality of the river resulting from the proposed change in abstraction, and that the regular and low flow regimes of the river will remain the same.

5.8.1.3 Effects on Ecological Values and Biodiversity, Including the Benefits of Natural Flow Variability

Natural flow variability is important in influencing and maintaining the ecological condition of the waterway through the prevailing interaction of velocity, depth and substrate. The structure and function of most aquatic communities is highly influenced by the stability of the predictability of hydrological patterns and instream hydraulic conditions.

The effects of modifications to the hydrological regime can heavily influence the biota such that dramatic changes in the type and composition of the biotic communities occur. This is most obviously seen from river impoundments which truncate flows and lead to extended periods of low flow. As outlined above for water quality, it is during low flows, particularly during summer, when a combination of low flows, higher temperatures, greater light penetration, nutrient enrichment and suitable habitat can result in excessive growth of algae and macrophytes, which can modify the benthic aquatic biota and fish communities.

During elevated flows, the disturbance to river beds and stream channels, results in bed movements that dislodge algae and benthic biota, which is transported away from the site. This creates opportunity for invasion and recolonization when the flood waters recede.

As outlined above, the flow variability of the Ohinemuri River resulting from the proposed increase in abstraction will remain largely unchanged. As a result, Boffa Miskell (2018b) consider there will be no meaningful impact on the natural flow variability and thus no impact on the ecological values and biodiversity of the Ohinemuri River.

5.8.1.4 Effects on Wetlands and Significant Indigenous Areas

Natural flow variability is also important for sustaining wetlands associated with rivers and streams. The periodic inundation of wetland areas from elevated flows, and the connection that groundwater has with the natural river levels, are essential components of wetland function.

Wetland areas occur along the margins of the Ohinemuri River, both within the vicinity of the Waihi mines, and downstream. These wetland areas vary in size and for the most part are highly modified. However, these wetlands can have significant values for terrestrial fauna (e.g., marsh birds) and aquatic biota (e.g., feeding grounds for eels). Wetlands have important functions in retaining water and the slow release of water for baseflow of waterways, trapping and retaining sediments (and other contaminants), denitrification, and retaining carbon.

As outlined above, the flow regime of the Ohinemuri River resulting from the proposed increase in abstraction remains largely unchanged and retains its natural flow characteristics. As a result, Boffa Miskell (2018b) consider there will be no meaningful impact on the natural flow variability and thus no impact on wetland values and function.

5.8.1.5 Effects on Fish Passage and Migration

Several of the 41 species of native fish of New Zealand are 'diadromous' or 'sea run', which means that they migrate between freshwater and saltwater during some part of their life cycle. Species such as longfin and shortfin eels, require migration to the sea for breeding - while others such as banded kokopu require passage for young larva to the sea for growth purposes. The migration (and spawning) periods are often associated with specific environmental conditions such as rainfall, river flows, temperature, lunar cycles and tidal regimes. Elevated river flows have been considered as a cue for migration upstream.

The Ohinemuri River is also an important rainbow trout fishery, with spawning grounds in the river tributaries.

Boffa Miskell (2018b) conclude the proposed increase in maximum water take from the Ohinemuri River is unlikely to result in any changes to fish migration regimes (or fish passage). As the abstraction is restricted and provides for flows to continue downstream of a similar magnitude, the alteration to flow is not significant.

5.8.2 Pit Lake Stratification and Mixing

HydroNumerics (2018a) contains a detailed assessment of the potential for stratification and mixing of the pit lake over decadal timeframes. Key features identified by HydroNumerics (2018a) include:

- Strong seasonal stratification in the warmer months, followed by winter mixing that erodes the temperature stratification;
- In years with cooler and/or stormier autumn and winter months the mixing may extend more than 150 m below the surface. In years with warmer autumn and winter months, the extent of winter mixing is less than 100 m, and typically less than 75 m;
- Mixing to the full depth of the pit lake is not predicted because of development of a density gradient between the overlying pit lake water and water of high Total Dissolved Solids that develops at depth; and
- Deep mixing below 1,000 m RL is predicted to occur in approximately 50% of years in the first 18 years after filling, and extended periods of no deep mixing are expected.

5.8.3 Pit Lake Water Quality

5.8.3.1 Geochemistry

AECOM (2018b) has modelled the potential water quality of the pit lake. AECOM considered six base scenarios which investigate the 'worst case' results (from a physical model) in relation to the geochemical makeup of the upper layer of water in the Pit Lake (known as the "***epilimnion***"). Several scenarios have been considered to determine what if

any mitigation is required to meet the recreational use and lake discharge water quality standards.

The management measures proposed by AECOM (2018b) are:

- The addition of alkalinity to Ohinemuri River water, as the pit lake is being filled; and
- An active treatment system as required to add alkalinity once the lake is filled.

A conceptual design for the active treatment system is provided in Figure 5.6.

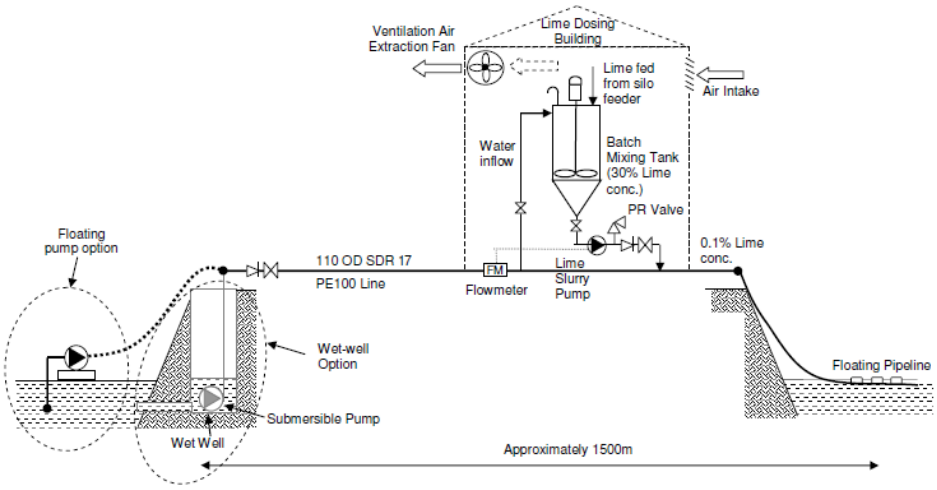

Figure 5.6: Conceptual Outline of Pit Lake Limestone Dosing System

5.8.3.2 Impact on Primary Production

HydroNumerics (2018b) have modelled the water quality of the pit lake and its likely effects on primary production. They expect external inputs of nitrogen to be the dominant source into the lake during filling which will come from the river water (as nitrate and nitrite). Phosphorus levels from the river water are expected to be a low contributor to the lake water quality, and other sources such as pit wall run-off are expected to dominate.

HydroNumerics (2018b) go on to conclude that it is reasonable to assume that in comparison to the external sources, the internal contributions of nitrogen and phosphorus will be small in the lake filling and immediate post-filling stages. However, the relative TN:TP ratios in the epilimnion means that, given other conditions in the lake being suitable (see below), there is a 'potential' for growth of blue-green algae (Cyanobacteria) at times.

5.8.4 Trophic Status

HydroNumerics (2018b) provide discussion on the trophic status of lakes and the possible trophic condition of the revised pit lake. The most relevant factors influencing trophic status are light penetration, lake water disturbance and movement, lake stratification and nutrient availability.

Project Martha does not alter the most relevant factors that may influence the trophic status and likely water quality outcomes for the existing consented pit lake, and it seems unlikely that the project will alter nutrient availability or cycling.

HydroNumerics (2018b) conclude that without any management of the pit lake in respect of the trophic status:

- There are likely to be seasonal patterns of primary production;
- Light limitation in the epilimnion is not likely given the clarity of the river waters and settling of suspended solids, except in the event of significant algal production;
- The river waters, and pit-wall run-off, are significant external inputs into the available nutrient pool in the epilimnion during filling;
- It is most likely that the extent of primary production during filling will be limited by the availability of phosphorus in the source waters;
- During filling the nutrient availability is sufficient to suggest productivity consistent with a eutrophic lake;
- After filling, the internal cycling of nutrients is likely to dominate nutrient availability and both physical and biogeochemical mechanisms will control nutrient availability in the epilimnion;
- After filling, loss of nitrogen from the lake due to denitrification in the anoxic waters may lead to a shift towards nitrogen limitation;
- The depleted oxygen concentrations in the hypolimnion and associated sediment release of nutrients into the hypolimnion followed by the subsequent entrainment of these nutrient enriched waters into the epilimnion during mixing will be an important sequence of processes that control nutrient availability in the photic zone after filling;
- Nutrient bioavailability in the epilimnion is therefore likely to be irregular, given the changes in the depth of winter mixing and the associated changes in the extent of entrainment of nutrient-enriched waters. This may in turn lead to years that are significantly more productive than others when mixing occurs after an extended period of hypolimnetic nutrient enrichment; and
- Given the complexity of the nutrient cycles and the unknown rates of oxygen depletion and nutrient release from the sediments, it is difficult to predict post-filling primary production, other than to say it is likely to initially reduce from the filling period.

HydroNumerics (2018b) notes it is not possible to definitively predict the complexities of the limnology that will result in the pit lake given the unique nature of all lakes. As such, the successful management of the pit lake will be addressed by ongoing monitoring during, and after, filling and via the use of adaptive management measures in response to the information collected. This will provide the information necessary to develop a more detailed understanding of the long-term nutrient availability and trends in primary production in the context of the broader ecology.

HydroNumerics (2018) also identify there are a number of management options that are likely to lead to improved outcomes for the pit lake, including provision for a littoral zone that allows for the establishment of macrophyte beds and riparian vegetation will have benefits for lake water quality.

5.8.5 Lake Ecology

Boffa Miskell (2018b) expect that the pit lake would be suitable for freshwater aquatic organisms, especially in the uppermost (20 m) layer. They also expect that with nutrient inputs coming mainly from the river during filling, inputs of nutrients will decrease significantly following completion of the filling, and following an initial period of possible high productivity, the quality and trophic status of the lake is likely to improve in the longer term.

Boffa Miskell (2018b) expect:

- Typical open water invertebrates (damselflies, dragonflies, water boatmen, non-biting midges and other fly larvae) to colonise the lake;
- That zooplankton and algae will occur in the water column; and
- That waterbirds will likely to visit the lake, and some may remain resident where conditions along the margins permit, but note the lake is not expected to have extensive habitat for birds.

Boffa Miskell (2018b) also recommend provision be included for a littoral zone as part of the mine closure plan. This will create conditions allowing emergent and submerged aquatic plants (aquatic macrophytes) to establish and will provide additional habitat for aquatic organisms and birds and contribute to the biotic productivity of the lake. Boffa Miskell (2018b) notes the ability to provide riparian planting (especially for shading) is limited but will assist in the provision of organic (allochthonous) material to the lake.

While it is proposed the lake outlet structure provide for native fish passage, Boffa Miskell (2018b) expect only the hardiest climbers will reach the lake, such as eels and possibly banded kokopu. In turn, unless specifically provided for, there is unlikely to be extensive habitat or refugia for fish or benthic aquatic organisms in the pit lake.

5.8.6 Effects of the Pit Lake Discharge on Water Quality and Ecology in Mangatoetoe Stream

Consent 971293, which authorises the pit lake discharge to Mangatoetoe Stream, contains a suite of water quality standards that must be met by the discharge. Boffa Miskell (2018b) has reviewed those standards and considers them to be protective of aquatic life, and therefore appropriate as water quality standards to be met in the Mangatoetoe Stream without change.

AECOM (2018b) have modelled the lake water quality under a series of scenarios and have proposed a management regime which will ensure the discharge water quality meets those resource consent limits.

Boffa Miskell (2018b) also recommend that as much as practicable the outlet design allow for:

- The flow of water;
- The passage of migratory native fish with ability to climb obstacles; and
- Improvement to the dissolved oxygen content of discharged water.

5.8.7 Effects of the Pit Lake Discharge on Flood Hazard in Mangatoetoe Stream

GHD (2018) developed a catchment specific hydraulic model to assess the potential impact of the Pit Lake discharge on flood levels in Mangatoetoe Stream, the results of which are shown in Figure 5.7.

Based on the modelling results, GHD (2018) conclude that the proposed pit lake outlet flows would have no discernible effect on the flood levels in the Mangatoetoe Stream.

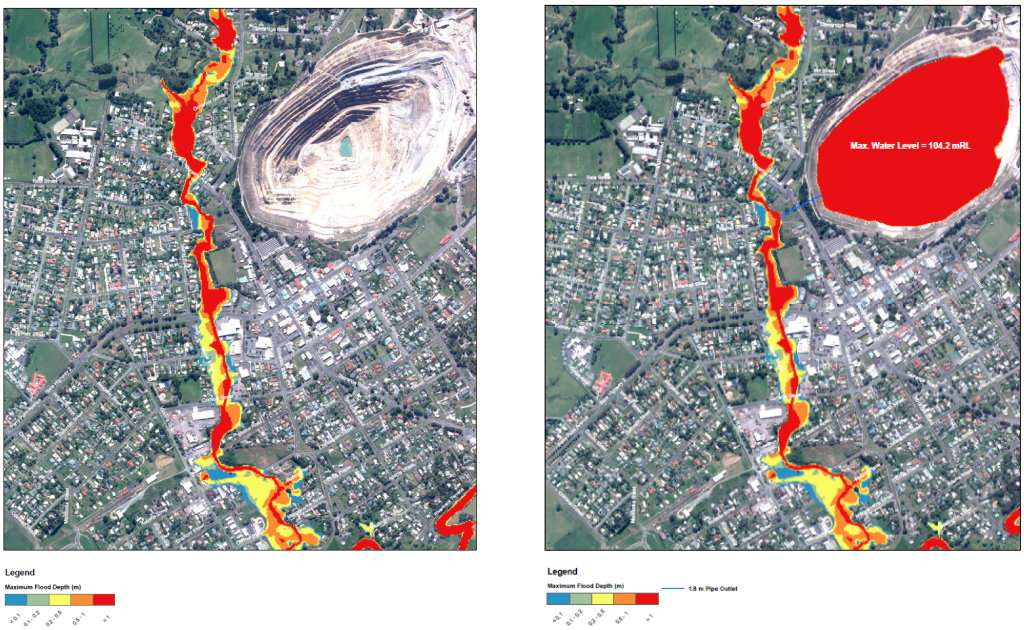

Figure 5.7 Mangatoetoe Stream flood inundation map without (left) and with (right) the Pit Lake Discharge (100-year ARI event).

5.8.8 Conclusion

The effect of the proposed take of water from the Ohinemuri River during elevated flows has minimal effect on the high flow disturbance regime (as measured by FRE_3), the life-supporting capacity of the river will be safeguarded and there will be no adverse effects resulting from the proposed modifications to the abstraction.

Once full, long term analysis of the Pit Lake water balance shows a positive mean discharge from the Pit Lake of 31 l/s, with potential for the discharge to cease during long dry periods.

Lake water quality would be affected by the pit wall lithology, mineralogy and the subsequent runoff into the lake, which will reduce the pH in particular without mitigation. To address this a suite of mitigation measures are proposed, including: minimisation of acid rock drainage contribution to the lake; modifying lake inflows during filling to increase alkalinity in the final lake at discharge; and increasing the alkalinity within the lake post filling to buffer against on-going acidity contribution.

Typical open water biota can be expected to colonise the lake, but the lake is not expected to have extensive littoral or benthic habitat. Provision for a littoral zone as part of the mine closure plan, that creates conditions for aquatic plants will be beneficial for water quality and habitat for aquatic organisms.

Modelling of the likely pit lake water quality has indicated that external inputs of nitrogen will be the dominant source into the lake during filling and will come from the river water. Phosphorus levels from the river water are expected to be a low contributor to the lake water quality, and other sources such as pit wall run-off are expected to dominate. However, the balance of nitrogen and phosphorus in the epilimnion in summer means that, given other conditions in the lake being suitable, there is a potential for growth of blue-green algae.

Over time, however, if the lake moves to a lesser trophic status, and the potential of high nutrient availability is decreased, the frequency of potential algal bloom events is likely to decrease. Monitoring and management measures will be implemented to assess the actual conditions of the pit lake so as to limit the potential for algal blooms.

For the Mangatoetoe Stream, the upper catchment retains better water quality and habitat, while the lower reaches below the proposed lake discharge point has degraded water quality and habitat. The discharge quality of water from the filled lake will ensure that the existing consented water quality standards for the Mangatoetoe Stream are met. These standards are protective of aquatic life and therefore remain appropriate as water quality standards to be met in the Mangatoetoe Stream.

In addition, that the proposed pit lake outlet flows would have no discernible effect on the flood levels in the Mangatoetoe Stream

5.9 NOISE

Project Martha will generate construction noise effects (e.g. those associated with the construction of the noise bund and the re-alignment of Bulltown / Cambridge Roads) and operational noise effects associated with mining and mining operations.

An assessment of the actual and potential noise effects of these activities is provided in Hegley (2018). A copy of this assessment is provided in **Appendix F** of this AEE, and an overview is provided in the sections below.

5.9.1 Noise Effects

Hegley (2018) predicts the noise effects of Project Martha using the Brüel & Kjær Predictor Program, which is an environmental noise calculation software package that uses a digital terrain model and considers the noise sources at their various locations on the ground.

Calculations are undertaken in accordance with the requirements of ISO9613-1/2 Acoustics – Attenuation of Sound during Propagation Outdoors.

The analysis has been based on the maximum equipment operating at the most exposed locations to residents and is inherently conservative.

5.9.1.1 Noise Bund Construction

The highest noise levels would be experienced during the construction of the noise bund, when there is no screening to the neighbours. Hegley (2018) has modelled construction noise levels at 1 m from the façade of the closet dwellings not owned by OGNZL (see Table 5.3 and Figure 5.8). As shown in Table 5.3, construction noise will comply with the construction noise standard of 70 dB L_{Aeq} in *NZS6803:1999 Acoustics – Construction Noise* (“***NZS6803:1999***”) at all residential locations. It is noted that the predicted levels are for the worst-case construction scenarios and for most of the time the noise levels will be noticeably lower than given in Table 5.3. Construction noise will only be at the higher levels predicted for 2 – 3 weeks (weather dependent) and will be restricted to the core construction hours of 0730 - 1800 Monday to Saturday.

Table 5.3: Predicted Construction Noise During Noise Bund Construction (dB L_{Aeq})

Site	Location of Construction Works		
	Eastern End of Bund	Centre of Bund	Western End of Bund
1	51	55	51
2	53	56	51
3	56	54	51
4	59	53	49
5	60	49	50
6	67	51	52
7	66	56	55
8	50	55	55
9	49	55	55
10	50	52	70
11	45	45	58
12	43	44	52
13	43	44	52

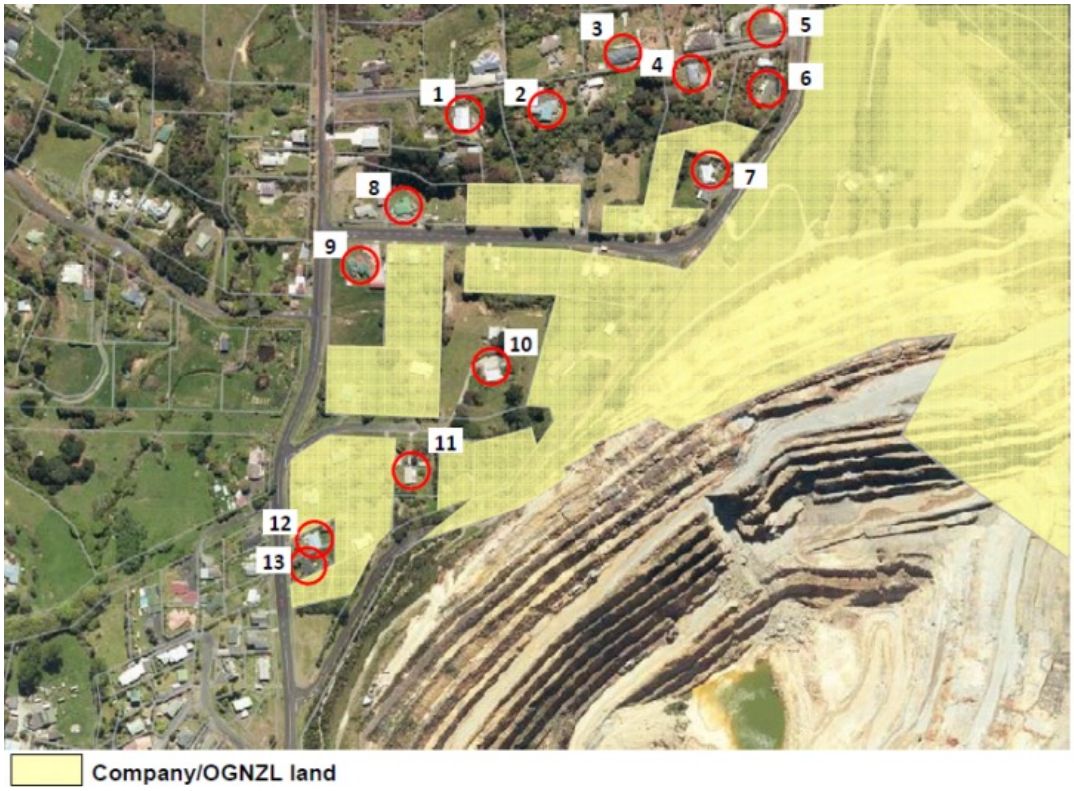

Figure 5.8: Closest Dwellings not owned by OGNZL

5.9.1.2 Bulltown / Cambridge Roads Re-Alignment

The noise effects of the road realignment will be from the construction of the new section of the road and the traffic noise once the road has been re-aligned. When taking into account the duration of this work, Hegley (2018) considers the construction noise will be typical of any minor road construction, will meet *NZS6803:1999*, and will be at a level considered reasonable for construction work.[2]

Once the road realignment is operational, Hegley (2018) does not expect any dwelling to experience a perceptible change in the traffic noise received and considers any traffic noise effects from the realignment to be less than minor.

5.9.1.3 Operational Mining

Table 5.4 shows predicted noise levels at the most exposed residential boundaries of neighbouring dwellings identified in Figure 5.8 for the most exposed aspect of the Phase 4 Cutback. These are the highest predicted noise levels associated with the Phase 4 Cutback works. As the project proceeds the equipment will be further away from the receiver positions, and lower into the pit, and after six months Hegley (2018) expects noise

[2] Although Hegley (2018) does note that due to its close proximity to the work it may be necessary to construct a solid 1.8m high barrier between the construction works and Dwelling 7 shown in Figure 7 to ensure noise at that dwelling meets the construction noise limit.

levels experienced by neighbours to be at least 5 dB lower than those predicted in Table 5.4.

Table 5.4: Predicted Noise Levels – Mining Activities

Dwelling	Mining adjacent to the eastern end of the bund	Mining at centre of bund	Mining at western end of bund	Mining off western end of bund
1	45	44	43	43
2	47	46	43	42
3	44	45	44	42
4	46	43	46	43
5	46	47	46	44
6	48	48	46	45
7	53	53	51	47
8	46	46	45	44
9	45	45	45	45
10	46	47	47	51
11	44	45	46	52
12	44	44	44	50
13	44	44	44	50

The noise level from the Phase 4 Cutback at the most exposed locations on the north wall will be less than 50 dB L_{Aeq}, with the exception of Sites 7, 10 and 11 on Figure 5.8, where for a short period noise levels are predicted to be up to 53 dB L_{Aeq}, 51 dB L_{Aeq} and 52dB L_{Aeq} respectively. Hegley (2018) considers these temporary increases in noise levels above 50 dB L_{Aeq} will not unduly impact on the amenity experienced by the dwellings and that reasonable amenity will be maintained, noting:

- The relatively short duration of exposure – mining is transient and levels will only be above 50 dB for a short period before mining moves across the north wall;
- Any increased noise levels will be limited to daytime hours, which is a maximum of 0700 – 2100. These hours are less than the daytime hours of 0700 – 2200 adopted in the Hauraki District Plan;

- In most instances the level of noise at the boundary of any dwellings will remain close to 50 dB (i.e. 51 - 53 dB). While such increases in noise will be measurable, they are unlikely to be discernible to or noticed by residents; and
- Similar noise levels have been previously experienced in these areas as a result of mining activity in the Martha Pit.

Hegley (2018) also notes that establishing larger noise bunds so as to achieve 50 dB L_{Aeq} for these three properties would cause more substantial noise effects than the effects generated by the operational activities in the Martha Pit.

5.9.2 Proposed Noise Limits

A key focus of the noise assessment has been to establish noise limits / controls for Project Martha that are appropriately protective of the amenity of the surrounding community. This does not mean undertaking mining activities without generating any noise effects. Rather, the focus has been on ensuring that the generation of noise is managed within recognised limits relating to the ability for people to continue to reasonably enjoy their properties.

Against that background, Hegley (2018) has proposed a comprehensive suite of noise controls which reflect a proposal to develop a uniform noise control for all mining operations by modifying the location of the current noise control boundaries that apply to the Martha Pit and the SFA.

Hegley (2018) considers *NZS6803:1999 Acoustics – Construction Noise* contains appropriate noise limits for the following construction activities associated with Project Martha:

- All road realignment work at Bulltown Road/Cambridge Road;
- All work associated with the Project Martha noise bund/walls/fencing;
- House relocation and demolition;
- Construction of the lake outlet tunnel;
- Construction of the limestone addition plant for the pit lake;
- Construction associated with the pit lake filling pipeline corridor; and
- Rehabilitation work.

A specific, lower construction noise limit is also proposed for construction activities to be achieved during school hours within the boundary of Waihi Central School.

With respect to operational noise, Hegley (2018) proposes daytime noise limits of 55 dB L_{Aeq} or 50 dB L_{Aeq} depending on the location of the receiving site and whether it is practicable to achieve the lower 50 dB L_{Aeq} limit at the site.

Both the 50 dB L_{Aeq} and 55 dB L_{Aeq} limits are within the limits recommended in *NZS6802:2008* and are consistent with the recommendations for daytime noise published by the World Health Organisation. The proposed noise limit of 40 dB L_{Aeq}, which applies during all other times, is also consistent with *NZS:6802:2008* and World Health

Organisation guidance for the preservation of sleep when residents may have their windows open at night.

5.9.3 Mitigation

In accordance with past practice at the Martha Mine, Hegley (2018) recommends OGNZL prepare a Noise Management Plan to provide detail on how compliance with the noise limits included in the proposed noise conditions and summarised in Section 5.9.2 will be achieved for the duration of the consent (in relation to construction and operational noise).

5.9.4 Conclusion

The construction and operational noise effects of Project Martha have been assessed. The analysis has been based on the maximum equipment operating at the most exposed locations to residents.

The analysis shows that the noise generated during the construction of the proposed noise bund and road realignment will be managed to comply with the District Plan noise standards for construction work.

Except for three adjacent residences the operational noise levels from the Phase 4 Cutback will also comply with the Hauraki District Plan noise standards for the Residential and Low Density Residential Zones of 50 dB L_{Aeq}. The maximum level that will be experienced at any residential boundary of any property not owned by the company is 53 dB L_{Aeq}. As an increase of 3 dB is considered to be just noticeable and taking into account the existing noise environment, the small increase for the period when 53 dB L_{Aeq} would be experienced is unlikely to be noticed by the resident and hence there will be no adverse noise effects. As the Phase 4 Cutback proceeds the equipment will also be further away from the receiver positions and will drop to a lower level in the pit. This will, within 6 months, reduce the noise for the neighbours by at least 5 dB, such that the Hauraki District Plan noise standards will be comfortably complied with.

5.10 BLASTING AND VIBRATION

As outlined in Section 3 of this AEE, blasting will occur as part of both the Phase 4 Cutback and the Martha Underground Mine. The potential environmental effects of blasting fall into three main categories: vibration, overpressure and flyrock. However, the underground nature of the Martha Underground Mine eliminates overpressure and flyrock from that activity.

An assessment of the actual and potential vibration, overpressure and flyrock effects of Project Martha is provided in Heilig (2018), a copy of which is included as **Appendix G** to this AEE. An overview of the Heilig (2018) assessment is provided in the sections below.

5.10.1 Description of the Blasting

The type of blasting differs according to whether it occurs in the open pit or in underground operations. Blast patterns for the open pit activities tend to be simpler, involving drilling of blast holes on a regular pattern to a consistent depth, loading a known quantity of explosive into the base of the blast hole, adding stemming material to the blast

hole above the explosive column and initiating the blast with a series of small intervals between successively detonated blast holes.

Blasting in underground operations is more complex and broadly either classed as development or production. Development blasting is small scale, in terms of the blast hole diameter, blast hole length, explosive weight and overall yield of broken rock (see Table 5.5 below). Production blasting is larger scale, although less than the amount of rock broken by an open pit blast. The blasting is significantly more detailed in design than open pit blasting.

Blasting is always engineered to minimise the potential risks and consequences of vibration, as well as overpressure and flyrock (in the case of open pit blasting).

Table 5.5: Development and Production Blasting

Parameter	Development Blasting	Production Blasting
Blast hole Diameter	Small blast hole diameter commonly in the range of 45mm to 51mm	Larger blast hole diameters in the range of 64mm to 89mm
Blast hole Length	3 m	18 m or more
Blast Yield	280 tonnes	Several thousand tonnes
Blast Duration	10 second window	Complete in several seconds
Explosive Quantity	150 kg in total (each blast hole containing up to 4kg)	Several hundred kg in total with each hole containing up to 30 kg.

Development blasting also generally produces significantly lower levels of vibration than that produced by production blasting due to the smaller quantity of explosive involved, and the smaller diameter and length of the blast hole. However, the vibration persists longer than that produced from a production blast due to the different initiation systems used.

5.10.2 Vibration Limits

The Hauraki District Plan seeks to provide for the utilisation of the Waihi mineral resource in a sustainable manner while ensuring the amenity values of Waihi and the wider community are protected.[3]

To identify the appropriate approach to achieve these outcomes for vibration effects resulting from Project Martha, Heilig (2018) completed a comprehensive analysis of:

[3] Section 5.17.2 of the Hauraki District Plan.

- The vibration conditions contained on the mining licences and resource consents which authorise existing and past mining activities at Waihi;
- The District Plan vibration performance standards; and
- Various international guidelines, including those from Australia, Britain, Germany and the International Standards Organisation ("**ISO**").

In this analysis. Heilig (2018) identify that the effects of vibration on amenity values are dependent on various matters, including:

- The vibration amplitude experienced by receivers;
- The number of blast events;
- The timing of blast events; and
- The duration of blast events.

Based on this analysis, Heilig (2018) recommends a number of conditions be imposed on Project Martha blasting and vibration to ensure the amenity values of Waihi and the wider community are protected. They are set out in Table 5.6 below.

Table 5.6: Blasting Limits Recommended by Heilig (2018)

Parameter	Phase 4 Cutback	Martha Underground Mine Development / Production Blasts	Martha Underground Mine Maintenance / Safety Blasts
Maximum Peak Amplitude	Peak particle velocity (PPV, vector sum) 5 mm/s at 95th percentile.	Peak particle velocity (PPV, vector sum) 5 mm/s at 95th percentile	Peak particle velocity (vector sum) 1 mm/s at 95th percentile.
Maximum Number of Blast Events	N/A	3 blast events per day	N/A
Blast Times	Monday to Friday 10am – 3pm Saturday 10am -1200pm	Monday to Saturday 7am to 8pm	N/A
Maximum Blast Event Duration	N/A	No blast event shall have a duration of more than 18 seconds	No blast event shall have a duration of more than 18 seconds

The conditions for the Phase 4 Cutback are the same as those which currently apply to existing and consented activities in the Martha Pit (as articulated in ML 32 2388 and LUC 97/98-105).

The conditions proposed for the Martha Underground Mine are the same as apply to the Correnso Underground Mine, subject to some administrative refinements. Conditions that restrict the following remain unchanged:

- Maximum peak amplitude of vibration from production and development blasts;
- The blast times;
- Maximum number of blast events;
- Maximum blast event duration; and
- The requirement for a web-based display of data.

The administrative refinements recommended by Heilig (2018) are:

- There be no requirement to separately record vibration from development and production blasting, on the basis both blast methods are subject to the same vibration limits and it is the vibration experienced by residents, not the origin of that vibration that is important;
- A consequential change to the blast duration limits which retains the existing maximum limit of 18 seconds, but removes the individual limits that apply to development and production blasts; and
- That an average vibration limit not be included as it serves little benefit over and above the maximum peak amplitude limit, is unnecessary to manage effects on amenity values given the operational realities of the underground mining operation and would impose administrative burden and cost.

The other change Heilig (2018) recommends is that provision be made for maintenance / safety blasts. This would permit small scale works to remedy issues within the mine that impact upon the mining schedule and safety, such as blasting of oversize material, blasting of blockages within drawpoints and so on.

Heilig (2018) considers these amendments would not reduce the level of amenity protection provided to residents relative to the conditions imposed on existing operations, and can be better managed both operationally and from a compliance and enforcement perspective.

The controls on vibration from blasting at the Waihi mines remain amongst the most rigorous applied to blasting activities internationally. Their basis of protecting amenity necessarily ensures that they are also protective of building integrity which is known to occur at values in excess of those assigned to personal amenity protection. This includes residential and commercial buildings and other infrastructure.

5.10.3 Vibration Effects

Having identified the key parameters Project Martha blasting should meet to protect the amenity values of Waihi and the wider community, Heilig (2018) then assesses the expected scale of blasting, and the amount of vibration the community would experience over the life of the project.

The output of that assessment is:

- A series of maximum vibration contours between 2 mm/s and 5 mm/s in 1 mm/s increments for Project Martha activities. These contours represent the maximum expected level of vibration at some time throughout the reported period and not necessarily the level that would be recorded day to day from each and every blast
- A series of vibration envelopes for representative properties closest to various Project Martha elements (see Figure 5.9 below) that illustrate the range of vibration levels that would likely be experienced by those properties over the life of the project. The vibration envelopes are important, as the maximum vibration contours provide little indication of the average, most likely, or distribution of vibration levels.

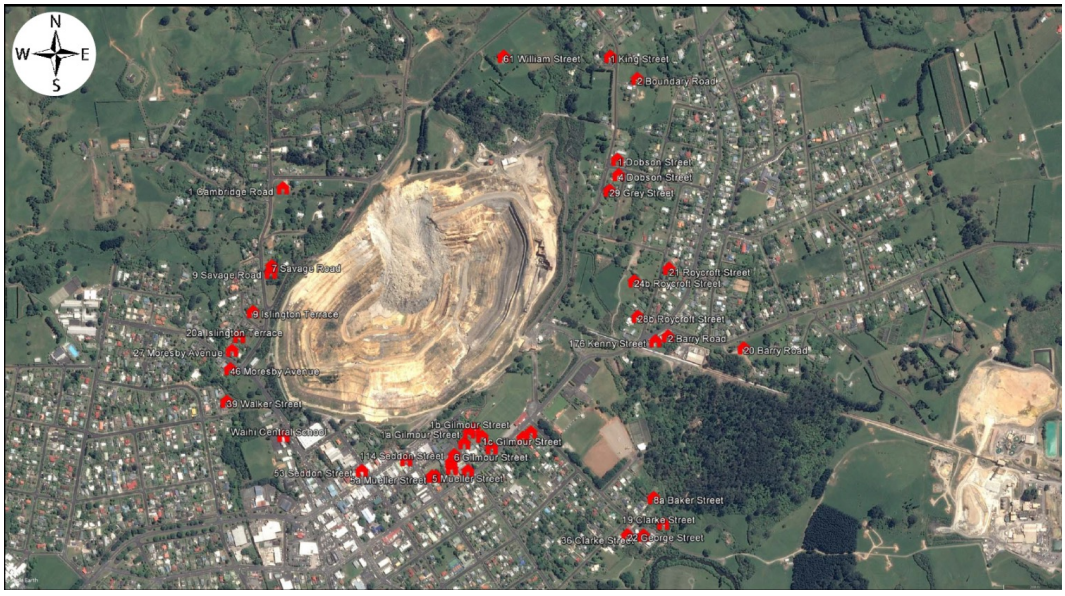

Figure 5.9: Representative Locations - Vibration Envelope Modelling

The maximum predicted vibration contours for each property are contained in Appendix A – D of Volume 1 of Heilig (2018). The vibration envelopes are contained in Volume 2 of Heilig (2018).[4]

A summary of the vibration effects predicted by the Heilig (2018) analysis is provided below for Project Martha.

5.10.3.1 Phase 4 Cutback

The extent of vibration predicted in surrounding areas during the Phase 4 Cutback predicted by Heilig (2018) is comparable to that of previous Martha Pit blasting given the explosive weights and blasting locations are similar. However, because the Phase 4

[4] Noting that the predicted vibration contours in Heilig (2018) are intended to demonstrate the Project Martha activities can be undertaken in a manner which complies with the limits specified in Section 5.10.2, and to provide an indication of the general extent of vibration expected to occur in the surrounding environment. For the avoidance of doubt, while blasting would always be undertaken in a manner which complies with those limits, in practice the amount of vibration received at a particular property may differ from the detailed predictions contained in the Heilig (2018) vibration contours and envelopes.

Cutback expands the pit crest to the north-west by approximately 40 metres, the vibration contours will extend further in this direction than they have in the past.

As with other mining at Waihi, blasting will also generally only produce perceptible levels of vibration when blasting in the immediate area of the receiver. This means when blasting is occurring on the north wall of the Pit, residents to the east of the Pit along Roycroft Street will be receive low levels of vibration, generally considered imperceptible.

Heilig (2018) concludes that blasting in the Phase 4 Pit can at all times comply with the proposed limits set out in Section 5.10.2, and will therefore protect the amenity values of residents.

5.10.3.2 Martha Underground Mine

Martha Underground - Excluding the Rex Orebody

Development blasting will extend over the full life of the Martha Underground Mine, commencing in 2020 and finishing in 2030.

The scheduling for the Martha Underground Mine shows production blasting commencing in 2020 and continuing in all years through to completion in 2030. The six year period between 2023 and 2028 is associated with geographically diverse blasting with stoping occurring over a distance of more than 500 m. The early blasting up until 2027 occurs beneath the centre of the existing Martha Pit, but extending towards the southern wall over time. In the later three years of the Martha Underground Mine, blasting progresses beyond the existing open pit crest and nearer to properties along Roycroft Street.

The vibration contours produced by Heilig (2018) for the Martha Underground Mine show perceptible levels of vibration extend around the mining areas. However, unlike the Correnso Underground Mine where properties were located above the stopes, the majority of the stope blasting for the Martha Underground Mine will occur several hundred metres in plan distance from properties. In turn, the predicted vibration contours are similar to those associated with blasting in the northern areas of the Correnso orebody where residents towards the south were not affected, and Heilig (2018) considers a similar situation will occur for the Martha Underground.

The Heilig (2018) modelling confirms the Martha Underground Mine can be effectively blasted and comply with the proposed conditions set out in Section 5.10.2 of this AEE, and will therefore protect the amenity values of Waihi and its surrounding residential areas

Rex Orebody

Development and production blasting of the Rex orebody is scheduled to commence in 2020 and continue for three years until completion in 2022.

The footprint of the contours is small as is the resulting zone of potential impact, and despite the reduced separation distance between the blasting and nearest properties, Heilig (2018) confirms the Rex orebody can also be effectively blasted while complying with the proposed conditions set out in Section 5.10.2. This will both protect the amenity

values of those properties affected and maintain building integrity in Waihi town centre and the surrounding residential areas.

5.10.4 Overpressure

Overpressure is only relevant to the Phase 4 Cutback and refers to the momentary levels of pressure above atmospheric pressure caused by a blast. It is measured irrespective of frequency with no weighting, and on this basis, is distinguished from noise and audibility.

Unlike vibration which can be perceived at very low levels, any direct perception of overpressure is unlikely unless the level of overpressure exceeds 145 to 150 dBL. The perceived effect on people at these elevated levels is commonly felt as a pulse impacting on the chest or face. These levels rarely occur from blasting unless the receiver is very close to the blast, typically within tens of metres. In turn, the most commonly observed effect of elevated overpressure levels is the associated rattling that it may cause to some parts of a dwelling, such as ill-fitting windows, loose timber panelling and so on. In this manner, Heilig (2018) notes the effect is often confused with that of elevated vibration.

Both ML 32 2388 and LUC 97/98 – 105 which authorise the past and current operation of Martha Pit contain a condition which restricts the peak overall sound pressure level due to air blasts to 128 dB linear (unweighted) at any residence not owned by OGNZL. Heilig (2018) recommends this limit be retained for Project Martha and has calculated the effect of the Phase 4 Cutback blasting on sound pressure levels will be no greater than 120 dB at neighbouring residences. In turn, the activity will be undertaken in a manner which protects the health and amenity values of neighbours.

5.10.5 Flyrock

Blasting at the Martha Pit has been continually and successfully completed over a 30-year period with only one instance of flyrock being propelled outside of the nominated exclusion zone. This occurred on 29 June 2007. The event was reviewed and key findings and conclusion presented to the Hauraki District Council. The key findings included:

- Some blast holes were inadequately stemmed to only around 50% of the design stemming length;
- Some blast holes were overcharged or the explosive placed in the incorrect horizon within the blast hole;
- Some holes were incorrectly loaded with emulsion emanating from the collar hole as the stemming material was being lowered into the blast hole;
- Probe holes were not located and stemmed prior to the blast; and
- Some collars of the blast hole were higher than designed and lead to a higher powder factor.

To mitigate these identified flyrock causes a number of adjustments to the Vibration Management Plan were agreed with the HDC, and blasting has been subsequently undertaken without further incident. It is proposed the management measures contained in the current Vibration Management Plan be adopted for the blasting for the Phase 4 Cutback.

With those management measures in place, and based on operational experience and detailed flyrock modelling, Heilig (2018) does not expect any future blasting to cause flyrock to land outside the defined exclusion zone.

5.10.6 Mitigation Measures

In addition to meeting the limits specified in Section 5.10.2 to mitigate the effects of Project Martha, all blasting will be undertaken in accordance with a Vibration Management Plan, which will include:

- Measures to be adopted to meet the conditions of the consent to ensure that blast vibrations are minimised to the greatest extent practicable, including;
  - Description of the blast design criteria and blast design review procedures;
  - The numbers, times (generally around shift changeovers), duration of blast events, and in general terms the coordination of blasts into one blast event and steps to minimise the duration of blast events;
  - Procedures to be adopted where vibration levels approach the maximum limits and mitigation actions to be implemented in the event of an exceedance of the limits;
  - The method and procedures to be adopted for managing flyrock and monitoring overpressure; and
  - The methods and procedures to be adopted in deploying roving monitor(s), data usage from the roving monitors, and identifying circumstances where vibration monitoring within structures shall be considered. Any monitoring undertaken in these circumstances is deemed not to be compliance monitoring.
- The location of fixed monitoring locations; and
- Records to be kept, including blast design data.

Heilig (2018) recommends the continuation of blast notification procedures presently undertaken should continue. These currently include:

- Six monthly notice in the local paper;
- Daily updates on the OGNZL webpage;
- The offer of an automated alarm system comprising modified restaurant coasters that play music;
- Telephone calls and SMS messages;
- Consistency in timing to help normalise/acclimate people to the blasting; and
- For the open pit blasting, a siren will also be sounded to alert persons of the impending blast.

5.10.7 Monitoring

Heilig (2018) recommends the monitoring equipment for demonstrating vibration compliance remain unchanged from current practices which have been shown to be appropriate. This includes selecting monitoring sites based on:

- Proximity to the blasting area and ensuring that the potentially sensitive properties are appropriately monitored;
- Selecting locations that will offer a secure area that will minimise the possibility of interference from the public; and
- Providing an accurate indication of the vibration level.

The monitoring sites Heilig (2018) identifies as best achieving these objectives are shown in Figure 5.10. However, Heilig (2018) notes it would be appropriate to consider additional monitoring if blast monitoring identifies anomalous regions that are not adequately covered by the monitoring network, or if justified concerns by residents warrants additional monitoring locations. These matters would be addressed in the Vibration Management Plan.

Heilig (2018) also recommends that the blasting results from all of the monitoring locations be displayed on OGNZL's web page (including the 95th percentile calculation for each location) as is currently the case for the Correnso Underground Mine.

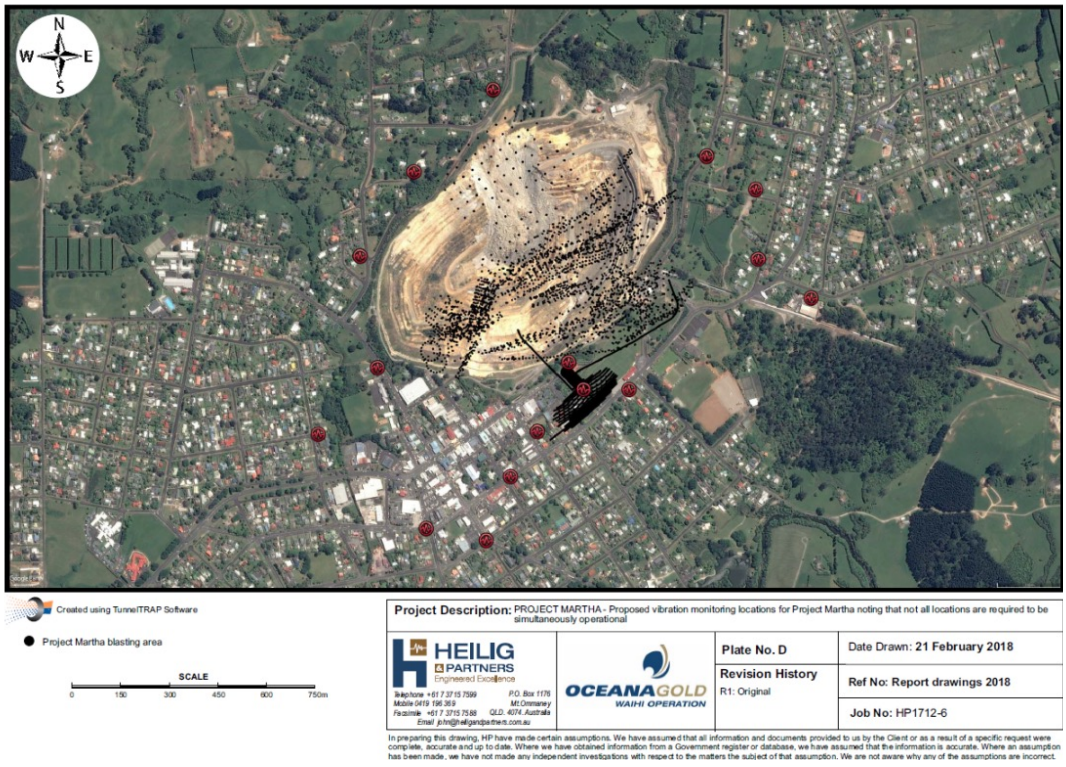

Figure 5.10: Vibration Monitoring Locations Recommended by Heilig (2018)

5.10.8 Other Measures

While no property damage is anticipated by Heilig (2018), OGNZL is committed to a 'we break, we pay policy to address any property damage caused by Project Martha activities, including ground settlement. This is detailed in Section 5.7.5 above.

5.10.9 Conclusion

Following a comprehensive review of the conditions contained on the mining licences and resource consents which authorise existing and past mining activities at Waihi, Hauraki District Plan vibration performance standards and international guidelines from Australia, Britain, Germany and the ISO a suite of conditions has been developed to ensure Project Martha will retain the amenity values of Waihi's town centre and residential environment. These conditions largely reflect the conditions which apply to existing blasting activities at the Martha Pit and the existing underground mines in Waihi – which remain amongst the most rigorous applied to blasting activities internationally.

Detailed modelling has shown that the blasting activities can be undertaken in accordance with those conditions. OGNZL will continuously monitor compliance with those conditions and will make the monitoring results available to the public on its webpage as occurs for current underground mining activities.

5.11 AIR QUALITY

An assessment of the potential effects of the Project Martha on air quality in the surrounding environment is provided in Beca (2018), a copy of which is included as **Appendix L** to this AEE.

An overview of the Beca (2018) assessment is provided in the sections below.

5.11.1 Emission Sources

Beca (2018) identify that discharges to air from Project Martha will be generated from the following sources:

- Dust from surface mining activities such as earthworks, excavation, vehicle movements, unconsolidated surfaces and materials handling, the crushing and screening plant and the concrete batching plant;
- Construction of the new noise bunds along Bulltown Road;
- Construction of the re-aligned section of Bulltown / Cambridge Roads;
- Products of combustion from vehicles on the surface;
- Products of combustion from vehicles and dust from underground mining activities that are discharged to air via the ventilation shafts;
- Contaminants produced from blasting both above the surface and underground and discharged to air via the ventilation shafts; and
- Rehabilitation of completed mine areas.

5.11.2 Assessment Methodology

The likelihood of the discharges to air from Project Martha resulting in adverse effects on sensitive receptors is assessed by Beca (2018) based on the historic and existing effects of mining at Waihi and the likely changes to the scale and location of the emissions. The likelihood of each of the project features resulting in adverse effects on the nearest sensitive receptors has been assessed taking into account the location of the receptor in relation to the potential sources of dust, the likely frequency of potential impacts and the likely severity of any potential impact. Where an elevated risk of adverse effects occurring has been identified, Beca (2018) has recommended additional dust control and monitoring methods to mitigate the risk.

5.11.3 Summary of Current and Past Effects

Beca (2018) concludes that the results of ambient air quality monitoring and the complaints history for the site demonstrate that any increase above background concentrations of deposited dust, TSP, PM_{10} and silica at sites in the vicinity of the mining operation are small and well below the relevant standards and guidelines and within the current resource consent and mining licence limits.

It is noted that the current deposited and suspended dust monitoring programme does not provide any information on short term dust concentrations and that at times, locations downwind of the mine may experience higher than normal dust concentrations for short periods of time, which may be noticeable to the public. However, the results of the long-term monitoring programme indicate that any such events do not occur sufficiently frequently, or are of sufficient magnitude, to increase the long-term average concentrations above the relevant guidelines and standards.

The existing monitoring data also shows there is minimal risk of discharges to air from blasting resulting in ambient concentrations of contaminants that exceed the NESAQ and Ambient Air Quality Guidelines at locations where members of the public may be exposed. Additionally, no complaints have been received regarding blasting emissions since the notification system was instituted in 2005.

Overall, Beca (2018) considers that past and current adverse effects resulting from the discharges to air from the Waihi mining operation are no more than minor.

5.11.4 Nuisance Effects of Deposited and Suspended Dust

Project Martha will bring mining activities in closer proximity to a small number of properties on Bulltown / Cambridge Roads. The works associated with relocation of the roads and the construction of the noise bunds will be completed in a relatively short timeframe and these houses will not be downwind of the Martha Pit in the prevailing or secondary wind directions (see Figure 5.11 below). The works involved with the relocation of the roads will be typical of other road works and will be small scale compared to mining activities.

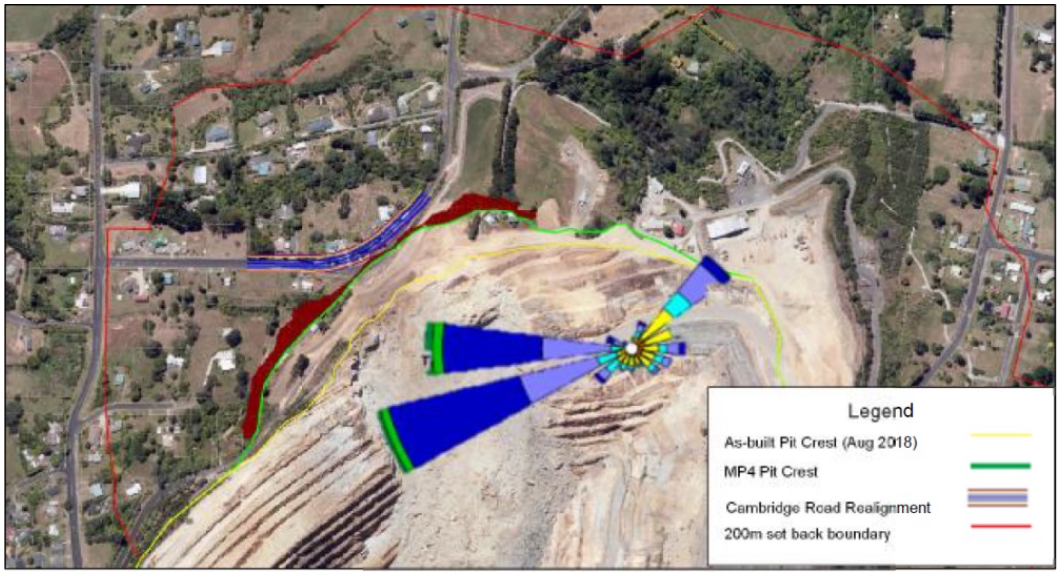

Figure 5.11: Locations of Houses within 200 m of the Phase 4 Cutback Overlaid with a Wind Rose.

Winds from the south-easterly quarter that exceed 5m/s and which could blow dust from the new noise bunds and road relocation works, towards the properties located within 200m of the proposed works, occur for approximately 3.7% of time, which is infrequent. Consequently, the risk of these properties being adversely affected by dust generated during the construction phase of the project is considered to be moderate to low due to their close proximity to the site.

During active mining operations the closest houses will be approximately 70m from the crest of the Martha Pit and will not be downwind of the mine during the prevailing and secondary wind conditions. Work on the upper benches near the crest of Martha Pit, which is beyond the boundary of the current permit boundaries, will take approximately 6 months to complete. Following the completion of these works, the mining activity will move progressively away from the crest for the remainder of the project. Consequently, the risk of the closest properties to Martha Pit being adversely affected by dust during mining operations is considered to be low.

Due to the close proximity of some of the properties to the proposed works, there is a chance that infrequent and short-term dust events may occur when works are taking place in close proximity to houses, which may have the potential to cause offensive or objectionable effects for short periods. In order to mitigate the risk of adverse effects occurring in this area, especially during dry and windy conditions some additional mitigation measures are recommended by Beca (2018), which are explained in Section 5.11.6 below.

Providing OGNZL implements the recommended mitigation measures and continues to use the current dust control methods that have been demonstrated to be effective at the current operations, Beca (2018) consider the risk of any adverse effects that may arise due to dust from the proposed Project Martha activities on these properties can be adequately avoided and mitigated.

5.11.5 Health Effects

The ambient air monitoring carried out by OGNZL and the WRC of PM_{10} and respirable silica concentrations and combustion emissions from vehicles, at various locations within Waihi and in the vicinity of the mine, has shown that the concentrations of these contaminants are well below the relevant guideline and standard concentration limits for the protection of human health.

Additionally, the monitoring carried out by OGNZL of the discharges to air from an underground mine vent shaft during blasting demonstrated that the average emissions of NO, NO_2 and CO discharged from the vent were all below ambient air quality guideline and standards. The vent shafts associated with Project Martha will be located within the Martha Pit, more than 130 m below the surface, and several hundreds of metres from sensitive locations. As the contaminants in the steam clouds from the vents will be dispersed and diluted in the plume as it travels downwind, the ambient concentrations of contaminants beyond the boundary of the site, where members of the public may be exposed, are expected to be negligible.

The overall scale of the mining operation at Waihi will not increase and the current mitigation measures will continue to be used, consequently the emission rates and ambient concentrations of the contaminants from these sources are also expected to remain similar to recent and current levels and less than past peak levels.

The re-alignment of Bulltown / Cambridge Roads will bring the road slightly closer to some houses. The numbers and types of vehicles using the road will not change and hence the emissions from traffic will also not change. Any effects of the realignment on ambient air quality in the vicinity of these houses is expected to be negligible.

Consequently, Beca (2018) consider that the discharges to air of PM_{10} and respirable silica from Project Martha can be adequately avoided and mitigated and the risk that of adverse health effects occurring will be negligible.

5.11.6 Mitigation

5.11.6.1 Air Quality Management Plan

OGNZL has an existing Air Quality Management Plan ("***AQMP***") for the mine which includes the mitigation methods used to control effects on the environment, including dust (Table 5.7). Beca (2018) recommend an updated AQMP be prepared for Project Martha which includes these existing measures, as well as the additional trigger levels discussed in Section 5.11.6.2 below.

Table 5.7: Mitigation measures implemented by the current Air Quality Management Plan to mitigate dust.

Activity	Existing Mitigation Measures
The stripping of overburden, soil and rock from surface areas and the spreading of overburden and topsoil on rehabilitated land. The construction of infrastructure such as roads, pit walls and noise bunds.	› Keep exposed surface areas to a minimum and re-vegetate exposed areas as soon as practical; › Use water sprays to keep surfaces damp where practicable and necessary; and › Plan potentially dusty activities such as stripping and spreading of topsoil for days when weather conditions are predicted to be favourable.
Dust from heavy vehicles on haul and general traffic around the proposed site works area.	› Limit vehicle speeds on haul roads and access roads within the project area; › Minimise haul distances; › Transport rock and ore from Martha Pit to the Process Plant and the Central, Northern and Eastern Stockpile areas by conveyor wherever practicable; › Keep roads and construction surfaces damp with water carts and/or fixed sprinklers when required; › Maintain haul roads regularly by grading and laying of fresh rock/gravel; › Utilise, where appropriate and cost effective, approved surface-binding agents for dust control on roads; and › Require drivers to use the wheel wash facilities located at main exits to the site to prevent mud being tracked off site.
The loading of material onto trucks and conveyors (and including the subsequent offloading)	› Require machinery operators to minimise drop heights when unloading materials; › Cover or shield conveyors in exposed locations to reduce drying effects and exposure to wind; and › Dampen materials to be moved where practicable.
Exposed surfaces such as those on stockpiles and noise bunds.	› Keep operational areas around the pit, stockpiles and Process Plant damp using water tanker vehicles when required; › Use water, where practicable to keep surfaces damp;

	▸ Keep the height of open pit stockpiles below the level of the perimeter fences around the pit rims; ▸ Plant and maintain a sustainable vegetative cover on exposed areas of the upper open pit batters and benches where practicable; ▸ Use screens and fences to prevent wind-blow in dust prone areas; and ▸ Vegetate the outer walls of the noise bunds as soon as practicable after construction has been completed.
Crushing and screening of rock.	▸ Use irrigation sprays on jaw crushers and conveyor transfer points to control the moisture content of materials; ▸ Minimise drop heights from the loading of raw materials into the feed hopper and from stacking of stockpiles; and ▸ Locate any mobile crushing and screening plant in Matha Pit below the ground level of nearby terrain.
The discharges to air from the vent on the cement silo of the concrete batching plant and from the stockpiles associated with the plant and surrounding yard areas.	▸ A bag filter on the cement silo discharge. ▸ Water sprays on the stockpiles and the feed hopper.
Spreading crushed limestone on the surface of rock stacks.	▸ Not applying limestone when winds are strong or blowing towards neighbouring properties.

5.11.6.2 Additional Trigger Levels

Although it is expected that the risk of dust generated by Project Martha creating adverse effects on the majority of properties located in the vicinity of the Project Martha works is low, for some properties located within 100 m of the proposed construction works there is a moderate risk that short term adverse effects may result especially during dry windy conditions.

To mitigate this risk, in addition to existing mitigation measures Beca (2018) recommend a suite of wind speed trigger levels for reviewing and ceasing work (see Figure 5.12). For the purposes of these trigger levels Beca (2018) recommends that a sensitive receptor include:

- Privately-owned residences, rest homes, marae;
- Schools, kindergartens and child care facilities; and
- Commercial, retail businesses.

Figure 5.12: Recommended Trigger Values for Wind Speeds for Works within 200 m of Sensitive Receptors Located within 100 m of the Project Boundaries

Trigger Method	Trigger Values (measured at the on-site monitoring station)	Actions
Wind speed alert	Hourly average wind speeds exceed 5 m/s as measured at Site 6.63 (MetStation/Office) and winds are blowing towards sensitive receptors located within 100 m of the boundary of the project boundaries.	Dust sources and dust control measures will be reviewed and additional dust control methods shall be implemented as required to ensure adverse effects do not result beyond the boundary of the mine.
Wind speed alarm	Gust wind speeds (two minute average or less) exceed 10 m/s as measured at Site 6.63 (Met Station/Office) during two consecutive ten minute periods and winds are blowing towards sensitive receptors within 100m of the project boundaries. Works may recommence when wind gusts (two minute average or less) are less than 7.5 m/s as measured at Site 6.63 (Met Station/Office) during the previous two consecutive ten minute periods.	All potentially dust-generating activities will cease within 200m of sensitive receptors located within 100m of the project boundaries except for dust control activities.

5.11.7 Monitoring

OGNZL undertakes an extensive suite of air quality monitoring in the vicinity of Waihi. This is expected to continue.

In accordance with current practice the details of air quality monitoring to be undertaken will be set out in the AQMP. This will include:

- Ambient air monitoring programmes for deposited particulate matter, total matter and PM_{10} (particulate matter smaller than ten microns) and particle size distribution studies (including silica content); and
- A programme to monitor emissions from vent shafts.

5.11.8 Conclusion

Beca (2018) concludes that, providing OGNZL continues to use the methods currently used to minimise discharges to air, along with the additional recommended mitigation measures, the discharges to air from the Project Martha will be adequately avoided and

mitigated such that the risk that these discharges will result in noxious, dangerous, offensive or objectionable effects is low.

Overall, Beca (2018) consider the potential effects of the discharges to air resulting from Project Martha to be less than minor.

5.12 ROADING AND TRAFFIC

5.12.1 Introduction

An assessment of the actual and potential effects of Project Martha on the roading and traffic network is provided in TDG (2018), a copy of which is included as **Appendix E** to this AEE. An overview of the assessment undertaken is provided in the sections below.

5.12.2 Traffic Generation

Table 5.8 summarises the expected vehicle numbers associated with the forecast number of workers through the life of the project. The total number of staff and contractors on site is expected to vary over the life of Project Martha, however is generally expected to be commensurate with the current and recent staffing levels (and approximately 10% lower than the peak numbers working at the site in recent years).

Table 5.8: Expected Vehicle Numbers for Project Martha

Year	Total Employed	Office	Barry Road Gate		Baxter Road Gate	
		Light	Heavy	Light	Heavy	Light
Year 1	360	55	0	0	38	404
Year 2	360	55	0	0	38	404
Year 3	420	55	8	89	38	404
Year 4	336	55	8	89	26	280
Year 5	336	55	8	89	26	280
Year 6	336	55	8	89	26	280
Year 7	336	55	8	89	26	280
Year 8	336	55	8	89	26	280
Year 9	336	55	8	89	26	280
Year 10	336	55	8	89	26	280
Year 11	276	55	0	0	26	280

In addition, TDG (2018) identify up to 71 additional truck movements per day at the Baxter Road access may be required for the importation of aggregate for use in the concrete batching plant.

5.12.3 Effects the Road Network

The two intersections most affected by traffic associated with Project Martha are the Baxter Road / SH2 intersection (which provides access to the Processing Plant and TSFs) and the Barry Road / SH25 intersection (which is the main accessway to the Martha Pit). Grey Street will also be used by a small number of vehicles over the life of Project Martha, including to deliver items of large plant in the early years.

TDG (2018) conducted detailed analysis and modelling of how vehicle movements generated by Project Martha would impact on the performance and safety of these intersections.

That analysis concludes that the traffic associated with Project Martha will have less than minor effects on the existing road network, including the operational performance of existing intersections. The largest changes result from the anticipated background growth in traffic flows on the highway, which would be expected to occur regardless of the proposed activity going ahead.

With respect to the periodic use of the access off Grey Street, TDG (2018) note any individual plant movement may require some localised traffic management, but this type of movement is very infrequent, and any associated effects are assessed to be localised and less than minor.

The possible use of imported fill material has also been noted by TDG (2018) and, if this does occur, they recommend a condition be included that requires either an upgrade of the Baxter Road / SH2 intersection as appropriate or further assessment relevant to the source of material and proposed route for delivery. This is addressed further in Section 5.12.6 below.

5.12.4 Parking and Loading

At the company office in Waihi staff currently park in the metalled car park adjacent to the building, in two parking spaces marked alongside the loading access at the north side of the building, and on-street nearby. The number of staff based in the office is not expected to change, and therefore no parking-related effects are anticipated within the town.

Within the remainder of the mine site (i.e. adjacent to the Martha Pit and the workings accessed via Baxter Road), sealed and unsealed parking areas are provided at several locations and all vehicles associated with the mine are currently provided for on-site.

No changes to the existing parking facilities are proposed. The number of staff and contractors visiting the site is not expected to increase above historical levels as a result of the proposed activities.

A number of parking areas are located at surface level around the mine. All parking areas are located well within the site, and it is assessed that off-site parking will not occur.

Specific loading areas are not provided within the site, with any deliveries being taken to the required location within the mine. Delivered materials will be set down in appropriate locations as directed by mine staff, in line with operational safety guidelines. No off-site loading effects are anticipated.

5.12.5 Bulltown / Cambridge Roads Re-Alignment

5.12.5.1 Construction

It is likely that the construction of this new road section will cause a minor level of disruption at a local level and TDG (2018) notes that this activity will need to be subject to a Construction Traffic Management Plan ("***CTMP***"). There will inevitably be lane closures, temporary lowered speed limits, and possibly full closures of the road for short durations, subject to consultation with the HDC. These will be managed through the CTMP, which will identify (among other things) diversion routes, how the works will be signposted to road users, and the level of consultation required with affected road users and nearby residents and businesses.

The CTMP will be certified by the HDC, as the road controlling authority, before works are undertaken. This is in accordance with normal process for undertaking work on the public road network.

The construction effects of the road realignments will be temporary and short-term. The expected traffic effects associated with construction, when appropriately mitigated by way of a CTMP, are assessed by TDG (2018) to be no more the minor.

5.12.5.2 Operation

The design for the road re-alignment will retain the existing overall form of the road network in terms of connectivity and intersection priorities. The new alignment will marginally reduce the length of the road and will improve the existing horizontal alignment.

On the basis that the re-alignment will have improved geometry compared to the current alignment, no road safety issues have been identified along the proposed realignment route of these roads.

It is therefore anticipated that there will be a small positive effect on the network overall resulting from the re-alignment of Bulltown / Cambridge Roads.

5.12.6 Mitigation

5.12.6.1 Construction Traffic Management Plan

TDG (2018) has recommended the local level disruption caused by the construction of the re-alignment of Bulltown / Cambridge Roads be subject to a CTMP as discussed in Section 5.12.5.1 above.

5.12.6.2 State Highway 2 / Baxter Road Intersection Upgrade

Should the importation of aggregate result in an any more than minor increase in right turn movement into Baxter Road, particularly by trucks, then TDG (2018) consider an

intersection upgrade similar to that proposed for the Correnso Underground Mine should be considered. The required upgrade would likely include right-turn lanes at both Baxter Road and Crean Road. If aggregate is sourced from elsewhere then further assessment is required.

In accordance with the TDG (2018) recommendation a similar condition is proposed for Project Martha.

5.12.7 Conclusion

Overall, TDG (2018) has assessed that the Project Martha can be undertaken in a way that will have less than minor effects on the surrounding road network.

The re-alignment of Bulltown / Cambridge Roads is expected to maintain the current overall network connectivity and will ultimately have a small but positive effect on the safety and efficiency of the network.

A CTMP process exists for managing construction on the public road network, and this process will be utilised for all the road network components of the proposal.

5.13 LIGHTING

The key matters to note when considering the effects of Project Martha lighting are that all lighting for Project Martha will continue to be installed, designed, located and shaded such that the level of lighting measured at the boundary of any site not owned by OGNZL is no greater than 8.0 lux.

Given this, it is considered that any potential lighting effects from Project Martha will be less than minor.

5.14 HISTORIC HERITAGE

The nature and significance of the historic heritage values in the vicinity of Project Martha have been assessed in Clough (2018). A copy of Clough (2018) is provided in **Appendix K** to this AEE.

Project Martha will have no direct physical impact on any listed historic heritage items recorded in the Hauraki District Plan (see Section 2.14 of this AEE). However, Clough (2018) identifies that Project Martha will:

- Impact on one late 19th Century / early 20th Century villa located at 12 Cambridge Road (T13/928);
- Require destruction or modification of possible 19th Century archaeological underground mining workings (T13/926) arising from land disturbance; and
- Require destruction or modification of possible unrecorded 19th Century archaeological subsurface remains relating to settlement / domestic dwellings or mining activities arising from land disturbance.

While these heritage features not protected by rules in the Hauraki District Plan, any impacts on them will require approval under the Heritage New Zealand Pouhere Taonga Act 2014 ("***HNZPTA***") as they are pre-1900 heritage features.

The approval required under the HNZPTA is assessed through a separate process, and Clough (2018) has made several recommendations on the conditions which should be included on that archaeological authority or as consent conditions, particularly in respect of the nature and extent of archaeological investigation, research and recording that should be required when Project Martha is being undertaken. They include:

- Relocating the late 19th Century/ early 20th Century villa at 12 Cambridge Road and archaeological monitoring of earthworks, which will aid understanding of early residential settlement in Waihi and the mining communities that once lived in the area;
- Remote investigation and research of historical underground mine workings from the original Martha Mine using modern survey techniques to recover information about the underground mining workings;
- Provision for additional permanent or temporary interpretative material, which is visible to the public, and explains the history of the Waihi mines if access is limited to the pit rim walk during works; and
- Making any further information on the history of the site and any outcomes from the archaeological investigations undertaken available to the public, including on the OGNZL website.

In addition to direct effects on individual heritage features, Clough (2018) has also assessed there will be no effects on the setting and views of key historic heritage items or heritage landscapes as a result of Project Martha. The impact of the re-alignment of Bulltown / Cambridge Roads was considered in terms of the streetscape context and it was concluded that although the roads and housing in this area were developed around the turn of the 20th Century, there is very little of this historic character evident today. Furthermore, the majority of these streets will remain intact, with just a small section of road altered.

Overall, Clough (2018) conclude that the adverse effects of Project Martha on historic heritage to be minor in nature and that effects can be appropriately addressed.

5.15 TERRESTRIAL ECOLOGY

The Phase 4 Cutback will disrupt areas of existing vegetation established along the northwestern extent of the pit rim. This includes areas of planting established by OGNZ along the former pit rim walkway and exotic tree planting established in adjoining residential gardens.

While this vegetation provides a good level of aesthetic and recreational value, it likely provides only a minor contribution to the ecological value of the greater area. It also consists of predominantly planted, narrow strips, and is not representative of any natural ecosystem and has low botanic value. Removal of this vegetation would therefore be a minor adverse ecological effect. Following preparatory works including relocation of the existing noise bund, the amended landform also provides an opportunity to extend replacement planting in association with the pit rim walkway.

Some vegetation may be used occasionally for roosting or nesting by common native birds such as tui, silvereye, fantail and grey warbler. However, edge effects (particularly light and

noise disturbances) would reduce the quality of these potential habitats, particularly given other suitable areas of vegetation in the surrounding landscape. Removal of these potential fauna habitats would be a minor adverse ecological effect.

Overall, given the limited removal of vegetation combined with the ability to replace this during mine operation, only minor effects on terrestrial ecology are expected.

5.16 HAZARDOUS SUBSTANCES

The storage and use of hazardous substances for Project Martha will be undertaken in accordance with the existing management practices employed at the Martha Pit and the existing underground mines operated by OGNZL. Those existing practices comply with the relevant New Zealand Standards, Codes of Practice and the Hazardous Substances and New Organisms Act 1996.

In accordance with current practice, a Hazardous Substances Use and Management Plan setting out the details of the substances used / stored, containment measures, risk management and emergency response approach will be maintained.

As a result, it is considered that any effects on the surrounding environment or on human health due to the storage and use of hazardous substances associated with Project Martha will be less than minor.

5.17 PUBLIC ACCESS AND RECREATION

The only change to public access and recreation as a result of Project Martha will be the realignment of the pit rim walkway around the Phase 4 Cutback.

Upon closure, the Martha Pit is currently required to be filled and the subsequent pit lake and its surrounds will be rehabilitated into a safe and sustainable recreational facility for the benefit of the Waihi community. Project Martha does not change this outcome.

5.18 CULTURAL VALUES

OGNZL is currently engaging with iwi in relation to Project Martha and the identification of possible measures to avoid, remedy or mitigate potential effects on environmental or cultural values of significance (including the relationship of iwi with their ancestral lands). These discussions are ongoing and are currently confidential in nature. However, the activities contemplated under Project Martha are in locations and of a nature that is the same or similar to previous mining activities that have been considered by iwi, and it is noted that no new cultural impact assessment for Project Martha has been sought by any iwi to date.

Previous applications for open pit and underground mining activities in Waihi provide useful context and understanding for the potential effects associated with Project Martha that may be of interest to iwi. These potential effects, and their relevance to Project Martha, are noted as follows:

- **The storage of waste rock and tailings** – the Hauraki Iwi Environment Plan states that the disposal of waste from mining activities has improved but remains a concern to Hauraki iwi.[5]

  Project Martha does not involve the establishment of any new rock or tailings storage facilities. Rather, the project involves the use of existing and consented facilities located to the southeast of Waihi township – which will continue to be managed in accordance with the appropriate management practices accepted by the HDC and the WRC;

- **Water quality of the Ohinemuri River** – iwi have previously identified the need to protect the quality of the Ohinemuri River and manage treated water from mining activities and stockpiles to the Ohinemuri River.[6]

  Mine water from Project Martha will be captured and conveyed to the WTP, where it will be treated in accordance with the existing systems and protocols required by OGNZL. The treated water will be discharged to the Ohinemuri River in accordance with the existing river flow and water quality discharge compliance limits specified in Consent 971318. As such, there will be no change to the water quality or life-supporting capacity of the Ohinemuri River as a result of Project Martha;

- **Effects on Groundwater** – Ngati Hako and Ngati Tara Tokanui have both previously raised concerns regarding the potential effects associated with the abstraction of groundwater for mining activities – particularly in respect of effects on settlement and any vegetation that is hydraulically connected to groundwater sources.

  An assessment of the potential effects associated with the dewatering of groundwater in order to facilitate the Phase 4 Cutback and the Martha Underground Mine have been undertaken by GWS (2018) and Engineering Geology Limited (2018). These assessments have considered the range of potential effects associated with dewatering, including those previously raised by Ngati Hako and Ngati Tara Tokanui. The assessment concludes that there will be no adverse effects on shallow groundwater or base flow to surface waters, drainage effects will not alter plant growth, and that any potential settlement will be minimal;

- **Ground stability** – iwi have previously identified that they unsure about the link between ground dewatering and surface stability.

  The potential impacts of dewatering on ground stability are addressed in the previous paragraph.

  The potential effects of the Martha Underground Mine on ground stability are considered in AMC (2018). This assessment notes that the Martha Underground Mine can be developed and brought into production without any compromise to underground or surface stability. Monitoring will be implemented as part of a Void

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5 Hauraki Iwi Environment Plan, March 2004, Page 15.

6 Cultural Values Assessment for the Favona Underground Mining Application, Te Kupenga o Ngati Hako Inc, 28 October 2004.

Management Plan to ensure that the excavations are performing as expected and that the response to mining is within acceptable limits;

- **Dust management** – iwi have previously raised concerns with the potential dust effects from mining activities at Waihi and the need for monitoring of such effects.[7]

  The potential air quality effects of Project Martha have been assessed in Beca (2018), which concludes that the nature of the air emissions from the mine will not change as a result of Project Martha. Only the location and scale of some of the individual air emission sources will change as a result of some of the new mine features. Overall, Beca (2018) concludes that the potential adverse effects of the discharges to air resulting from Project Martha are expected to be less than minor – and that a range of management measures and monitoring will be undertaken to ensure this outcome;

- **Landscape and visual effects** – iwi have previously recommended that OGNZL utilise native plants (if possible) as part of rehabilitation activities and that stockpiling areas be sheltered from view from the public.[8]

  Project Martha does not involve any changes to the Rehabilitation and Closure Plan for the Martha Pit (except for a small extension around the north wall), which will involve the substantial planting of native plants around the pit lake in addition to the planting and rehabilitation that is already occurring around Grey Street and the TSF's. It is also noted that the existing stockpile areas will be utilised at the Polishing Ponds and Favona Portal, which are located around the Processing Plant and away from public viewpoints; and

- **Maori heritage protocols** – iwi have previously advised that it is important cultural protocols are agreed upon in the event that waahi tapu, taonga or koiwi are discovered, or if a death occurs on site.

  OGNZL are willing to adopt such protocols for Project Martha, noting that similar requirements already exist in the conditions for LUC 97/98-105.

The impact on the mauri of Pukewa as a consequence of the mining of the Martha Pit and how that can best be addressed remains a matter under discussion between OGNZL and iwi. Any further detail on any outcomes of engagement between OGNZL and iwi in relation to Project Martha will be provided, as appropriate and agreed with iwi, as the resource consent applications for the proposal are advanced.

5.19 SOCIAL IMPACTS

Mining has been a major part of Waihi's history, with the town's fortunes closely tied to the fortunes of generations of gold miners who have worked the resource in this part of the Hauraki Goldfield. In the modern era, open pit and underground mining has been a constant feature of life in and around the town. It is, therefore, considered that an examination of previous community responses to announcements about new mining development in the town, and an examination of the social impacts that have been

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[7] Cultural Values within Kainga Kanohi a Ohinemuri ki Hauraki, Page 34.

[8] Cultural Values Assessment for the Favona Underground Mining Application, Te Kupenga o Ngati Hako Inc, 28 October 2004.

observed in connection with those mining activities can provide sound information on the likely community responses to, and the potential social impacts of, Project Martha.

There is a considerable body of existing information available in this context, noting that in addition to implementing comprehensive monitoring of the effects of past mining activities in Waihi, numerous social impact assessments have been completed in the past 15 years - as have numerous surveys on the community's views on the mining activities. These are summarised in Phoenix Research (2018), a copy of which is included in **Appendix W** to this AEE.

As is outlined in Section 2.4 and Section 5.3 of this AEE, the mines contribute significantly to the provision of employment and economic activity in Waihi. They also contribute positively to the social fabric of the town with employees and their families attending local schools, and being members of local community sports organisations, service organisations, rescue volunteer groups and being involved in arts / cultural groups. The charitable donations OGNZL makes to the local community are also significant. It is expected these positive social impacts will continue to occur as a result of Project Martha extending the life of mining at Waihi.

The potential adverse social impacts highlighted most often in respect of past mining at Waihi, and during the consultation OGNZL has undertaken for Project Martha, focus on:

- How mining activities impact on amenity values, particularly associated with the vibration, noise and dust produced by mining activities;[9]
- Concerns that the value of their residential properties in the area of the mine will be adversely affected; and
- Uncertainty regarding when the Waihi mines will close.

The need to relocate schools and substantive disruption to the fabric and layout of Waihi town centre are also identified by Phoenix Research (2018) as being key concerns associated with past mining proposals in Waihi. However, Project Martha's limited footprint means it will not have these impacts.

Phoenix Research (2018) also note the regular community perception surveys undertaken in Waihi have shown approximately 66% of residents are in favour of mining in Waihi, 25% are neutral, and approximately 9% are either not in favour or strongly not in favour. They have also shown residents of Waihi are more favourable about mining in general when some time has elapsed since the last announcement of a proposal.

The various technical reports have assessed the impact of Project Martha on the amenity values enjoyed by Waihi's residents, and concluded that the project will be undertaken in a manner that provides for these values provided certain mitigation measures are implemented. OGNZL has committed to these recommended mitigation measures and has also proposed a range of other measures it currently uses to address these effects in respect of existing mining activities.

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[9] Phoenix Research (2018) identify that concerns regarding noise and dust have reduced since activity in the Martha Pit ceased in 2015.

Other measures proposed by OGNZL to respond to the potential social impacts of Project Martha include:

- Various measures intended to make the mining activities as predictable and unremarkable as possible, including:
  - The Blast Notification Programme (which provides residents with advance warning of blast events via website, text, phone call or blast notification device);
  - Periodic blast vibration workshops to educate the community; and
  - Transparent and timely provision of environmental monitoring results to the community, including real time online monitoring results of blast events.
- Employment of a Company Liaison Officer to act as the main point of contact between members of the community and OGNZL, and regular community meetings to ensure effective two-way communication; and
- A comprehensive and transparent complaints procedure which ensures that public complaints are managed in a sensitive, timely and consistent manner and which identifies corrective actions where appropriate.

In addition to these management measures, OGNZL is proposing other measures as possible means of ensuring positive effects. These measures are a voluntary gesture by OGNZL and largely reflect existing initiatives by the company for its other mining projects in Waihi. These are discussed further in Section 6 of this AEE.

An assessment of potential effects on property values is provided in **Appendix X** to this AEE. With respect to property values, Telfer Young (2018) note that property values in Waihi have increased more than would have occurred if mining had not taken place since 1987. On the basis of the assessments of ground stability contained in this AEE, and OGNZL implementing its Amenity Effect Programme, property purchase and top up programmes, Telfer Young (2018) also conclude that:

- Commercial property will not be negatively impacted by Project Martha and over time are likely to benefit from the Project; and
- The greatest potential changes in residential property values are anticipated through the period from the announcement of the project until the start-up and early part of the mining activity. Beyond that, and with certainty around the earlier market perceptions of mining and its effects, normal market forces would be expected to take effect reflecting supply and demand pressures similar to other areas of the town.

Considering all of the above, and based on past experience, in the period shortly after Project Martha is announced it is expected there to be some heightened concern amongst the community in respect of the potential adverse social impacts of the project. However, for most people, it is expected that the proposed measures will be effective in managing these potential adverse social impacts, and that these concerns will fade over time.

Notwithstanding the positive social impacts of the Waihi mines in Waihi, and the mitigation measures proposed, OGNZL expects a small but vocal minority (approximately 7 - 9% of the population) will continue to be strongly not in favour of the mines. OGNZL will continue to seek to address the concerns of these individuals through the measures outlined

above, however, it acknowledges that some of these people are fundamentally opposed in principle to mining occurring in Waihi, and that there may be limited scope to address their concerns.

5.20 CONCLUSION

Project Martha will extend the life of mining in Waihi by approximately 12 years. This represents significant additional economic activity that would otherwise not occur. There are both national and local economic gains, the most obvious of which are gains in economic activity and employment. Increases in exports, attraction of new investment in the economy, and providing a strong core for a regional economy, are also additional benefits.

With respect to the actual and potential environmental effects of Project Martha, it is considered that the project can be undertaken in a manner that will appropriately avoid, remedy or mitigate adverse effects. It is, however, recognised that it will not be possible to ensure that all actual and potential environmental effect associated with Project Martha are avoided, remedied or mitigated such that there are no adverse effects. In this regard, there will be some visual, noise and vibration effects associated with the project at various stage of its development.

However, OGNZL is proposing that Project Martha be undertaken in accordance with a range of consent conditions which will limit the potential for adverse effects on the environment and which, in many instances, align with the permitted activity standards for mining in the Hauraki District Plan or the existing resource consents held by the company. Management plans will also be utilised to ensure that OGNZL undertakes practicable measures to minimise any potential disturbance caused by Project Martha (e.g. from dust, noise or vibration). These various management measures proposed by OGNZL are discussed in Section 6 of this AEE and are detailed in the proposed consent conditions contained in **Appendix O** to this AEE.

6. MANAGEMENT AND MONITORING OF ACTUAL AND POTENTIAL ENVIRONMENTAL EFFECTS

Section 5 of this AEE provides an assessment of the actual and potential effects of Project Martha, which is based on the various technical assessments commissioned by OGNZL. It is noted that many of the technical assessments have recommended the implementation of various measures in order to assist in avoiding, remedying or mitigating potential adverse effects from Project Martha on the environment.

These recommendations have shaped the development of the suite of management and monitoring measures that are proposed as conditions on the resource consent applications that are being sought by OGNZL. A copy of the proffered consent conditions is provided in **Appendix O** to this AEE.

The proffered consent conditions are largely based on the existing measures used for the existing and consented underground and open pit mining activities undertaken by OGNZL in Waihi. These measures have been very effective in managing the actual and potential effects of the existing mining activities.

Key management measures include:

- Limits on the hours of works (in relation to the Phase 4 Cutback);
- Limits on the generation of noise and vibration;
- The requirement to complete a structural condition survey for representative properties before blasting associated with underground mining in the Rex orebody commences;
- The requirement to establish a noise bund before the works for the Phase 4 Cutback commence;
- The preparation of a number of environmental management plans[1] which will further detail how potential effects associated with key activities will be managed and monitored. These environmental management plans allow mitigation and monitoring measures to be refined and updated over time as best practice evolves, and as additional information on the receiving environment and the effectiveness of the mitigation measures is gathered via monitoring;
- The use of an independent peer review panel comprising technical experts in key fields to advise on technical matters relating to the management of mining activities (e.g. pit wall stability);
- Provision for the preparation of a cultural balance monitoring plan and an iwi advisory group to monitor progress on the implementation of the plan (as well as the continuation of cultural awareness training of OGNZL staff and contractors); and
- A rehabilitation and closure plan secured by rehabilitation and capitalisation bonds.

[1] For example, for noise, vibration, dewatering and settlement and air quality.

The key management measures proposed by OGNZL are summarised further in Table 6.1 below.

In addition to these management measures, OGNZL is proposing other measures as possible means of ensuring positive effects on the environment. These measures are a voluntary gesture by OGNZL and largely reflect existing initiatives by the company for its other mining projects in Waihi, and include:

- The rectification of any property damage that may be experienced from mining activities associated with Project Martha (i.e. a 'we break, we pay' approach);
- Six monthly payments under the Amenity Effect Programme for residents adjacent to, Project Martha. Payments will vary depending on where OGNZL is working in the mines and the level of effect on amenity will be based on vibration monitoring results;
- An ex-gratia payment if OGNZL constructs a drive for the Martha Underground Mine underneath a property it does not own;
- An offer to purchase any property not owned by OGNZL (at market valuation) if mining occurs under that property, along with provision for legal, relocation and inconvenience costs; and
- A 'top-up' policy to meet any gap between a buyer's fair offer and a vendor's fair market price for properties within a defined area close to the Martha Underground Mine.

Table 6.1: Summary of Key Management and Monitoring Measures for Project Martha

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
Landscape and Visual Amenity			
Localised effects in the vicinity of the Phase 4 Cutback	Preparation and implementation of a landscape plan.	Maintenance and replacement planting for the first three years of planting.	None.
Noise			
Potential for increased noise at immediately adjacent properties	Provision of new noise bunds adjacent to the Phase 4 Cutback. Compliance with NZS 6803:1999 for construction activities (e.g. the construction of the noise bund). Imposition of noise limits at the perimeter of the Martha Pit and around immediately adjacent properties. Preparation and implementation of a Noise Management Plan. Establishment of a complaints register.	The Noise Management Plan will outline the noise monitoring methods to demonstrate compliance with the proposed noise limits.	None.
Vibration			
Effects of vibration on amenity values.	Limits on the number of blast events per day, the blast times those blast events occur in, blast event duration and the peak amplitude of vibration and overpressure received at any property or site not owned by OGNZL. Preparation and implementation of a Vibration Management Plan which sets out how the impacts on of	Requirement to monitor impulsive vibration from all blast events. Deployment of a roving monitor to record vibrations in locations where complaints	The Amenity Effect Programme is proposed for Project Martha in relation to the Martha Underground Mine. Property purchase programme.

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
	blasting on the community will be minimised to the extent practicable. Establishment of a complaints register.	regarding vibration have been made. Making monitoring results available to the public on the OGNZL website.	
Effects of vibration on property	As above.	As above.	Implementation of 'we break, we pay' property damage policy.
Traffic			
Local level disruption to traffic during construction of the re-alignment of Bulltown / Cambridge Roads.	Preparation and implementation of a Construction Traffic Management Plan.	None.	None.
Increase in right turn truck movements at the Baxter Road intersection due to the importation of aggregate for the concrete batching plant.	Upgrade of SH2 and Baxter Road and / or Crean Road	None.	None.
Deterioration of the existing surface of Baxter Road.	Return Baxter Road to the agreed pavement condition with HDC.	Record the pavement condition of Baxter Road prior to the commencement of transportation of aggregate for the concrete batching plant.	None.

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
Geotechnical Matters			
Instability of the walls of the Martha Pit.	Engagement of a peer review panel. Preparation and implementation of a Pit Slope Management Manual.	Detailed monitoring requirements will be set out in the Pit Slope Management Manual.	None.
Risks and hazards associated with mining near old workings.	Stope voids created or enlarged as a result of this consent to be backfilled Preparation and implementation of a Void Management Plan to identify the risks and controls required to ensure ground surface stability.	Detailed monitoring requirements will be set out in the Void Management Plan. Extending the seismic monitoring network.	None.
Stability of the crown pillar above the Rex orebody.	Maintaining adequate depth of cover on both andesites and post mineral cover. Electing not to stope the upper levels if ground conditions in the sill drives are poorer than expected.	Installation of extensometers or other similar monitoring from the surface into the crown pillar.	
Dewatering and Ground Settlement			
Effects on ground settlement during mining activities.	Preparation and implementation of a Dewatering and Settlement Monitoring Plan, which will set out how OGNZL will manage and monitor effects of the activities on land settlement and the groundwater hydraulic regime, and also details the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.	The Dewatering and Settlement Monitoring Plan will require monitoring of groundwater levels and surface tilt in an extensive network of monitoring locations around Waihi.	Implementation of the 'we break, we pay' property damage policy.

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
	Use of preventive mitigation actions to ensure the mining does not drain the strata overlying the adesite via existing drillholes and structures.		
Geochemistry			
Effects on soil and groundwater from stockpiling overburden.	Continued implementation of proven overburden management approach, including amending overburden placed in temporary stockpiles with limestone.	None.	None.
Surface Water			
Effects of surface water abstraction on the Ohinemuri River.	The intake shall be designed so that it does not entrain fish.	None.	None.
Effects of the pit lake outfall structure and discharge on aquatic ecology in Mangatoetoe Stream.	Compliance with specified water quality criteria for the discharge. Outlet structure and channels shall be designed in such a manner that provides for passage of migratory fish species and to the extent it is practicable to do so the improvement of the dissolved oxygen content of the discharged water.	Pit lake water quality monitoring programme to confirm compliance with consent limits on water quality.	None.
Air Quality			
Potential for unmitigated dust discharges to adversely affect the amenity of surrounding neighbours	Preparation and implementation of an air quality management plan, including the use of wind speed trigger levels for reviewing and ceasing work.	In accordance with current practice, a comprehensive ambient air quality monitoring programme will continue for deposited particulate matter,	None.

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
		total matter and PM_{10}, and particle size distribution.	
Heritage			
Accidental discovery of archaeological items.	Imposition of an appropriate accidental discovery protocol.	None.	None.
Destruction of underground workings from the 19th Century.	Where safety considerations allow, use laser scanning underground to accurately identify the extent of old workings. From a safe position, photograph any pre-1900 workings that are intersected by the Martha Pit. In addition, and where it is safe to do so, retrieve items from the historic workings that might be useful for displays and interpretation, and carry out additional photography within the workings.	None.	Provision for additional heritage interpretation and education opportunities.
Potential loss of heritage villa from 12 Cambridge Road.	Relocation of the villa from 12 Cambridge Road to another appropriate location in Waihi.	None.	None.
Cultural Matters			
Potential effects on matters of importance to the iwi of Waihi, and their relationship with ancestral lands and water.	Implementation of a Cultural Awareness Programme for all staff and contractors. Preparation of a Cultural Balance Monitoring Plan. Establishment of an Iwi Advisory Group to meet at six-monthly intervals.	The Iwi Advisory Group will be responsible for monitoring progress on the implementation of the Cultural Awareness Programme and	To be confirmed.

Actual or Potential Effect	Recommended Mitigation / Management	Recommended Monitoring / Future Action	Additional Measures Proposed by OGNZL
		the Cultural Balance Monitoring Plan.	
Hazardous Substances			
The release of hazardous substances into the environment.	All hazardous substances will be stored in approved and bunded containment in accordance with the relevant New Zealand Standards and Codes of Practice and the Hazardous Substances and New Organisms Act 1996 and Regulations. A Hazardous Substances Use and Management Plan will be prepared and implemented.	None.	None.
Post-Closure Effects			
Risk of OGNZL defaulting on its rehabilitation obligations.	The combination of the rehabilitation and closure concept plan and the bonds ensures that rehabilitation and closure of the site will occur under all circumstances, and that the costs associated with both the rehabilitation of the land and its long-term management will be met.	None.	None.

7. CONSULTATION

OGNZL has identified the following parties as potentially having an interest in Project Martha:

- Land owners and occupiers in Waihi, particularly those in the immediate vicinity of Project Martha;
- Iwi;
- Government departments, agencies, regional and district councils;
- Community groups;
- Waihi businesses;
- Real estate agencies;
- OGNZL staff and contractors;
- Politicians; and
- Media.

Consultation with these parties is summarised below and has taken the form of private meetings, home visits, community open days, mail outs of information brochures, local media articles, and question and answer sessions on local radio.

A copy of the information brochures available to the community is provided in **Appendix Y** to this AEE.

Project Martha is essentially a continuation and extension of mining activities which stakeholders are familiar with, and this has been reflected in the nature of the consultation information provided by OGNZL – as well as the questions and feedback received. Stakeholders generally understand the benefits of further mining in Waihi, but also understand that mining is a significant activity that cannot take place without some effects on the environment.

OGNZL continues to work with all stakeholders to ensure that the way its activities impact on the various communities of interest (both those regulated under the RMA and non-regulated activities it undertakes as part of the community) contributes positively to the social, economic and cultural wellbeing of the people and communities of Waihi to the greatest extent possible.

7.1 IWI

As noted in Section 5 of this AEE, OGNZL is currently engaging with iwi in relation to Project Martha and the identification of possible measures to avoid, remedy or mitigate potential effects on environmental or cultural values of significance (including the relationship of iwi with their ancestral lands).

These discussions are ongoing and are currently confidential in nature. However, the activities contemplated under Project Martha are in locations and of a nature that is the same or similar to previous mining activities that have been considered by iwi, and it is

noted that no new cultural impact assessment for Project Martha has been sought by any iwi to date.

7.2 DIRECT CONSULTATION WITH LANDOWNERS AND LOCAL RESIDENTS

7.2.1 Home Visits

OGNZL staff conducted door to door visits of all properties above and adjacent to the Martha Underground Mine, and the Phase 4 Cutback, between 27 and 29 March 2018.

During these visits Project Martha was discussed with residents, questions were answered, and feedback recorded.

7.2.2 Community Open Day

A community open day was also held at the Baptist Church for local residents on 4 April 2018, and approximately 70 people attended. During that open day information on Project Martha was made available, and OGNZL staff were on hand to discuss the project and answer questions.

Key feedback and comments raised included:

- The extent and depth of mining proposed for the Martha Underground Mine relative to previous underground mining projects;
- Whether OGNZL would pay for property managers for any people who chose to move out and rent their properties for the duration of Project Martha;
- The extent of ground conditions beneath people's properties; and
- How the Amenity Effects Programme operates.

7.2.3 Meetings with Local Community and Interest Groups

OGNZL has conducted extensive consultation with various community groups in Waihi in relation to Project Martha. This has included meetings with:

- The Salvation Army on 12 February 2018;
- The Waihi Central School Board of Trustees on 8 March 2018;
- The Waihi Baptist Church on 13 March 2018;
- The Waihi Rugby Club on 13 March 2018;
- The Business After 5 on 28 March 2018;
- Gold Discovery Centre staff on 29 March 2018;
- The Waihi / Waihi Beach Real Estate Agents on 5 April 2018;
- The Waihi Community Forum on 5 April 2018;
- Waihi Friendship Club on 6 April 2018;
- St John's Anglican Church Vestry on 8 April 2018;
- Waihi Lions Club on 24 April 2018; and

- Waihi Drama Club on 1 May 2018.

7.3 MEDIA

In addition to meeting with potentially interested and affected persons, OGNZL has also sought to disseminate information, answer questions and elicit feedback on Project Martha via various media forums.

This has included:

- A public announcement of Project Martha on 28 March 2018, which was picked up by local and national news outlets;
- A double page update on Project Martha in the Waihi Leader on 29 March 2018;
- Information on Project Martha in the April 2018 issue of the 'East Ender' a publication distributed to the residents of Waihi East;
- Monthly publication of a Project Martha Update newsletter (first issue April 2018); and
- Weekly radio question and answer sessions on the local Waihi radio station - Gold FM.

8. STATUTORY CONSIDERATIONS

8.1 INTRODUCTION

This section of the AEE assesses Project Martha against the relevant statutory planning framework. The relevant statutory considerations under the RMA are addressed in the following sections:

Section 8.2 Identifies the information requirements for the resource consent applications in accordance with Section 88 of the RMA;

Section 8.3 Addresses the gateway test for non-complying activities in accordance with Section 104D of the RMA;

Section 8.4 Addresses that matters the consent authorities must have regard to in accordance with Section 104 of the RMA;

Section 8.5 Addresses the consideration of alternatives for discharge permits in accordance with Section 105 of the RMA;

Section 8.6 Addresses the management of subdivision and natural hazard risks in accordance with Section 106 of the RMA; and

Section 8.7 Addresses the restrictions on the grant of discharge permits in accordance with Section 107 of the RMA; and

8.2 INFORMATION REQUIREMENTS

Section 88(2) of the RMA stipulates that a resource consent application must be made in the prescribed form and manner. It must also include an assessment of environmental effects in such detail as corresponds with the scale and significance of the effects that the activity may have in accordance with Schedule 4 of the RMA.

The resource consent applications for Project Martha are in the prescribed form as set out in Form 9 of Schedule 1 to the Resource Management (Forms, Fees, and Procedure) Regulations 2003. OGNZL has also complied with the application forms requirements of the HDC and WRC.

With respect to the information requirements in Schedule 4 of the RMA, it is noted that Clauses (2), (3), (4), 6) and (7) specify information requirements that are directly relevant to the resource consent applications required for Project Martha. These matters have been addressed throughout this AEE and in the relevant technical assessments.

8.3 SECTION 104D OF THE RESOURCE MANAGEMENT ACT 1991

As outlined in Section 4 of this AEE, the resource consents required from the HDC for Project Martha are classified as non-complying activities under the Hauraki District Plan. This is due to the classification of the following activities:

- Mining operations associated with the Phase 4 Cutback in the Residential and Low Density Residential Zones;

- Mining operations associated with the use, maintenance and rehabilitation of existing and consented portals, access drives, ventilation shafts and other underground facilities and infrastructure in the Residential, Reserve (Active) and Reserve (Passive) Zones;
- The subdivision of land to accommodate the re-alignment of Bulltown / Cambridge Roads; and
- The use and storage of hazardous substances in the Martha Mineral Zone.

Section 104D of the RMA establishes restrictions on the ability of a consent authority to grant resource consents for non-complying activities. It states:

> *(1) Despite any decision made for the purpose of notification in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—*
>
> *(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or*
>
> *(b) the application is for an activity that will not be contrary to the objectives and policies of—*
>
> *(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or*
>
> *(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or*
>
> *(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.*

The objectives and policies of the relevant statutory planning documents are identified and assessed in Section 8.4 of this AEE. As is noted in the sections below, Project Martha will not be contrary to the objectives and policies of the relevant statutory planning documents – particularly the Hauraki District Plan (being the statutory planning document that classifies the activities associated with Project Martha as non-complying activities). It is also concluded that in most circumstances the environmental effects of Project Martha will be appropriately managed so that the project sits comfortably with the outcomes sought by the objectives and policies in the relevant statutory planning documents.

As such, the requirements of Section 104D(1)(b) of the RMA are met. The resource consent applications can, therefore, be considered in the broader context in accordance with Section 104 of the RMA.

In light of the above, it is not necessary to form an overall conclusion as to whether the adverse effects of Project Martha on the environment will be 'more than minor' in order to satisfy the first gateway test of Section 104D(1) of the RMA.

8.4 SECTION 104 OF THE RESOURCE MANAGEMENT ACT 1991

8.4.1 Introduction

Section 104 of the RMA identifies the matters that a consent authority must have regard to, subject to Part 2 of the Act, when considering an application for resource consent. It states:

> *(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to–*
>
> *(a) any actual and potential effects on the environment of allowing the activity; and*
>
> *(ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and*
>
> *(b) any relevant provisions of—*
>
> *(i) a national environmental standard:*
>
> *(ii) other regulations:*
>
> *(iii) a national policy statement:*
>
> *(iv) a New Zealand coastal policy statement:*
>
> *(v) a regional policy statement or proposed regional policy statement:*
>
> *(vi) a plan or proposed plan; and*
>
> *(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*
>
> *(2) When forming an opinion for the purposes of subsection (1)(a), a consent authority may disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect.*
>
> *(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.*
>
> *(2B) …*

Section 104 of the RMA does not give primacy to any of the matters to which a consent authority is required to have regard. All of the relevant matters are to be given such weight as the consent authority deems appropriate in the circumstances, and all matters listed in section 104(1) are subject to Part 2 of the RMA (which is further discussed in Section 8.4.11 of this AEE).

An assessment of Project Martha against the relevant matters set out in Section 104 of the RMA is provided in the sections below.

8.4.2 Actual and Potential Effects on the Environment

With respect to Section 104(1)(a) of the RMA, an assessment of the actual and potential effects on the environment associated with Project Martha is provided in Section 5 of this AEE and in the technical assessments commissioned by OGNZL. This assessment includes consideration of the positive effects associated with Project Martha, which will include extending the life of mining in Waihi by approximately 12 years and economic gains which will average approximately $73M a year. This represents significant additional economic activity that would otherwise not occur.

With respect to potential adverse effects on the environment, it is considered that Project Martha can be undertaken in a manner that will appropriately avoid, remedy or mitigate adverse effects in a manner that aligns with the management expectations outlined in the relevant statutory planning documents (which are discussed below). Importantly, most of the works (and potential adverse effects) associated with Project Martha will be undertaken within the Martha Mineral Zone or will occur underground.

That said, it is recognised that it will not be possible to ensure that all potential effects associated with Project Martha are avoided, remedied or mitigated such that there are no adverse effects. In this regard, there will be some visual, noise and vibration effects associated with the project at various stages of its development. However, OGNZL is proposing that Project Martha be undertaken using the same approaches that have been previously used in Waihi for both open pit and underground mining activities, and in accordance with a range of consent conditions which will limit the potential for adverse effects on the environment and which, in many instances, align with the permitted activity standards for mining in the Hauraki District Plan or the existing resource consents held by the company. A number of management plans will also be utilised to ensure that OGNZL undertakes practicable measures to minimise any potential disturbance or risk of adverse effects from Project Martha.

These various management measures proposed by OGNZL are discussed in Section 6 and **Appendix X** to this AEE.

Section 6 of this AEE also outlines other measures proposed by OGNZL which are able to be considered under Section 104(1)(ab) of the RMA as possible means of ensuring positive effects on the environment. These measures largely reflect existing initiatives by OGNZL for its other mining projects in Waihi, and include:

- The rectification of any property damage that may be experienced from mining activities associated with Project Martha (i.e. a ‘we break, we pay’ approach);
- Six monthly payments under the Amenity Effect Programme for residents in adjacent to Project Martha. Payments will vary depending on where OGNZL is working in the mines and the level of effect on amenity will based on vibration monitoring results;
- An ex-gratia payment if OGNZL construct a drive for the Martha Underground Mine underneath a property it does not own;
- An offer to purchase any property not owned by OGNZL (at market valuation) if mining occurs under that property, along with provision for legal, relocation and inconvenience costs; and

- A ‘top-up’ policy to meet any gap between a buyer’s fair offer and a vendor’s fair market price for properties within a defined area close to the Martha Underground Mine.

Overall, it is considered that Project Martha will be undertaken in a manner that promote the outcomes sought by the relevant statutory planning documents in order to achieve the sustainable management purpose of the RMA.

8.4.3 Relevant Statutory Planning Documents

With respect to Section 104(1)(b) of the RMA, the national, regional and district planning documents of relevance to Project Martha are:

- Resource Management (National Environmental Standard for Air Quality) Regulations 2004;
- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (“***NESCS***”);
- Resource Management (National Environmental Standard for Sources of Human Drinking Water) Regulations 2007 (“***NESHDW***”);
- The National Policy Statement for Freshwater Management;
- The Hauraki Gulf Marine Park Act 2000;
- The Waikato Regional Policy Statement;
- The Waikato Regional Plan; and
- The Hauraki District Plan.

An assessment of Project Martha against the relevant provisions of these statutory planning documents and regulations is provided in the sub-sections below.

8.4.4 National Environmental Standards

National environmental standards prescribe standards for environmental matters in accordance with Section 43 of the RMA. Each local authority must enforce the national environmental standards. Where specified, a local authority can impose stricter or more lenient standards than those set out in a national environmental standard.

The national environmental standards potentially relevant to Project Martha are discussed in the sub-sections below.

8.4.4.1 National Environmental Standard for Air Quality

The NESAQ sets out ambient air quality standards for a number of contaminants for the protection of public health - including fine particulates (PM_{10}), sulphur dioxide (SO_2), carbon monoxide (CO) and nitrogen dioxide (NO_2). It applies where people are likely to be exposed for periods commensurate with the relevant assessment averaging period. The NESAQ also includes concentration limits and the specified number of occasions that those concentration limits may be exceeded within any year.

The standards specified in the NESAQ, along with the Regional Ambient Air Quality Guidelines, are considered in Section 5.11 of this AEE. This section concludes that the concentrations of PM_{10}, NO_2, CO and SO_2 associated with any air discharges from Project Martha and the existing mining operations are expected to remain within the relevant standards.

As such, the NESAQ is not an impediment to the granting of the air discharge permits required for Project Martha.

8.4.4.2 National Environmental Standard for Assessing and Managing Contaminants in Soil

The NESCS seeks to ensure that land affected by contaminants in soil is appropriately identified and assessed before it is developed. If necessary, affected land will need to be remediated or the contaminants contained to make it safe for human use.

Mining industries are included on the Hazardous Activities and Industries List, although it is understood that the continuation of existing uses is not affected by the NESCS.

The Martha Underground Mine is not considered to be affected by the NESCS. In this regard, the standard applies to a particular piece of land affected by, or likely to be affected by, contamination. Given the separation distance between the Martha Underground Mine and any actual or potential source of contamination within previously undisturbed ground, it is not considered that the NESCS is triggered in these circumstances.

The Phase 4 Cutback will involve the disturbance and subdivision of land that is outside of the footprint of the Martha Pit and which may have potentially been contaminated as a result of historic land use activities. However, based on a review of the WRC's Land Use Information Register it is noted that none of the properties in the Residential or Low Density Residential Zone that will accommodate Project Martha are listed as contaminated or potentially contaminated. As such, the NESCS is not considered to be triggered with respect to the Phase 4 Cutback either.

8.4.4.3 National Environmental Standard for Sources of Human Drinking Water

The NESHDW sets requirements for the protection of sources of human drinking water from contamination. A human drinking water source is a natural water body that is used to supply a community with drinking water.

The HDC holds water permits from the WRC to abstract water from the Ohinemuri and Waitawheta Rivers for community drinking water supplies.[1]

The consented abstraction from the Ohinemuri River for drinking water supply is located upstream of OGNZL's proposed abstraction point for the filling of the pit lake and the proposed overflow point from the pit lake to the Mangatoetoe Stream. As such, this water supply sources will not be affected by Project Martha.

[1] AUTH130392.03.01 and AUTH101995.01.02.

The proposed abstraction and discharge points for Project Martha are not hydrologically connected to the HDC's consented abstraction from the Waitawheta River. In this regard, this drinking water supply is sourced from a downstream tributary of the Ohinemuri River - a number of kilometres away from the abstraction and discharge points proposed for Project Martha.

In light of the above, Clauses (7) and (8) of the NESHDW are not an impediment to the granting of the water and discharge permits sought for Project Martha.

8.4.5 National Policy Statement for Freshwater Management

The NPSFM recognises Te Mana o te Wai and sets out objectives and policies that direct local authorities to manage water in an integrated and sustainable way, while providing for economic growth within set water quantity and quality limits.

The NPSFM is a relevant statutory planning document under Section 104(1)(b) of the RMA as Project Martha involves the abstraction of water from the Ohinemuri River, the pumping of groundwater to dewater the Martha Pit, the discharge of water to ground as part of the flooding of the underground workings and the filling of the pit lake, and the discharge of overflow water from the pit lake to the Mangatoetoe Stream.

The relevant objectives and policies of the NPSFM can be grouped into the following topics:

- Water quality;
- Water quantity;
- Integrated management; and
- The role and interests of tangata whenua.

It is noted that a number of the policies in the NPSFM direct the WRC to undertake specific actions in order to achieve the desired outcomes (e.g. developing or changing regional policy statements or regional plans).[2] These policies are not considered directly relevant to the consideration of the resource consent applications for Project Martha.

The relevant objectives and policies are discussed in the sub-sections below.

8.4.5.1 Water Quality

The objectives and policies relating to the management of water quality seek the following outcomes:

- The safeguarding of the life-supporting capacity, ecosystem processes and indigenous species of freshwater, and the health of people and communities as affected by contact with freshwater;[3]

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[2] For example, Policies AA1, A1, A2, A3, A5, A6, B1, B2, B3, B4 and B6 of the NPSFM.

[3] Objective A1 of the NPSFM.

- The maintenance or improvement of the overall quality of freshwater, while protecting outstanding freshwater bodies and wetlands;[4]
- The improvement of the quality of freshwater so it is suitable for primary contact more often; and[5]
- The enablement of communities to provide for their economic wellbeing within limits.[6]

The dewatering of groundwater is critical to enable the operation of the Martha Underground Mine and the Phase 4 Cutback so that underground workings below the water table are not flooded. Water that is abstracted as part of this process is pumped to the WTP, before being discharged to the Ohinemuri River. The proposed dewatering is not expected to have any adverse effect on the baseflow of any surface water source. Likewise, the discharge from the WTP is already authorised by the WRC[7] and is subject to a range of consent conditions that ensure the life-supporting capacity of the Ohinemuri River is safeguarded.

A new water permit is being sought for the abstraction of water from the Ohinemuri River for the flooding of the underground works and the filling of the pit lake as part of final rehabilitation activities. The potential hydrological and ecological effects of the revised abstraction regime are discussed in Section 5.13.1 of this AEE, where it is concluded that the abstraction regime will not adversely affect the ecological benefits provided by freshes and floods in the Ohinemuri River, and that ecosystem processes, indigenous biodiversity and water quality within the river will be maintained. This is consistent with the outcomes sought by the NPSFM.

With respect to the filling of the pit lake and the discharge of overflow water to the Mangatoetoe Stream, a new discharge permit is being sought by OGNZL. Section 5.13.4 of this AEE concludes that the increased discharge will have no discernible effect on flood levels in the Mangatoetoe Stream, while Section 5.13.3 also concludes that life-supporting capacity and ecosystems within the stream will not be adversely affected by the proposed intermittent discharges.

Further, and based on the assessment in Section 5.13.2 of this AEE, Project Martha will not alter the expected water quality for the pit lake. In this regard, the water quality of the pit lake will be monitored and adaptively managed if necessary (e.g. including provision for a littoral zone and riparian vegetation) to lead to improved outcomes for the pit lake over time in accordance with Objective A3 of the NPSFM.

8.4.5.2 Water Quantity

The objectives and policies relating to the management of water quantity seek the following outcomes:

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4 Objective A2 of the NPSFM.
5 Objective A3 of the NPSFM.
6 Objective A4 of the NPSFM.
7 Consent 971315.

- To safeguard the life-supporting capacity, ecosystem processes and indigenous species of freshwater in sustainably managing the taking, use, damming or diversion of freshwater;[8]
- Avoid any further over-allocation of freshwater and phase out existing over-allocation;[9]
- To improve and maximise the efficient allocation and efficient use of water;[10]
- To protect significant values of wetlands and of outstanding freshwater bodies; and[11]
- To enable communities to provide for their economic wellbeing within limits.[12]

The water abstractions associated with Project Martha are critical to ensure mining activities are undertaken in a safe manner and that post-mining rehabilitation activities occur in a timely manner.

The potential hydrological and ecological effects of the proposed alternative abstraction regime are considered in Section 5.8 of this AEE. This section conclude that the abstraction regime will not impact on the positive effects provided by freshes and floods in the Ohinemuri River, and that ecosystem processes, indigenous biodiversity and water quality within the river will be maintained. This is consistent with the outcomes sought by the NPSFM.

With respect to the avoidance of over-allocation (and phasing it out over time), the NPSFM defines over-allocation as:

> *Over-allocation is the situation where the resource:*
>
> *a) has been allocated to users beyond a limit or*
>
> *b) is being used to a point where a freshwater objective is no longer being met.*

'Limit' and 'freshwater objective' are also defined as follows:

> ***Limit** is the maximum amount of resource use available, which allows a freshwater objective to be met.*
>
> ***Freshwater objective** describes the intended environmental outcome in a freshwater management unit.*

Over-allocation in the context of the NPSFM relates to not meeting the freshwater objectives or limits for a freshwater management unit. It is understood that no formal objective and limit setting process has been completed for the Ohinemuri River by the WRC in accordance with the framework set out in the NPSFM. In this regard, there are no formal freshwater objectives for the catchment as per the NPSFM. Therefore, the proposed abstraction regime would not constitute an over-allocation in the context of the NPSFM.

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8 Objective B1 of the NPSFM.
9 Objective B2 of the NPSFM.
10 Objective B3 of the NPSFM.
11 Objective B4 of the NPSFM.
12 Objective B5 of the NPSFM.

The explanation to Issue 3.3.1 of the Waikato Regional Plan supports this conclusion. It states:

> *"The NPS on Freshwater Management requires allocation limits to be set and defines 'over-allocation'. Chapters 3.3 and 3.4 were developed prior to the release of the Operative NPS and it was not intended that an exceedance of an allocable flow as set out in Table 3-5 would be considered to be 'over-allocation' as defined in the NPS. The flows in Table 3-5 have been set to achieve Objective 3.3.2 and they also determine the activity status of water take consent applications. The activities identified in Policy 6 are enabled to achieve aspects of Objective 3.3.2."*

In terms of protecting significant values of wetlands, Section 5.8 of this AEE notes that monitoring data collected over the period since dewatering began indicates that there have been no adverse effects on shallow groundwater or base flow to surface water sources. This is due to the perched nature of the surface water bodies in the shallow groundwater system. Section 5.7 also concludes that the proposed groundwater deepening will have no additional adverse effects on surface waters and wetlands for the same reasons.

Section 5.8 of this AEE also concludes that the proposed abstraction of water from the Ohinemuri River will have no meaningful impact on the flow variability, and thus no impact on the wetland values and function supported by the Ohinemuri River.

Finally, neither the Ohinemuri River or the Mangatoetoe Stream are identified in the RPS or the Waikato Regional Plan as an outstanding freshwater body. As such, Objective B4 of the NPSFM will not be affected by Project Martha.

8.4.5.3 Integrated Management

Objective C1 of the NPSFM seeks to improve the integrated management of freshwater and the use and development of land in whole catchments, including the interactions between freshwater, land and associated ecosystems.

While the policies that accompany Objective C1 are focused on actions to be undertaken by the WRC, it is noted that the technical assessments commissioned by OGNZL have considered the actual and potential effects of Project Martha on land and freshwater resources in an integrated manner. This includes considering the potential effects of dewatering of the Martha Underground Mine on surface water and seepage flows, and the potential effects of the proposed abstraction regime from the Ohinemuri River on the ecological and hydrological functioning.

8.4.5.4 Tangata Whenua Roles and Interests

Objective AA1 of the NPSFM refers to the consideration and recognition of Te Mana o te Wai in the management of freshwater. Further, Objective D1 seeks to provide for the involvement of iwi and hapu in the management of freshwater and to ensure that tangata whenua values and interests are identified and reflected.

The policies that accompany Objectives AA1 and D1 are focussed on actions to be undertaken by the WRC. In this regard, they direct that regional policy statements and regional plans be amended or that local authorities work with iwi and hapu to involve them

in the management of, and decision-making on, freshwater issues. These are not tasks that can be undertaken or implemented by OGNZL as part of its resource consent applications for Project Martha.

Notwithstanding the above, it is understood that upholding Te Mana o te Wai acknowledges and protects the mauri of water and that in using water there is also a need to provide for Te Hauora o te Taiao (the health of the environment), Te Hauora o te Wai (the health of the waterbody) and Te Hauora o te Tangata (the health of the people). Given the conclusions regarding the hydrological and ecological effects associated with the abstraction and discharge of water for Project Martha in Sections 5.12 and 5.13 of this AEE, it is considered that the health and wellbeing of the Ohinemuri River will continue to be maintained.

Furthermore, the water quality of the pit lake will be managed such that it is suitable for primary contact on an ongoing basis.

8.4.5.5 Overall Conclusion

Given that:

- The dewatering of groundwater associated with the Martha Underground Mine will not adversely affect any shallow groundwater or base flow to surface waters;
- The proposed abstraction of water from the Ohinemuri River and the discharge of water to the Mangatoetoe Stream will maintain water quality and continue to safeguard life-supporting capacity and ecological processes; and
- The rehabilitation of the pit lake will be monitored and adaptively managed if necessary to lead to improved outcomes for the pit lake over time

it is concluded that Project Martha will be consistent with the objectives and policies of the NPSFWM relating to the management of water in an integrated and sustainable way.

8.4.6 Hauraki Gulf Marine Park Act 2000

Section 9(4) of the Hauraki Gulf Marine Park Act 2000 specifies that when considering an application for a resource consent for the Hauraki Gulf, its islands and catchments, a consent authority must have regard to Sections 7 and 8 of the Act (in addition to the matters set out in the RMA).

Section 7 of the Hauraki Gulf Marine Park Act 2000 recognises the interrelationship between the Hauraki Gulf, its islands, and catchments, and the ability of that interrelationship to sustain the life-supporting capacity of the environment of the Hauraki Gulf, as a matter of national significance. Section 8 of the Act goes on to identify a number of objectives for the management of the Hauraki Gulf. These include:

- The protection and, where appropriate, enhancement of the life-supporting capacity of the environment of the Hauraki Gulf;
- The protection and, where appropriate, enhancement of the natural, historic, and physical resources of the Hauraki Gulf;

- The protection and, where appropriate, enhancement of those natural, historic, and physical resources (including kaimoana) of the Hauraki Gulf with which tangata whenua have an historic, traditional, cultural, and spiritual relationship;
- The maintenance and, where appropriate, enhancement of the contribution of the natural, historic, and physical resources of the Hauraki Gulf to the social and economic wellbeing of the people and communities of the Hauraki Gulf and New Zealand; and
- The maintenance and, where appropriate, enhancement of the natural, historic, and physical resources of the Hauraki Gulf which contribute to the recreation and enjoyment of the Hauraki Gulf for the people and communities of the Hauraki Gulf and New Zealand.

The Hauraki Gulf Marine Park Act 2000 is relevant to Project Martha as the project involves the abstraction of water from the Ohinemuri River and the discharge of water from the pit lake into the Mangatoetoe Stream (a tributary of the Ohinemuri River). The Ohinemuri River converges with the Waihou River near Paeroa, which then discharges into the Firth of Thames at Kopu.

The actual and potential effects of the proposed abstraction of water from the Ohinemuri River and the discharge of water from the pit lake to the Mangatoetoe Stream are discussed in Section 5.13 of this AEE, and in relation to the objectives and policies of the NPSFM. Based on these assessments, it is not considered that Project Martha will adversely affect the life-supporting capacity of the environment of the Hauraki Gulf or the protection of its natural, historic, cultural, and physical resources.

8.4.7 Waikato Regional Policy Statement

The RPS provides an overview of the resource management issues for the Waikato Region, and sets out objectives, policies and methods intended to achieve the integrated management of natural and physical resources. The Waikato Regional Plan and Hauraki District Plan are required to give effect to the RPS, although it is understood that neither have been amended so far to reflect the most recent policy direction provided by the RPS.

The relevant topics in the RPS to Project Martha include:

- Integrated management;
- The use and development of resources;
- Relationship of tangata whenua with the environment;
- Air quality;
- Built environment;
- Freshwater bodies;
- Riparian areas and wetlands;
- Historic and cultural heritage;
- Indigenous biodiversity and ecosystem services;
- Landscape, natural character and amenity;

- Public access;
- Natural hazards; and
- Soils.

These topics are discussed in the sub-sections that follow.

8.4.7.1 Integrated Management

Objective 3.1 of the RPS seeks that natural and physical resources are managed in a way that recognises the inter-relationships within, and values of, catchments, and the relationships between environmental, social, economic and cultural wellbeing (amongst other things). This objective is intended to be implemented by a range of policies in the RPS, many of which are discussed in the sub-sections below.

However, Policy 4.1 specifies that an integrated approach to resource management will be adopted by recognising the inter-connected nature of natural and physical resources and the multiple values of natural and physical resources. Many of the methods to implement this policy are focussed on plan-making processes and the development of strategies, and not the assessment of resource consent applications.

Notwithstanding this, the technical assessments commissioned by OGNZL have considered the actual and potential effects of Project Martha on land and freshwater resources in an integrated manner. This includes considering the potential effects of dewatering of the Martha Underground Mine on land instability, surface water and seepage flows, and the potential effects of the proposed abstraction from the Ohinemuri River on the ecological and hydrological functioning of the river system.

8.4.7.2 Use and Development of Resources

There is a broad suite of provisions in the RPS which seeks to recognise and provide for sustainable resource use and development in the Waikato Region, and access to its significant mineral resources. This includes Objective 3.2, which seeks that this be done by maintaining, and where appropriate, enhancing:

- Access to natural and physical resources to provide for regionally significant industries; and
- Access to the region's significant mineral resources.

Objective 3.10 also seeks that the use and development of natural and physical resources occurs in a way and at a rate that is sustainable, and that the use and development of all natural and physical resources occurs in an efficient manner and minimises the generation of waste.

Related to these two objectives, Policy 4.4 of the RPS specifies that the management of natural and physical resources should provide for the continued operation and development of regionally significant industries by:

- Recognising the value and long-term benefits of regionally significant industry to wellbeing;

- Ensuring that the adverse effects of regionally significant industry are avoided, remedied or mitigated;
- Maintaining and, where appropriate, enhancing access to natural and physical resources, while balancing the competing demand for these resources; and
- Promoting positive environmental outcomes.

Policy 6.8 goes on to state that management of development of the built environment should appropriately recognise the potential benefits of further development of mineral resources and the need to provide for the continued operation of existing lawfully established mineral extraction activities. It also recognises the need to manage the adverse effects of mineral extraction (which may include avoiding mineral extraction or certain types of mineral extraction in some areas) and that some mineral resources are considered taonga or traditional resources by tangata whenua.

These provisions are principally intended to be implemented via the amendment and development of regional and district plans. However, it is noted that the development of Project Martha will involve the use of a regionally significant mineral resource while avoiding, remedying or mitigating its adverse effects – which is consistent with the relevant provisions in this regard.

8.4.7.3 Relationship of Tangata Whenua with the Environment

Objective 3.9 of the RPS seeks that the relationship of tangata whenua with the environment is recognised and provided for, including:

- The use and enjoyment of natural and physical resources in accordance with tikanga Māori, including mātauranga Māori; and
- The role of tangata whenua as kaitiaki.

The associated policies in the RPS on this matter direct the following:

- Tāngata whenua are to be provided appropriate opportunities to express, maintain and enhance the relationship with their rohe through resource management and other local authority processes;[13]
- Provide for the collaborative, consistent and integrated management of historic and cultural heritage resources;[14] and
- Recognise and provide for the relationship of tangata whenua and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.[15]

Most of the methods are focussed on actions to be undertaken by the WRC and local authorities. In this regard, they refer to local authorities working with tangata whenua to identify opportunities to maintain or enhance their relationship with their rohe through

[13] Policy 4.3 of the RPS.
[14] Policy 10.1 of the RPS.
[15] Policy 10.2 of the RPS.

recognition, protection, maintenance or enhancement of Māori cultural landscapes (and for these to be provided within regional and district plans).

Notwithstanding this, OGNZL acknowledges the special relationship that local iwi have with Pukewa, Motukeho and the Ohinemuri River, and that this relationship is important to spiritual and cultural wellbeing.

Iwi have previously identified the need to protect the quality of the Ohinemuri River and manage treated water from mining activities to the Ohinemuri River (as noted in Section 5.18 of this AEE). For this project all mine water will be captured and conveyed to the WTP, where it will be treated in accordance with the existing systems and consent conditions required of OGNZL. In this regard, the treated water will be discharged to the Ohinemuri River in accordance with the existing river flow and water quality discharge compliance limits. There will be no change to the water quality as a result of Project Martha and as such the life-supporting capacity of the Ohinemuri River will continue to be suitably protected.

The relationship of iwi with Pukewa is acknowledged and remains a matter under discussion between OGNZL and iwi (and any further detail on outcomes between the parties will be provided as, and when, appropriate). However, OGNZL is proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan.

8.4.7.4 Air Quality

Objective 3.11 of the RPS relates to the management of air quality. It seeks that air quality be managed so that where it is better than national environmental standards for ambient air any degradation is as low as reasonably achievable, so it avoids unacceptable risks to human health and ecosystems. It also seeks to avoid (where practicable) adverse effects on local amenity values.

Policies 5.2 and 5.3 follow this approach and specify that:

- Discharges to air are to be managed to ensure any degradation avoids unacceptable risks to human health, and is as low as reasonably achievable; and
- Discharges to air are to be managed so as to avoid, remedy or mitigate objectionable effects beyond the property boundary.

Potential effects on air quality are addressed in detail in Section 5.14 of this AEE, which concludes that the ambient concentrations of key contaminants associated with Project Martha are expected to remain within the relevant standards and guideline values, thus preserving human health.

In addition, a number of management measures are proposed by OGNZL as part of the proposed consent conditions (including the implementation of a comprehensive Air Quality Management Plan) to ensure that any discharges to air are managed and controlled so they do not result in objectionable effects beyond a property boundary.

In light of the above, it is considered that Project Martha will meet the management outcome sought by Objective 3.11 and Policies 5.2 and 5.3 of the RPS with respect to air quality and the control of the effects of air discharges.

8.4.7.5 Built Environment

The built environment provisions of the RPS are relevant to Project Martha insofar as it will be undertaken in close proximity to, and in some cases beneath, the built environment of Waihi. It will also require minor modifications to the existing roading network, and to Council infrastructure located within the existing road alignment.

Objective 3.12 of the RPS seeks that development of the built environment (including transport and other infrastructure) occurs in an integrated, sustainable and planned manner which enables positive environmental, social, cultural and economic outcomes. It seeks to achieve this outcome in a range of ways, including:

- Protecting access to identified significant mineral resources;
- Minimising land use conflicts, including minimising potential for reverse sensitivity;
- Promoting a network of sub-regional and town centres; and
- Providing for a range of commercial development to support the social and economic wellbeing of the region.

Policies 6.1 and 6.8 provide the most relevant direction on how Objective 3.12 should be implemented.

Policy 6.1 directs that subdivision, use and development of the built environment occur in a planned and coordinated manner and its methods specify that local authorities should have regard to the principles in Section 6A of the RPS when preparing, reviewing or changing their plans and developing planning methods. While Project Martha does not involve any changes to the Hauraki District Plan, regard has been given to the relevant principles in Section 6A of the RPS and it is considered that the project broadly aligns with the relevant matters. In particular:

- Project Martha will not displace urban land use in a manner which results in the needs for further urban development of greenfield areas, and the existing delineation between urban and rural areas within Waihi will not be affected;
- The existing transport and municipal infrastructure affected by Project Martha will be relocated and reinstated to the standards specified by the HDC such that its safe, efficient and effective operation and use is sustained;
- Potential adverse effects on natural hydrological characteristics and processes, water quality and aquatic ecosystems have been considered in Section 5.8 of this AEE. While potential adverse effects on these values cannot be avoided, OGNZL is proposing a range of measures such that adverse effects are avoided, remedied or mitigated and the outcomes sought by the Waikato Regional Plan and Hauraki District Plan are achieved;
- Project Martha will not alter the existing interface of land zoned for mining activities with land zoned for residential or low-density residential purposes in the Hauraki

District Plan. A range of consent conditions and management plan requirements are also proposed by OGNZL in order to ensure that Project Martha does not cause undue adverse effects on sensitive land uses nearby; and

- Project Martha will not impact on the protection of any significant indigenous vegetation or significant habitats of indigenous fauna listed in any of the relevant statutory planning documents. Likewise, it will not impact on the overall maintenance or enhancement of ecosystem services.

8.4.7.6 Freshwater Management

Objective 3.14 of the RPS seeks to maintain or enhance the mauri and identified values of freshwater bodies. It proposes to do this by implementing many of the outcomes sought by the objectives and policies of the NPSFM, including maintaining or enhancing the overall quality of freshwater within the Waikato Region, safeguarding the life-supporting capacity of freshwater bodies and enabling people to provide for their social, economic and cultural wellbeing. It also proposes to establish objectives, limits and targets for freshwater bodies.

Objective 3.15 seeks that the allocation and use of freshwater is managed to achieve those freshwater objectives by:

- Avoiding any new over-allocation of ground and surface water;
- Seeking to phase out any existing over-allocation of ground and surface water by 31 December 2030;
- Increasing efficiency in the allocation and use of water; and
- Recognising the social, economic and cultural benefits of water takes and uses.

The analysis provided in Section 8.4.5 of this AEE with respect to the consistency of Project Martha with the objectives and policies of the NPSFM is equally applicable to Objectives 3.14 and 3.15 of the RPS (and the project is considered to sit comfortably with the outcomes sought).

Policies 8.1 to 8.6 of the RPS are the primary policies that give effect to Objectives 3.14 and 3.15. They direct that:

- The WRC facilitate a process to identify values and establish subsequent fresh water objectives, limits and targets for freshwater bodies;[16]
- The outstanding values of outstanding freshwater bodies, and the significant values of wetlands, are protected or enhanced;[17]
- The effects of activities be managed to maintain or enhance the identified values of freshwater bodies;[18]

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16 Policy 8.1 of the RPS.

17 Policy 8.2 of the RPS.

18 Policy 8.3 of the RPS.

- Catchments that require specific intervention to address the adverse effects of activities and land use changes should be identified and intervention measures implemented; and[19]
- The increasing demand and competition for water be managed through the setting of allocation limits and the efficient allocation within those limits. In addition, water should be managed to maintain and enhance the mauri of freshwater bodies, safeguard life-supporting capacity and recognise that lawfully established takes for regionally significant industries contribute to wellbeing.[20]

Again, most of the policies (and the associated methods) relate to actions to be undertaken by the WRC as part of its resource management planning processes.

It is also noted that the Ohinemuri River is not considered to be an outstanding freshwater body for the purposes of Policy 8.2 of the RPS, and Sections 5.7 and 5.8 of this AEE conclude that the proposed abstraction regime from the river and the lowering of groundwater levels for mining operations will not impact on any significant wetlands in the catchment (such that important wetland values will continue to be protected).

With respect to the management of the effects of activities in order to maintain or enhance the identified values of freshwater bodies, the proposed abstraction regime from the Ohinemuri River will continue to safeguard the life-supporting capacity of the river and maintain flow variability. This is detailed in Section 5.8 of this AEE. Likewise, the discharge of water from the pit lake to the Mangatoetoe Stream will continue to be managed to meet the existing consent condition limits such that the existing values of the stream will be maintained.

8.4.7.7 Riparian Areas and Wetlands

Objective 3.16 of the RPS (and its associated policies) seeks that riparian areas and wetlands be managed to maintain or enhance a range of values – including water quality, indigenous biodiversity, cultural values and the quality and extent of riparian and wetland habitat.[21] Risks from natural hazards are also required to be effectively managed.

As outlined above, Project Martha is not expected to adversely affect any wetlands within the surrounding area. As such, it is considered that wetland values in the catchment will be maintained. Riparian disturbance will also be limited to that necessary to construct the new intake and outfall structures.

8.4.7.8 Historic Heritage

Objective 3.18 of the RPS specifies that sites, structures, landscapes, areas or places of historic and cultural heritage are to be protected, maintained or enhanced in order to

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19 Policy 8.4 of the RPS.

20 Policy 8.6 of the RPS.

21 Objective 3.16 also seeks that they be managed to maintain or enhance public access and amenity values and this aspect of the provision is addressed in more detail in Section 8.4.7.11 below.

retain the identity and integrity of the Waikato Region and New Zealand's history and culture. A number of policies seek to achieve this objective, and direct that:

- Tangata whenua are to be provided appropriate opportunities to express, maintain and enhance the relationship with their rohe through resource management and other local authority processes;[22]
- Provision should be made for the collaborative, consistent and integrated management of historic and cultural heritage resources; and[23]
- Development should be managed to give recognition to historic and cultural heritage and to integrate it with development where appropriate.[24]

The provisions of the RPS regarding the relationship of tangata whenua with their cultural heritage are addressed in Section 8.4.7.3 above.

With respect to historic heritage, it is noted that most of the methods place the onus on local authorities to give effect to the identified objectives and policies via the amendment and updating of their district plans. That said, Section 5.14 of this AEE notes that the Phase 4 Cutback will require the relocation of a villa at 12 Cambridge Road and the destruction or modification of possible 19th century archaeological underground mining workings or remains relating to settlement. A range of mitigation measures (including recording or research and display of heritage features) are proposed by OGNZL, which give recognition to these heritage values and will ensure that an understanding of the values of the area is retained and enhanced. These are documented in **Appendix O** to this AEE.

There will also be no effects on the setting and views of key historic heritage items or heritage landscapes as a result of Project Martha.

For completeness, Project Martha is also not considered inappropriate when regard is given to the matters set out Method 10.3.2.

8.4.7.9 Indigenous Biodiversity and Ecosystem Services

Objective 3.8 of the RPS seeks that the range of ecosystem services associated with natural resources are maintained or enhanced to enable their ongoing contribution to regional wellbeing. Further, Objective 3.19 seeks that the full range of ecosystem types, their extent and the indigenous biodiversity that those ecosystems can support exists in a healthy and functional state.

The key policies that seek to implement Objectives 3.8 and 3.19, as relevant to Project Martha, are Policies 11.1 and 11.2. They direct the following:

- Promote positive indigenous biodiversity outcomes to maintain the full range of ecosystem types and maintain or enhance their spatial extent as necessary to achieve healthy ecological functioning of ecosystems - with a particular focus on working towards achieving no net loss;

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22 Policy 4.3 of the RPS.

23 Policy 10.1 of the RPS.

24 Policy 10.3 of the RPS.

- Significant indigenous vegetation and the significant habitats of indigenous fauna should be protected by ensuring the characteristics that contribute to its significance are not adversely affected to the extent that the significance of the vegetation or habitat is reduced.

The methods that follow these policies provide direction as to how regional and district plans should manage potential adverse effects on indigenous biodiversity and significant natural areas.[25]

Project Martha does not impact on any areas of significant indigenous vegetation or significant habitats of indigenous fauna identified in the Waikato Regional Plan or the Hauraki District Plan. As such, Project Martha will not compromise the protection of significant indigenous vegetation and the significant habitats of indigenous fauna.

With respect to the maintenance of indigenous biodiversity and the extent of ecosystem types, Section 5.15 of this AEE notes that the Phase 4 cutback will disrupt planting established by OGNZL along the pit rim walkway and exotic tree planting established in adjoining residential gardens. While this vegetation provides a level of aesthetic and recreational value, it provides only a minor contribution to the ecological value of the greater area such that it is not considered that the maintenance of indigenous biodiversity will be adversely affected by Project Martha.

8.4.7.10 Landscape, Natural Character and Amenity

Objectives 3.20, 3.21 and 3.22 of the RPS relate to the management outcomes expected for landscapes, natural character and amenity respectively. They seek:

- That the values of outstanding natural features and landscapes are identified and protected from inappropriate development;
- The protection of the natural character of wetlands, lakes and rivers and their margins from the adverse effects of inappropriate development; and
- The maintenance and enhancement of the qualities and characteristics of areas and features valued for their contribution to amenity.

The associated policies and methods direct that regional and district plans should identify outstanding natural features and landscape, and areas of amenity value, and that effects on those values be managed accordingly.[26] It is noted that Project Martha is not located near any identified landscapes, features or amenity areas in the RPS, Waikato Regional Plan or the Hauraki District Plan. Furthermore, Boffa Miskell (2018a) does not identify any outstanding natural features / landscapes or amenity landscapes within the project area as part of their landscape and visual assessment.

In light of the above, Project Martha will not adversely impact on the protection of outstanding features / landscapes from inappropriate development. Likewise, Boffa Miskell

[25] For example, Method 11.1.3 of the RPS.

[26] For example, Policy 12.3 and Method 12.3.1 of the RPS.

(2018a) considers that the visual amenity effects of the project will be limited and that the visual amenity of Waihi will be maintained.

With respect to the protection of natural character from inappropriate development, Section 5.4 of this AEE concludes that the activities within the Ohinemuri River and the Mangatoetoe Stream will not inhibit the maintenance of the existing characteristics and qualities that contribute to the natural character of these waterbodies. In this regard, it is noted that the locations along these waterbodies where the intake / discharge structures will be established are already consented for such purposes and are relatively modified by the surrounding land use activities. The proposed abstraction of water from the Ohinemuri River, and discharge of pit lake overflow water to the Mangatoetoe Stream, have also been designed to maintain the functioning of these waterbodies, water quality and ecological processes for life-supporting capacity as sought by Objective 3.22.

8.4.7.11 Public Access

Objective 3.23 of the RPS seeks that public access to, and along, lakes and rivers is maintained and enhanced. Objective 3.16 seeks the same outcome in respect of riparian areas and wetlands.

Project Martha will not result in any new impediments to public access along the Ohinemuri River or the Mangatoetoe Stream. While intake / discharge structures will be installed along the margins of these waterbodies, they will not impede any existing public access that may be available. In addition, it is noted that the public access around the pit lake will be provided following the completion of mining activities and the flooding of the underground workings and pit.

8.4.7.12 Natural Hazards

Objective 3.24 of the RPS seeks that the effects of natural hazards on people, property and the environment are managed by:

- Increasing community resilience to hazard risks;
- Reducing the risks from hazards to acceptable or tolerable levels; and
- Enabling the effective and efficient response and recovery from natural hazard events.

The associated policies go on to direct natural hazard risks be managed using an integrated and holistic approach that ensures the risks from natural hazards do not exceed an acceptable level, and development is managed to reduce the risks from natural hazards to an acceptable or tolerable level.[27]

'Natural hazard' is defined in the RMA as any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding), the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment. Project Martha does not constitute a natural hazard, but it is noted that mining activities can potentially exacerbate natural hazard risks. In this context, Section 5.7

[27] Policies 13.1 and 13.2 of the RPS.

of this AEE notes that current mining operations (e.g. dewatering) have only resulted in small amounts of settlement and that no damage to property or infrastructure has been attributed to mining. Any settlement associated with Project Martha is also considered to be small and will be monitored in accordance with defined trigger levels.

With respect to the potential effects of underground mining on underground or surface stability, Section 5.8 of this AEE notes that AMC is confident that the proposed underground mining can be developed and brought into production without compromising underground or surface stability. The planned development, drilling and interpretation of ground data will provide sufficient opportunity to adjust the design in response to encountered ground conditions, and old historical workings which are encountered will be backfilled. The proffered consent conditions in **Appendix O** to this AEE also include suitable controls to ensure ground surface stability.

In addition, Section 5.5 of this AEE provides an assessment of the stability of Phase 4 Cutback in the Martha Pit. It notes that the stability of the pit walls and the proposed works has been assessed and, overall, there are high factors of safety for the Phase 4 Cutback. A number of management and monitoring measures will also be implemented by OGNZL to ensure that the remediation of the north wall occurs in a manner that allows for the Martha Pit to be completed in a safe and stable manner.

Finally, Section 5.8 of this AEE notes that consideration has been given to the potential impact of the discharge of overflow water from the pit lake to the Mangatoetoe Stream. It is not considered that this discharge will have any discernible impact on flood levels in the stream.

8.4.7.13 Soils

Objective 3.24 of the RPS seeks that the soil resource is managed to safeguard its life supporting capacity, for the existing and foreseeable range of uses. In this case, the existing and foreseeable range of uses for the area around the Martha Pit is mining and the rehabilitated parkland area.

The associated policies and implementation methods are primarily directed at regional and district Councils and regional and district plans, including direction that district plans include provisions that support the implementation of the NESCS (which is addressed in Section 8.4.3 of this AEE above).

For completeness it is also noted that the existing Rehabilitation and Closure Plan suggests the narrative closure criteria for soils at the Martha Pit be "*to identify, and as relevant remove, treat and/or appropriately dispose contaminated soil around the site to achieve regulatory requirements relevant to the proposed future use of the land*"[28] This would achieve an outcome consistent with Objective 3.24.

[28] Section 1.4.5 of the Rehabilitation and Closure Concept Plan, October 2016 (Document Reference: WAI-200-PLN-011).

8.4.7.14 Overall Conclusion

As is to be expected, there are a series of competing tensions within the objectives and policies of the RPS with respect to the utilisation of natural and physical resources for social and economic wellbeing, and the protection or maintenance of natural character, amenity, indigenous biodiversity, freshwater and cultural values. Many of the policies and methods related to the management of natural resources are also aimed at regional and district plans and direct that they be amended or updated so as to protect or maintain such values via the avoidance, remediation or mitigation of adverse effects.

Overall, it is concluded that Project Martha can be undertaken in a manner that is consistent with the objectives and policies of the RPS seeking to enable the use of natural and physical resources, and regionally important industries.

With respect to the objectives and policies of the RPS relating to the protection of natural resource values, Project Martha will be generally consistent with the outcomes sought. In this regard, the project will not impact on any identified sites of significance in relation to landscapes / features, ecological values or historic heritage.

Further, OGNZL recognises the special relationship that local iwi have with Pukewa, Motukeho and the Ohinemuri River, and that this relationship is important to spiritual and cultural wellbeing. Various measures are proposed by OGNZL to avoid, remedy or mitigate the actual and potential adverse effects of Project Martha - as detailed in Section 6 and **Appendix O** of this AEE.

8.4.8 Waikato Regional Plan

The Waikato Regional Plan contains objectives, policies, methods and rules relating to the management of natural and physical resources of the Waikato Region. The Waikato Regional Plan is fully operative and has been varied several times over the past decade to address issues relating to water allocation, geothermal systems management and water quality in Lake Taupo.

The Waikato Regional Plan was made operative prior to the NPSFM and RPS. It hasn't yet been reviewed or updated in order to give effect to these higher-order statutory planning documents.

The Waikato Regional Plan contains objectives and policies which address the following topics of relevance to Project Martha:

- Tangata whenua relationships with natural and physical resources;
- Water – including provisions which address water takes, efficient use, discharges to water, and the damming and diversion of water;
- Lake and river beds – including provisions relating to the erection and use of structures;
- Land and soil – including provisions which address works in high risk erosion areas, and discharges onto or into land; and
- Air – including the management of dust and other discharges of contaminants to air.

An analysis of the relevant objectives and policies is provided in the sub-sections below.

8.4.8.1 Tangata Whenua Relationship with Natural and Physical Resources

The objectives in Section 2.3.2 of the Waikato Regional Plan relate to the relationship of tangata whenua with natural and physical resources. They seek:

- The minimisation of uncertainty regarding the relationship between tangata whenua and resources for which they are kaitiaki; and
- Tangata whenua being able to give effect to kaitiakitanga.

The associated policies specify that the process for determining the relationship of tangata whenua with natural and physical resources should be defined, and that methods to increase community awareness of the relationship between tangata whenua and the natural and physical resources will be promoted.

As with the RPS, most of the implementation methods are focussed on actions to be undertaken by the WRC. In this regard, they refer to local authorities working with tangata whenua to establish relationships, encouraging the development of iwi management plans and facilitating the involvement of iwi in resource management processes.

Notwithstanding this, OGNZL has sought to engage (and is continuing to do so) with local iwi in relation to Project Martha. To date, no iwi have requested that a specific cultural impact assessment for the project be undertaken – instead they noted that the previous assessments for other projects provide context as to matters of importance to them in relation to mining activities in Waihi. Sections 2.5 and 5.18 of this AEE provide further context in this regard.

It is also noted that iwi have previously identified the need to protect the quality of the Ohinemuri River and manage treated water from mining activities to the Ohinemuri River (as noted in Section 8.4.7.3 of this AEE). There will be no change to the water quality or life-supporting capacity of the Ohinemuri River as a result of Project Martha.

As also noted in Section 8.4.7.3 of this AEE, the relationship of iwi with Pukewa is acknowledged and remains a matter under discussion between OGNZL and iwi. OGNZL is, however, proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan.

8.4.8.2 Surface Water Abstraction

Section 3 of the Waikato Regional Plan includes provisions that establish a water allocation framework for the proposed abstraction from the Ohinemuri River. Central to this framework is:

- Objective 3.1.2 – identifies a range of outcomes sought in the management of waterbodies. These include: enabling people to take water for social and economic wellbeing; the avoidance of significant adverse effects on aquatic ecosystems; the enhancement of the characteristics of flow regimes where practicable and justified by

ecological benefits; the maintenance or enhancement of the range of uses reliant on the characteristics of flow regimes; and the preservation of the natural character of waterbodies from inappropriate use and development; and

- Objective 3.3.2 – addresses matters which are either not included in Objective 3.1.2 or which are included but are not clearly attributable to water allocation and use. These matters include: recognition that existing water takes contribute to social and economic wellbeing and in some cases significant investment relies on the continuation of those takes; sufficient water being retained instream to safeguard the life supporting capacity of freshwater; and that decisions regarding the allocation and use of water take account of the need to avoid the further degradation of water quality.

The relevant policies in Section 3.3.3 of the Waikato Regional Plan include:

- Policy 1 – directs the establishment and review of allocable and minimum flows for waterbodies which are to be used when assessing authorised water takes and resource consent applications. It also provides a list of matters to be given particular regard when establishing allocable and minimum flows;
- Policy 2 – details that minimum flows, allocable flows and water harvesting flows will be determined as follows:

  "a. ...the minimum flow shall be set at 90% of the one in five year 7-day low flow (Q5) for streams with a mean flow greater than 5 cumecs and 95% of the Q5 for streams with a mean flow less than 5 cumecs. One function of the minimum flow is to determine when water take restrictions commence.

  b. ...primary allocable flows shall be set on the basis of the difference between the minimum flow and the Q5 flow. If the minimum flow is greater than the Q5 the allocable flow is zero.

  c. ...the level of the secondary allocable flow shall be deemed to be the portion of the flow between the primary allocable flow and 30% of Q5 except as otherwise specified in Table 3-5.

  d. ...provide for surface water harvesting at an amount up to 10% of the river's flow at times when the flow is greater than the median flow immediately upstream of the point of the take..."

  Table 3-5 goes on to specify the percentage of the Q5 flow which is required for minimum flow purposes and the percentage that is able to be allocated;
- Policies 7 and 8 – describe the activity status afforded to resource consent applications for water takes. The activity status depends on the purpose of the take, the allocation status of the catchment, whether the take is for an existing or new activity, and whether the take is from the primary / secondary allocation or is for water harvesting;
- Policy 11 – sets out the matters to be given particular regard when assessing resource consent applications for water takes. The matters listed are extensive and include the phasing out of any existing allocation of surface water that exceeds the allocable

flows in Table 3-5 or the water harvesting limits in Policy 20(b) by 31 December 2030 in accordance with Policy 19. Other relevant matters include considering the significance of the social and economic benefits that derive from existing takes and the significance of the investment that relies on the continuation of those takes, and effects on ecological values and biodiversity and the benefits of the natural flow regime variability (including sediment transport and natural flushing and flood flows);

- Policy 14 – specifies that takes for non-complying activities shall 'generally' not be granted unless it is a zero-net take, replaces a consented take for a large-scale capital-intensive activity (such as a mine), is for ecological enhancement purposes or avoids the further degradation of water quality;
- Policy 15 – addresses the consent duration for taking of water. It allows for consents associated with mines, as one example, to potentially have a term longer than 15 years;
- Policy 19 – sets out approach for phasing out exceedances of the primary and secondary allocable flows in Table 3-5; and
- Policy 20 – addresses provision for water harvesting and states:

> *"...in addition to the primary allocation and secondary allocation set out in Table 3-5, an allocation at higher flows from rivers may be provided as a restricted discretionary activity:*
>
> *...in circumstances where water is only taken when the river flow is greater than the median flow, and the total amount of water taken by way of water harvesting does not exceed 10% of the flow in the river at the time of abstraction."*

The proposed abstraction regime for the replacement of Consent 124862 will not take water from either the primary or secondary allocable flows prescribed in Policy 2 and Table 3-5, as it will only involve the taking of water when the flow in the Ohinemuri River is greater than twice MALF. The abstraction is also not 'water harvesting', which is defined in the Waikato Regional Plan as:

> *"Taking water to be stored for future use in accordance with Section 3.3.3 Policy 20."*

The proposed take is for the purpose of filling the pit lake and re-watering associated underground areas – there is no storage of water for a future use (e.g. irrigation). Further, the proposed take will not be 'in accordance with' Policy 20, which further defines the activity of water harvesting as being an abstraction when the flow in a river is greater than the median flow[29] and the total amount of water taken does not exceed 10% of the river flow at the time of abstraction. In contrast, the existing abstraction authorised by RC124862 can occur when the flow in the Ohinemuri River is greater than twice MALF.

As noted in Section 4.2 of this AEE, the proposed abstraction is considered to be a discretionary activity in accordance with Policy 7(e) and Rule 3.3.4.23(4). In this regard, it is a replacement consent for an existing take in a catchment where all existing takes

[29] Median flow is approximately 1.3 m^3/s at the point of abstraction in the Ohinemuri River.

cumulatively exceed the primary and secondary allocable flows specified in Table 3-5.[30] Rule 3.3.4.26(2) does classify 'surface water harvesting takes' which exceed the limits set in Policy 20(b) as non-complying activities. While the proposed abstraction regime will not comply with Policy 20(b), the activity is not water harvesting as defined in the Waikato Regional Plan (and is therefore not subject to this rule).

In light of the above, the policies in the Waikato Regional Plan addressing the primary and secondary allocable flows, and water harvesting, are not directly relevant to the proposed abstraction regime.

Policy 11 is, however, considered to be relevant to the proposed abstraction regime as it applies when assessing any resource consent application for a surface water take. It sets out matters that are to be given particular regard, which means that they are important to decision-making and are to be considered and carefully weighed. They are not absolute requirements or standards in their own right.

The matters in Policy 11 relevant to the proposed abstraction regime include:

- Cultural effects;
- Demonstrating the need for the take and water efficiency measures;
- The need to ensure that water is available for existing and foreseeable water supply needs;
- The significance of the benefits derived from existing takes and the significance of investment that relies on the continuation of these takes;
- Potential adverse effects on existing users;
- Effects on water quality;
- Consideration of alternative water sources;
- Whether Tangata Whenua uses and values are maintained or enhanced;
- Effects on ecological values and biodiversity, including the benefits of natural flow variability;
- The need to ensure waterbodies are not over-allocated;
- Whether the applicant has demonstrated a continued need for the take;
- Effects on wetlands and significant indigenous areas;
- Effects on fish passage and migration; and
- Mitigation measures.

These matters are addressed, as applicable, in Section 5 of this AEE.

Policy 11 also requires particular regard to be given to the significant social and economic benefits that would accrue by enabling the pit lake to be filled in the shortest timeframe

[30] As defined by the WRC's online water allocation tool.

possible. The proposed abstraction regime would enable the re-watering of the underground workings and pit lake within approximately 9.5 years.

If there is not universal agreement that the proposed abstraction regime is not water harvesting, and the application were considered to be a non-complying activity in accordance with Rule 3.3.4.26(2), this would still not represent a barrier to granting the consent. This is because it is not considered that the application would be contrary or repugnant to the objectives and policies of the Waikato Regional Plan for the reasons set out below:

- Policy 2(d) 'provides for' surface water harvesting up to 10% of the river's flow at times when the flow is greater than the median flow. While the proposed abstraction regime would not be consistent with these parameters, it is not considered that the policy requires all takes to meet them either. In this regard, the policy does comment on the appropriateness (or otherwise) of alternative surface water harvesting proposals – it simply seeks to make water available for use within the specified parameters;
- Policy 7 does not seek to preclude water harvesting takes that are not in accordance with Policy 20 by classifying them as prohibited activities. Rather, the policy classifies 'other' proposed takes as non-complying activities – which makes provision for the consideration of exceptions or alternatives in accordance with Section 104D of the RMA;
- Policy 11(d) does refer to phasing out any existing allocation of surface water that exceeds the allocable flows in Table 3-5 or the water harvesting limits in Policy 20(b) by 31 December 2030 in accordance with Policy 19. This is a matter to be given particular regard, which as noted above, is not an absolute requirement. However, Policy 19 does not address the phasing out of existing allocations that exceed the water harvesting limits. The focus in clauses (b) and (c) is limited to the phasing out exceedances of the primary and secondary allocable flows in Table 3-5;
- Policy 14 states that non-complying activities shall 'generally' not be granted, unless the take is one of the listed exceptions. In this instance the resource consent application relates to the replacement of a consented take for a large-scale capital-intensive activity and will be managed to avoid the further degradation of water quality; and
- Policy 20 reinforces that an allocation at higher flows 'may be provided' as a restricted discretionary activity in circumstances where the amount is up to 10% of the river's flow and at times when the flow is greater than the median flow. It does not provide any commentary on the appropriateness (or not) of takes that are deemed non-complying activities and which may be true exceptions. As such, it is considered that Policy 11 provides the assessment framework for any resource consent application for flow harvesting that is classified as a non-complying activity.

For the above reasons, and based on the assessment of effects of the proposed abstraction regime in Section 5.8 of this AEE, it is considered that the outcomes sought by Objectives 3.1.2 and 3.3.2 (in terms of maintaining the benefits provided by flow regime variability, sediment transport and flood flows) can be achieved for this project.

8.4.8.3 Groundwater Abstraction

The abstraction of groundwater for the dewatering of the Martha Underground Mine and the Martha Pit is also subject to Objectives 3.1.2 and 3.3.2 of the Waikato Regional Plan.

The Waihi Basin is not currently subject to a sustainable yield in accordance with Table 3-6 of the Waikato Regional Plan, and the necessary resource consent application for groundwater dewatering is to be considered in accordance with the matters set out in Policy 12 of Section 3.3.3. The relevant matters include:

- The effect of the activity on the relationship of tangata whenua with their ancestral lands and waters;
- The need for the volume and rate of water sought;
- The need to ensure that groundwater is available for existing and foreseeable domestic or municipal supply needs;
- Consideration of alternative water sources;
- Whether existing lawful takes of water will be adversely affected;
- Whether tangata whenua uses and values, including the mauri of water, are maintained or enhanced;
- The need to ensure that aquifers are not over-allocated;
- Any demonstrated return flow to the aquifer;
- Whether surface water instream uses, values and flows are adversely affected;
- Where sustainable yields have not been set in Table 3-6 potential for loss of recharge to other aquifers;
- Where sustainable yields have not been set in Table 3-6 potential adverse effects from aquifer compaction and ground surface subsidence;
- Potential for contamination of ground or surface water;
- Potential for interference effects on neighbouring bores;
- Possible monitoring methods;
- Demonstration that physical access to the water does not adversely affect any other land and/or property owner; and
- The nature of hydraulic connection (if any) between the groundwater resource from which water is proposed to be taken and surface waterbodies.

The rationale for the abstraction of groundwater for Project Martha is explained in Section 3 of this AEE, while the actual and potential effects of the abstraction of groundwater (and how these will be managed) are discussed in Section 5 of this AEE. In particular, it is noted that the abstraction of groundwater is necessary to provide safe access to the mineral resources and that there are no alternative options to this approach to the operation of Project Martha. Further, it is concluded that the abstraction of groundwater will not impact on any existing groundwater abstractions or wetlands around Waihi – as noted in Section 5.7 of this AEE.

8.4.8.4 Geothermal Water

As noted in Section 4.2 of this AEE, OGNZL has identified that some groundwater being abstracted as part of dewatering for the Correnso Underground Mine has a temperature exceeding 30°C. As such, there is potential for abstracted groundwater for the operation of the Martha Underground Mine and Martha Pit to be deemed geothermal water.

The relevant objective of Section 7 of the Waikato Regional Plan seek the following outcomes:

- Geothermal energy and water shall be used and managed efficiently;[31]
- In all Small Geothermal Systems[32], significant adverse effects on significant geothermal features arising from the take of geothermal energy and fluid are to be avoided; and[33]

The dewatering of groundwater for the operation of the Martha Underground Mine and the Martha Pit is not for a consumptive purpose (i.e. the abstraction occurs solely to avoid the flooding of the workings). As such, it does not raise any issues with respect to efficiency of use.

There are no significant geothermal features identified in the vicinity of Waihi.

In light of the above, it is considered that any abstraction of geothermal water will be consistent with the relevant provisions in the Waikato Regional Plan.

8.4.8.5 Discharges to Water

Objective 3.5.2 of the Waikato Regional Plan seeks that discharges of contaminants to water be undertaken in a manner that:

- Does not have adverse effects that are inconsistent with the water management objectives in Section 3.1.2;
- Does not have adverse effects that are inconsistent with the discharges onto or into land objectives in Section 5.2.2; and
- Ensures that decisions regarding the discharge of contaminants to water do not reduce the contaminant assimilative capacity of the water body to the extent that allocable flows as provided for in Chapter 3.3 are unable to be utilised for out of stream uses.

Policy 2 of Section 3.5.3 follows a similar theme as Objective 3.5.2 and seeks that adverse effects on surface waterbodies that are inconsistent with the policies in Section 3.2.3 of the Waikato Regional Plan are avoided, as far as practicable, and otherwise remedied or

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31 Objective 1 of Section 7.3 of the Waikato Regional Plan.

32 The area is not identified as a Development, Limited Development, Research or Protected Geothermal System. As per Chapter 7.2.1 of the Waikato Regional Plan it is therefore treated as a Small Geothermal System.

33 Objective 3 of Section 7.3 of the Waikato Regional Plan.

mitigated. Likewise, it seeks that the discharges not cause significant adverse effects from flooding, erosion or downstream siltation.

As noted in relation to the analysis of the NPSFM, Section 5.8 of this AEE concludes that the discharge from the pit lake will not have a discernible impact on flood levels in the Mangatoetoe Stream. Likewise, this section also concludes that life-supporting capacity and ecosystems within the stream will not be unduly impacted by the proposed (intermittent) discharge.

The quality of any overflow water will also be managed and monitored so that it does not exceed the existing receiving water standards established for the discharge in the conditions of RC971293.

Policy 5 of Section 3.5.3 is specific to discharges into land and seeks that the adverse effects of those discharges on groundwater quality be minimised by ensuring that they do not compromise existing or reasonably foreseeable uses of groundwater, and avoid, as far as practicable, adverse effects on surface waterbodies that are inconsistent with the policies in Section 3.2.3 of the Waikato Regional Plan (and otherwise, remedy or mitigate those effects). As outlined in Section 5.7.2 of this AEE Project Martha effects on groundwater will be minimal, in accordance with the effects of existing activities, and will not compromise reasonably foreseeable uses of groundwater, nor have effects in consistent with the policies in Section 3.2.3 of the Waikato Regional Plan.

8.4.8.6 River and Lake Bed Structures

Objectives 4.2.2 and 4.3.2 address the management of structures in, on, under or over the beds of rivers and lakes (and associated disturbance activities). They seek that this occur in a manner that:

- Produces a net reduction in the adverse effects of the destabilisation of river and lake beds;
- Does not have adverse effects on water quality, flow regimes, aquatic ecosystems and wetlands that are inconsistent with Objective 3.1.2;
- Maintains bank stability;
- Does not obstruct fish passage for trout and indigenous fish to complete their life cycle;
- Preserves the natural character of river and lake beds and their margins and protects them from inappropriate use and development;
- Does not increase the adverse effects of flooding;
- Provides for navigation of water bodies where appropriate;
- Remedies or mitigates adverse effects of existing structures on the relationship tangata whenua as kaitiaki have with identified taonga;
- Avoids significant adverse effects, and remedies or mitigates cumulative effects, of new structures on the relationship tangata whenua as kaitiaki have with identified taonga; and

- Maintains existing legal public access to and along river and lake beds and their margins.

The associated policies clarify that the matters set out above will be considered when considering resource consent applications for structures in, on, under or over the beds of lakes and rivers,[34] but also acknowledge that positive benefits can arise from the use, development and protection of river and lake beds.[35]

The intake and discharge structures required for the rehabilitation of the pit lake are being reconsented as part of Project Martha. They will effectively be constructed and operated in the same manner as currently authorised, such that no additional adverse effects are anticipated. In this regard, the final design of the structures will ensure that the potential for fish entrainment is minimised. The existing natural character values of the Ohinemuri River and the Mangatoetoe Stream will also be retained.

The intake and discharge structures will also not impact on the navigation of waterbodies, noting that the Mangatoetoe Stream is not considered navigable.

Overall, the proposed parameters for the design of the intake structure will minimise the adverse effects of physical disturbance to aquatic life and habitat and the activities are considered to be broadly consistent with those sought by the identified objectives and policies.

8.4.8.7 Accelerated Erosion

The walls of the Martha Pit, and the riparian areas where the new intake and outfall structures will be located, meet the definition of 'high risk erosion areas' in the Waikato Regional Plan - and the provisions in Section 5.1 are relevant to activities in those areas.

Of most relevance is Objective 5.1.2, which seeks a net reduction in accelerated erosion. Policy 2 also states that the WRC will use a mixture of regulatory and non-regulatory approaches to minimise the adverse effects of soil disturbance and vegetation clearance in high risk erosion areas.

The activities associated with Project Martha are aligned with these provisions, noting that:

- There will be no connection between the works on, and around, the walls of the Martha Pit and downstream waterbodies (i.e. the works are occurring in a contained environment); and
- The final design and construction methodology for the intake and outfall structures will address any necessary stability and erosion control measures.

8.4.8.8 Discharges to Land

Objective 5.2.2 of the Waikato Regional Plan relates to the discharges of wastes and hazardous substances onto or into land. It acknowledges that discharges onto, or into, land are a necessary facet of resource use in the Waikato Region and, subject to

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[34] For example, Policy 2, Section 4.2.3 of the Waikato Regional Plan.

[35] For example, Policy 6, Section 4.2.3 of the Waikato Regional Plan.

environmental standards, should be allowed to occur. In that context it seeks that these discharges be undertaken in a manner that:

- Does not contaminate soil to levels that present significant risks to human health or the wider environment;
- Does not have adverse effects on aquatic habitats, surface water quality or ground water quality that are inconsistent with the Water Management objectives in Section 3.1.2;
- Does not have adverse effects related to particulate matter, odour or hazardous substances that are inconsistent with the Air Quality objectives in Section 6.1.2;
- Is not inconsistent with the objectives in Section 5.1.2; and
- Avoids significant adverse effects, and remedies or mitigates cumulative adverse effects, on the relationship that tangata whenua as kaitiaki have with their taonga such as ancestral lands, water and waahi tapu.

Policy 2 of Section 5.2.3 follows a similar theme as the objective and seeks that discharges of contaminants to land be undertaken in a manner that avoids, where practicable, adverse effects on a range of values. Where the avoidance of adverse effects is not possible, the policy seeks that they be remedied or mitigated.

These provisions are particularly relevant to the proposed placement and storage of waste rock at the Martha Pit and Processing Plant, and the use of waste rock and CAF to backfill stopes in the Martha Underground Mine. A range of recognised methods for the management of mine waste have been effectively employed for the existing mines operated by OGNZL and Project Martha will be undertaken in a similar manner.

With these methods in place, it is considered that the outcomes sought by Objective 5.2.2 (and its associated policies) will be achieved.

8.4.8.9 Air Quality

There are three objectives in Section 6.1.2 of the Waikato Regional Plan relating to the management of air quality. They seek:

- The significant characteristics of air quality are either protected, enhanced or maintained;[36]
- No significant adverse effects from individual site sources on the characteristics of air quality beyond property boundary; and[37]
- The management of the cumulative effects of discharges on ambient air quality.[38]

The relevant policies direct that the effects of air discharges be managed having particular regard to the effects on ambient air quality guidelines, human health, the identified values

[36] Objective 1, Section 6.1.2 of the Waikato Regional Plan.
[37] Objective 2, Section 6.1.2 of the Waikato Regional Plan.
[38] Objective 3, Section 6.1.2 of the Waikato Regional Plan.

of tangata whenua as kaitiaki, and any potential cumulative effects. Recognition is also given to the positive benefits to people and communities arising from activities that affect air quality (whilst ensuring that air quality resources are protected and adverse effects avoided, remedied or mitigated).[39]

The analysis in Section 8.4.7.4 of this AEE is equally applicable to the air quality provisions of the Waikato Regional Plan. In this regard, particulate deposition and the concentrations of PM_{10}, respirable silica, NO_2, NO and CO associated with air discharges from Project Martha and the existing mining operations are expected to remain within the relevant standards and guidelines, and will be managed so as not to result in objectionable effects beyond the site boundary. A number of management measures are proposed by OGNZL to ensure this is the case, including implementation of an Air Quality Management Plan.

In light of the above, it is considered that Project Martha can be undertaken in such a manner that it meets the management outcomes sought by Objectives 1, 2 and 3 of Section 6.1.2 of the Waikato Regional Plan.

9.4.8.10 Overall Conclusion

Based on the analysis in the sub-sections above, it is considered that the various 'regional' activities associated with Project Martha will be managed such that the project is not contrary to the relevant objectives and policies of the Waikato Regional Plan. Of particular note:

- The abstraction of groundwater for dewatering purposes will not adversely affect any shallow groundwater or surface waterbodies;
- The relationship of iwi with Pukewa is acknowledged and remains a matter under discussion between OGNZL and iwi. The company is, however, proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan;
- The proposed abstraction of water from the Ohinemuri River does not constitute the over-allocation of water resources, and will continue to ensure that the life-supporting capacity of the river is safeguarded and the ecological benefits associated with freshes and floods are maintained;
- The rehabilitation of the pit lake and discharge of overflow water to the Mangatoetoe Stream will be managed in accordance with appropriate water quality standards. In addition, the discharge of overflow water will not have a discernible impact on flood levels in the stream; and
- The discharge of contaminants to air will not exceed the applicable air quality standards and guidelines, and will be managed so that they do not cause offensive or objectionable effects beyond the boundaries of the site.

[39] Policy 2, Section 6.1.3 of the Waikato Regional Plan.

8.4.9 Hauraki District Plan

The Hauraki District Plan was made operative in 2014 and includes objectives, policies and methods intended to achieve the integrated management of the use, development or protection of land (and associated natural and physical resources) in the Hauraki District.

Sections 5, 6, 7 and 8 of the Hauraki District Plan contain objectives and policies. The objectives and policies most relevant to Project Martha are contained in:

- Section 5 – which contains objectives and policies for the various zones in which Project Martha will be undertaken;
- Section 6 – which contains objectives and policies relating to the management of historic heritage, indigenous biodiversity, landscapes and significant trees;
- Section 7 – which contains objectives and policies for activities in riparian margins and esplanade reserves, the management and use of hazardous substances and contaminated land, earthworks, the management of the transport network and the use of financial contributions; and
- Section 8 – which contains objectives and policies relating to performance standards for subdivision and development.

Each is addressed below.

8.4.9.1 Residential Zone

A small part of the northwest corner of the Phase 4 Cutback, along with a section of the western noise bund and the outlet structure for the pit lake, will occur in the Residential Zone. These activities are all considered to be 'mining operations' as per the definition in the Hauraki District Plan (and as already discussed in Section 4.1 of this AEE).

In addition, the Martha Underground Mine will be partly located under the Residential Zone.

Section 5.7 of the Hauraki District Plan describes the Residential Zone as enabling a variety of residential activities and some compatible non-residential activities in a manner that ensures that the amenity and character of the residential areas is protected. There are three objectives and a number of associated policies relating to the management of activities in the Residential Zone.

Objective 1 seeks to provide for residential development that maintains and enhances neighbourhood amenities and qualities consistent with the aspirations of the individual communities within those areas. While the objective is not particularly relevant to Project Martha (as it is specific to residential development in the zone), Policies 1(a)(i) and (v) direct that:

- Activities in residential areas should be required to be sited, designed and operated in such a way that avoids, remedies or mitigates adverse noise, privacy and traffic effects on health, safety and amenity values; and
- Flexibility be provided for non-residential activities which are not incompatible in scale, intensity and character with the residential area in which they are located.

Objective 3 seeks to avoid, remedy or mitigate any adverse effect of residential and non-residential developments on the environment and character of the locality. Policies 3(a)(i), (ii) and (iii) direct this to be achieved by:

- Ensuring development is designed and located to integrate well with the immediate locality, contribute positively to the streetscape, and provide occupants of dwellings with a reasonable amenity;
- Ensure development and subdivision can be effectively serviced by local infrastructure or in a manner which can protect the health and safety of residents and does not have a detrimental effect on the environment; and
- Ensuring development can safely cater for on-site traffic, parking and servicing needs and has safe and practical vehicular access to a public road.

The key potential effects on residential amenity in the Residential Zone associated with Project Martha are visual, noise, vibration, air quality and traffic.

The Martha Pit has been a key feature of Waihi for a number of years and mining has a strong influence on the character of the town. While all of the pit is located in the Martha Mineral Zone, it does directly abut the Residential Zone in a number of places. In addition, activities associated with the mine are already authorised to occur in the Residential Zone as a result of LUC 97/98-105 (including the outlet structure for the pit lake). Notwithstanding this, Section 5.4 of this AEE notes that mining activities have not resulted in major visual impacts on adjoining areas (primarily due to the topography and vegetation which maintains an effective screen along the pit rim).

Section 5.4 of this AEE also notes that the Phase 4 Cutback will generate some temporary adverse physical and landscape effects, such effects will be low and occur in a relatively short period of time. Landscape mitigation will ensure the resultant changes along the pit rim retain an appropriate residential scale, and will include planting associated with noise bunds and realignment of the pit rim walkway to provide amenity improvements. In addition, there may be some moderate-low adverse visual effects from adjoining residential properties at the commencement of Project Martha (as initial works and associated noise bunds / fencing are developed). However, once operational the potential for adverse visual effects will reduce as planting is re-established along this area of the pit rim and mining within the open pit remains visually well contained below the pit rim. Beyond the pit rim, views of the Martha Pit will remain limited.

The potential noise and vibration effects associated with Project Martha are addressed in Sections 5.9 and 5.10 of this AEE respectively. In addition, the noise and vibration effects associating with mining activities in Waihi already authorised by existing resource consents or permitted activity rules are detailed in Section 2. It is important to acknowledge that some noise and vibration is an expected part of the immediate residential environment by way of the rules / standards in the Hauraki District Plan.

A key focus of the noise and vibration assessments has been on the establishment of noise and vibration limits / controls, and mitigation options, such that the amenity of the surrounding community is appropriately protected. This does not mean undertaking mining activities without generating any noise or vibration effects. Rather, the focus has been on

ensuring that the generation of noise and vibration is managed within recognised limits relating to the ability for people to continue to reasonably enjoy their properties.

The vibration limits proposed for blasting activities associated with Project Martha generally reflect the existing performance standard of 5 mm/s in the Hauraki District Plan and other international standards. The proposed blast times for open pit and underground operations associated with Project Martha also reflect the existing limits that apply to existing mining activities in Waihi.

The proposed noise controls reflect a proposal to develop a uniform noise control for the all mining operations by modifying the location of the current noise control boundaries that apply to the Martha Pit and surface facilities. The proposed daytime noise limits of 50 and 55 dB L_{Aeq} (depending on location) are within the limits recommended in NZS6802:2008 and are consistent with the recommendations for daytime noise published by the World Health Organisation. The proposed noise limit of 40 dB L_{Aeq}, which applies during all other times, is also consistent with NZS:6802 and WHO guidance for the preservation of sleep when residents may have their windows open at night.

In light of the noise bund mitigation proposed by OGNZL, there will be three properties not owned by OGNZL where noise levels above 50 dB L_{Aeq} may be experienced (but not above 55 dB L_{Aeq}). One of these is in the Residential Zone, the other two are in the Low Density Residential Zone. However, this effect will be limited to a nominal six-month period at any given receiver - after which the mining will have moved and the noise exposure reduced to no more than 50 dB L_{Aeq}. In addition, it is noted that:

- Any increased noise levels will be limited to daytime hours;
- In most instances the level of noise at the boundary of any dwellings will remain close to 50dB L_{Aeq} (i.e. 51 - 53 dB L_{Aeq}). While such increases in noise will be measurable, they are unlikely to be discernible to residents;
- Similar noise levels have been previously experienced in these areas as a result of authorised mining activities in the Martha Pit.

Establishing a larger noise bund so as to achieve 50 dB L_{Aeq} for these three properties would cause more substantial noise effects than the effects generated by the works in the Martha Pit.

Potential air quality effects have been discussed in relation to the NESAQ, RPS and the Waikato Regional Plan. In this regard, the air discharges from Project Martha are expected to remain within the relevant standards and guidelines, and a number of management measures are proposed by OGNZL to ensure that any discharges to air are managed and controlled so they do not result in objectionable effects beyond the boundaries of the site.

With respect to traffic effects, the Martha Pit will continue to be accessed from existing access points - none of which are located in the Residential Zone. Any changes to traffic volume will have less than minor effects on the surrounding road network.

On the basis of the above, it is considered that Project Martha can be undertaken in a manner that is not incompatible with the scale, intensity and character of the immediate area comprising the Residential Zone. Specific controls on mining activities are proposed

by OGNZL so as to ensure that the health and amenity of the adjacent residents in the Residential Zone can be maintained overall.

8.4.9.2 Low Density Residential Zone

The northwest corner of the Phase 4 Cutback, most of the noise bund and the re-alignment of Bulltown / Cambridge Roads will be located in the Low Density Residential Zone. No underground mining will occur in the Low Density Residential Zone. As noted in Section 8.4.9.1 above, the activities proposed to occur in the Low Density Residential Zone are considered to be 'mining operations' as per the definition in the Hauraki District Plan.

Section 5.8 of the Hauraki District Plan describes the purpose of the Low Density Residential Zone as being to satisfy a particular demand from people wishing to live in a semi-rural setting, but which want to have minimal involvement in farming activities. Objectives 1 and 2 are most relevant to Project Martha and seek:

- To retain highly productive land for existing and further rural production activities; and
- To provide areas that are attractive for low density residential development.

The associated policies seek to give effect to Objective 1 and 2 by:

- Providing for low density residential activities in a number of locations on land suitable for that activity and of lesser quality for productive purposes; and[40]
- Protecting and enhancing the rural-residential amenities of the zone (e.g. privacy, space, quiet) by controlling the scale, location and type of activities compatible with the environment they are located within.[41]

The Phase 4 Cutback is not considered to impact on the ability to provide for low density residential development in semi-rural locations within Waihi in accordance with Objective 1. In this regard, only a very small number of properties in the Low Density Residential Zone are directly impacted by the Phase 4 Cutback and this will not impact on the ability of the zone to accommodate a particular demand from people wishing to live in a semi-rural setting around Waihi.

With respect to protecting and enhancing the amenity of the Low Density Residential Zone, most of the analysis in Section 8.4.9.1 of this AEE with respect to the Residential Zone is also considered to be applicable. In this regard, the potential for adverse visual effects will reduce as planting is re-established along this area of the pit rim and mining within the open pit remains visually well contained below the pit rim. Beyond the pit rim, views of the Martha Pit will remain limited such that it is not incompatible with the surrounding environment.

Specific controls and management plans are proposed by OGNZL with respect to noise, vibration and air quality (as noted in **Appendix O** to this AEE). These have been designed with the express purpose of ensuring that the health and amenity of the adjacent residents is maintained in accordance with Objective 2.

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40 Policy 1(a)(i), Section 5.8 of the Hauraki District Plan.
41 Policy 2(a)(iii), Section 5.8 of the Hauraki District Plan.

With respect to construction activities (e.g. the realignment of Bulltown / Cambridge Road, the construction of the noise bund and the removal / demolition of dwellings), noise effects will be managed in accordance with NZS 6803:1999 and with mitigation for specific properties so that the noise level is considered reasonable for construction work. This is discussed further in Section 5.9 of this AEE.

On the basis of the above, it is considered that Project Martha can be undertaken in a manner that is not incompatible with the scale, intensity and character of the immediate area comprising the Low Density Residential Zone.

8.4.9.3 Town Centre Zone

The Martha Underground Mine will partly occur under the Town Centre Zone (principally in the vicinity of Gilmour Street).

The Town Centre Zone provides for a broad range of business activities whether these be retail, administration or light industry. Section 5.11 of the Hauraki District Plan goes on to describe the Town Centre Zone in Waihi as follows:

> *"The established town centre is on both sides of Seddon Street extending from Devon Street to Gilmour Street, with a pedestrian shopping core between State Highway 2 and Mueller Street. The existing town centre has substantial depth on the southern side of Seddon Street and to balance this, the Town Centre Zone has been extended on the northern side of Seddon Street, to encompass the industrial area in the Martha Street vicinity, and to include the former and new Mitre 10 sites at the western end."*

The only provisions in Section 5.11 of the Hauraki District Plan of relevance to Project Martha are Policy 1(a)(iv) and Objective 2, which seek to:

- Ensure activities are sited, designed and operated to avoid, remedy or mitigate adverse amenity effects on adjacent residential and reserve areas, and on the efficient operation of main traffic routes; and
- Provide for a safe, convenient, pleasant and environmentally friendly environment for business, shopping and community activities.

Project Martha will not impact on the outcomes sought for the Town Centre Zone in the Hauraki District Plan. As already discussed in this statutory assessment, the potential vibration effects associated with blasting in the underground mine will be controlled in accordance with limits which generally reflect the existing performance standard of 5 mm/s in the Hauraki District Plan and other international standards. The proposed blast windows for open pit and underground operations associated with Project Martha also reflect the existing limits that apply to OGNZL's mining operations.

Section 5.10 of this AEE also notes that these vibration limits will not impact on any commercial buildings in the Town Centre Zone, as it is accepted that commercial buildings and other infrastructure can withstand vibration levels far greater than those applied for personal amenity.

Further, it is not considered that the Town Centre Zone will experience any adverse traffic effects associated with Project Martha.

8.4.9.4 Rural Zone

The use of existing underground mining infrastructure, the establishment of the intake structure and pipeline corridor, stockpile areas and the concrete batching plant are located in the Rural Zone.

Section 5.1 of the Hauraki District Plan identifies that most of the land in the Rural Zone is in pasture or under cultivation, but that there are also areas of commercial forestry and that extractive industry occurs in a number of locations. It also identifies that there are significant natural areas, outstanding natural features and landscapes and district amenity landscapes within the Rural Zone. In this regard, the relevant objectives for the Rural Zone seek:

- To preserve and enhance the open rural landscape character of the zone;[42]
- To provide for the investigation and utilisation of mineral resources including on-site processing and use of these resources by associated industries; and[43]
- To ensure that adverse effects of a land use activity on the environment or on the amenities of neighbours are avoided, remedied or mitigated.[44]

The surface features associated with Project Martha in the Rural Zone will be located in areas that have previously been authorised for mining operations (and are simply being reconsented for reasons outlined in Section 4.1 of this AEE). They are also generally located in close proximity to the Martha Mineral Zone (e.g. the concrete batching plant), which means that they are occurring in an area where mining-related activities are an expected part of the environment.

The retention of existing controls on the operation of these surface facilities will ensure that any potential adverse effects on the amenity of rural neighbours are avoided, remedied or mitigated.

8.4.9.5 Reserve (Active) Zone

The Martha Underground Mine will partly occur under the Reserve (Active) Zone – specifically Rugby Park.

Section 5.14 of the Hauraki District Plan sets out the framework for reserves in the Hauraki District. Reserves are intended to provide for the needs of the community and promote the health and wellbeing of the populace. Reserves are also intended to provide for active and passive recreation opportunities, as well as protection of ecological, historic and other environmental resources.

Section 5.15 relates to the Reserve (Active) Zone. The objectives for the zone relevant to Project Martha seek the following outcomes:

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42 Objective 2, Section 5.1 of the Hauraki District Plan.

43 Objective 3, Section 5.1 of the Hauraki District Plan.

44 Objective 4, Section 5.1 of the Hauraki District Plan.

- Provision for a variety of passive and active recreational and social uses compatible with both the functions of the reserve and the amenities of the reserve; and[45]
- The conservation of those natural features which contribute significantly to the amenities of the reserve.[46]

Project Martha will also not impact on the outcomes sought for the Reserve (Active) Zone in the Hauraki District Plan. As already discussed in this statutory assessment, the potential vibration effects associated with blasting in the underground mine will be controlled in accordance with limits which generally reflect the existing performance standard of 5 mm/s in the Hauraki District Plan and other international standards. The proposed blast windows for open pit and underground operations associated with Project Martha also reflect the existing limits that apply to OGNZL's existing mining activities.

Section 5.10 of this AEE notes that these vibration limits will not impact on any commercial buildings in the Reserve (Active) Zone (i.e. the Waihi Rugby Club), as it is accepted that commercial buildings and other infrastructure can withstand vibration levels far greater than those applied for personal amenity.

In addition, Project Martha will not impact on any natural features of Rugby Park.

8.4.9.6 Reserves (Passive) Zone

The use of existing underground mining infrastructure will occur in the Reserves (Passive) Zone.

The Reserve (Passive) Zone includes neighbourhood and local recreation reserves, esplanade, historic, amenity, and local purpose reserves, picnic / rest areas, water and soil conservation, coastal protection, tree and vegetation protection and archaeological/cultural reserves. The zone provides for passive types of recreation, such as walking, kite flying, picnic facilities and playgrounds. Buildings are generally limited (apart from those immediately related to the activity).

The objectives and policies in Section 5.16 seek to provide for passive recreation and reserve activities that enhance the function of the reserve itself and contribute to its amenity. They also seek to limit physical structures to those required for the purpose of the reserve.

Given that Project Martha only involves the use and maintenance of existing underground mining infrastructure in the Reserve (Passive) Zone, it is not considered that it will impact on the outcomes sought for the zone in the Hauraki District Plan.

8.4.9.7 Martha Mineral Zone

The majority of Project Martha will be located within the Martha Mineral Zone, including most of the Martha Underground Mine.

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45 Objective 1, Section 5.15 of the Hauraki District Plan.

46 Objective 2, Section 5.15 of the Hauraki District Plan.

There is one objective and four policies relating to the management of activities within the Martha Mineral Zone. Objective 1 seeks to provide for the utilisation of mineral resources in the Martha Mineral Zone in a sustainable manner. The associated policies seek to give effect to Objective 1 by:

- Recognising the development of the mine and its processing areas, its ongoing rehabilitation and its longer term likely uses;[47]
- Providing for the social, economic and cultural wellbeing of the people of the Hauraki District and for their health and safety;[48]
- Ensuring that the amenity values of Waihi and the wider community are protected; and[49]
- Recognising that the risks associated with the historic underground working areas require a mixture of approaches to avoid, remedy or mitigate those hazards and provide for appropriate longer-term land use activities.[50]

Project Martha will provide for the continued utilisation of the mineral resource in Waihi over a period of approximately 12 years and, at the same time, facilitate the rehabilitation of the north wall of the Martha Pit. In doing so, the project will further provide for the social and economic wellbeing of Waihi and the Hauraki District as detailed in Section 5.3 of this AEE.

Project Martha also proposes an update to the Rehabilitation and Closure Plan for the Martha Pit. This update still reflects the existing community expectations with respect to the pit lake and will continue to provide for full public access around the pit rim.

With respect to ensuring the protection of the amenity values of Waihi, this matter has been discussed in detail in Sections 8.4.9.1 and 8.4.9.2 of this AEE with respect to the objectives and policies of the Residential and Low Density Residential Zones. The analysis provided with respect to the management of potential amenity effects for those zones applies equally to Policy 1(a)(iii).

With respect to the potential effects of underground mining on underground or surface stability, Section 5.5 of this AEE notes that AMC is confident that the proposed underground mining can be developed and brought into production without compromising underground or surface stability. The planned development, drilling and interpretation of ground data will provide sufficient opportunity to adjust the design in response to encountered ground conditions. The proffered consent conditions in **Appendix O** to this AEE also include suitable controls to ensure ground surface stability.

In addition, Section 5.5 of this AEE provides an assessment of the stability of the Phase 4 Cutback in the Martha Pit. It notes that the stability of the pit walls and the proposed works has been assessed and, overall, there are high factors of safety for the Phase 4 Cutback. A number of management and monitoring measures will also be implemented by OGNZL to

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47 Policy 1(a)(i), Section 5.17 of the Hauraki District Plan.

48 Policy 1(a)(ii), Section 5.17 of the Hauraki District Plan.

49 Policy 1(a)(iii), Section 5.17 of the Hauraki District Plan.

50 Policy 1(a)(iv), Section 5.17 of the Hauraki District Plan.

ensure that the remediation of the north wall occurs in a manner that allows for the Martha Pit to be completed in a safe and stable manner.

The proposed increased rate of take from the Ohinemuri River will also ensure the pit lake is filled in a similar timeframe to currently expected and will contribute to providing for the social wellbeing of Waihi's residents, and the amenity values the pit lake will provide. In light of the above, it is considered that Project Martha will be consistent with the outcome sought by Objective 1 and its associated policies with respect to the Martha Mineral Zone.

8.4.9.8 Historic Heritage

The relevant objectives in Section 6.1 of the Hauraki District Plan seek the following outcomes:

- The protection of a range of heritage items that reflect the past history of the Hauraki District from the adverse environmental effects of other activities;[51]
- The protection of significant archaeological sites which contribute to the District's heritage, knowledge and appreciation of the past;[52]
- Recognition and protection of sites of significance to Maori; and[53]
- The sustainable management of the built heritage resource by encouraging and promoting adaptive reuse of the built heritage features resource.[54]

It is noted that most of the policies focus on the management of scheduled historic heritage items in the Hauraki District Plan. To this extent, it is noted that Project Martha does not involve the disturbance or destruction of any scheduled historic heritage items and no resource consent application is required for works involving historic heritage under the Hauraki District Plan.

That said, Section 5.14 of this AEE notes that Phase 4 Cutback will require the relocation of a villa at 12 Cambridge Road and the destruction or modification of possible 19th century archaeological underground mining workings or remains relating to settlement. A range of mitigation measures (including relocation, recording or research and display of heritage features) are proposed by OGNZL to ensure that any potential effects are minor in nature and an understanding of heritage values in the area is retained.

The relationship of iwi with Pukewa is acknowledged and remains a matter under discussion between OGNZL and iwi (and any further detail on outcomes between the parties will be provided as, and when, appropriate). However, OGNZL is proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan.

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51 Objective 1, Section 6.1 of the Hauraki District Plan.
52 Objective 2, Section 6.1 of the Hauraki District Plan.
53 Objective 3, Section 6.1 of the Hauraki District Plan.
54 Objective 5, Section 6.1 of the Hauraki District Plan.

8.4.9.9 Indigenous Biodiversity and Significant Natural Areas

The objectives in Section 6.2 of the Hauraki District Plan seek the following outcomes:

- The protection of significant natural areas for the purpose of maintaining and enhancing their intrinsic, cultural and amenity values;[55]
- The maintenance and enhancement of the life-supporting capacity of ecosystems, the mauri of natural resources and the extent and representativeness of indigenous biodiversity; and[56]
- The promotion of greater public awareness, support for and involvement in the protection and enhancement of significant indigenous vegetation and significant habitats of indigenous fauna.[57]

As noted in Section 5.15 of this AEE, Project Martha does not impact on any areas of significant indigenous vegetation or significant habitats of indigenous fauna identified in the RPS, Waikato Regional Plan or the Hauraki District Plan. As such, Project Martha will not compromise the protection of significant indigenous vegetation and the significant habitats of indigenous fauna in accordance with Objectives 1 and 3 of section 6.2 of the Hauraki District Plan.

With respect to the maintenance of indigenous biodiversity and the life-supporting capacity of ecosystem types, the analysis with respect to the RPS also applies in relation to the Hauraki District Plan. That is, while the Martha Pit cutback will disrupt planting established by OGNZL along the pit rim walkway and exotic tree planting established in adjoining residential gardens, this vegetation only provides a minor contribution to the ecological value of the greater area such that it is not considered that indigenous biodiversity will be adversely affected.

8.4.9.10 Outstanding Natural Landscapes / Features and Amenity Landscapes

Section 6.3 of the Hauraki District Plan relates to the management of outstanding natural features / landscapes and amenity landscapes in accordance with the direction set out in Sections 6 and 7 of the RMA.

The identified landscapes and features of significance in the Hauraki District are set out in Section 6.3.1 of the Hauraki District Plan. None of the identified landscapes and features are located near Project Martha. Likewise, Section 2 of the AEE notes that Boffa (2018a) have also concluded that Project Martha is not located within, or near, an outstanding landscape / feature or amenity landscape.

Given the above, the objectives and policies of Section 6.3 of the Hauraki District Plan are not considered further in this assessment.

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55 Objective 1, Section 6.2 of the Hauraki District Plan.

56 Objective 2, Section 6.2 of the Hauraki District Plan.

57 Objective 3, Section 6.2 of the Hauraki District Plan.

8.4.9.11 Significant Trees

Section 6.4 of the Hauraki District Plan relates to the management of significant trees, with the purpose being to maintain and improve the significant trees resource for the purpose of preserving their intrinsic, historical, cultural and amenity values.

Project Martha is not located in the vicinity of any listed significant trees in the Hauraki District Plan. As such, the objectives and policies of Section 6.4 of the Hauraki District Plan is not considered further in this assessment.

8.4.9.12 Riparian Margins and Esplanade Reserves

Objectives 1 and 2 of Section 7.3 of the Hauraki District Plan relate to the management of public access to waterbodies, and seek the following outcomes:

- Sustainably manage the margins of waterbodies to maintain or enhance natural character, indigenous biodiversity, water quality, and aquatic and adjoining terrestrial habitats; and
- The maintenance and enhancement of public access to the margins of waterbodies in a manner that is compatible with the preservation of conservation values and does not unreasonably interfere with the landowner's ability to use and enjoy the land.

The associated policies focus on the use of the legislative mechanisms in the RMA to secure esplanade reserves and strips on subdivisions,[58] and the HDC negotiating to either have the land vested or set aside on a voluntary basis.[59]

The subdivision of land for the realignment of Bulltown / Cambridge Roads does not trigger the esplanade reserve provisions in the RMA as the subject land is not located along the margin of a waterbody.

Notwithstanding the above, Project Martha does involve the establishment of an intake structure on the margin of the Ohinemuri River and a discharge structure on the margin of the Mangatoetoe Stream. These structures are already authorised by way of the existing consents held by OGNZL for the rehabilitation of the pit lake but need to be reconsented for reasons outlined in Section 4 of this AEE. The reconsenting of these structures will not generate any additional effects on the values of the riparian margins of the Ohinemuri River and the Mangatoetoe Stream.

8.4.9.13 Hazardous Substances and Contaminated Land

Section 7.7 of the Hauraki District Plan relates to the management of hazardous substances and contaminated land.

The objectives and policies relating to the use, storage and transportation of hazardous substances specify the following:

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58 Policy 1(a)(ii), Section 7.3 of the Hauraki District Plan.

59 Policy 1(a)(v), Section 7.3 of the Hauraki District Plan.

- Avoid, remedy or mitigate the risk of adverse effects to the environment and the community associated with the transportation of hazardous substances;
- Minimise the risks of adverse effects to the environment and the community associated with the use and storage of hazardous substances; and
- Require that the location of sites on which hazardous substances can be stored and on which those facilities that involve the use of hazardous substances can operate be separated from environments that would be adversely affected by the inadvertent release of hazardous materials.

Project Martha will involve the storage and use of hazardous substances associated with surface mining and underground mining activities. Hazardous substances will be stored at the surface magazine and underground, and will be managed in accordance with the existing controls that apply to the storage and use of hazardous substances by OGNZL as part of its existing operations in Waihi. These measures will ensure that any potential risks associated with the use and storage of hazardous substances are minimised.

With respect to the management of contaminated land, Objective 3 seeks to minimise the risk of adverse effects on the environment and the community from contaminated land. Policy 3(a)(ii) proposes that contaminated land be managed in such a way to either avoid subdivision, use or development of land that presents a significant risk to health, safety or the environment, or to ensure that land is managed so that any potential risks are at acceptable levels for the proposed land use and the environment.

The analysis provided in relation to the NESCS is considered to apply equally to Objective 3 of Section 7.7 of the Hauraki District Plan (and its associated policies regarding the management of risk).

8.4.9.14 Excavations and Placement of Fill

Objective 1 of Section 7.8 of the Hauraki District Plan seeks to ensure site earthworks associated with land use and subdivision activities avoid, remedy or mitigate adverse visual effects and off-site effects. The associated policies focus on:

- Limiting the scale and location of earthworks in order to minimise the risk of instability, damage to other properties / network utilities and the environment, and flooding risk; and[60]
- Limit the scale and location of earthworks to avoid, remedy or mitigate adverse visual effects.[61]

The earthworks associated with the re-alignment of Bulltown / Cambridge Roads and the establishment of the noise bunds will be minimised as far as practicable, and undertaken in accordance with sediment control guidelines from the WRC. These measures will ensure that potential adverse effects on the environment are minimised.

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60 Policy 1(a)(iv), Section 7.8 of the Hauraki District Plan.

61 Policy 1(a)(v), Section 7.8 of the Hauraki District Plan.

In addition, network utilities within the road corridor of Bulltown / Cambridge Roads will be relocated by OGNZL in accordance the relevant infrastructure standards utilised by the HDC.

8.4.9.15 Transportation Network

Objectives 1 and 2 of Section 7.9 of the Hauraki District Plan seek the following outcomes:

- Provide and maintain a safe and efficient transport network that will meet current and planned future demands with minimal effects on the environment and adjoining land uses; and
- Ensure that the adverse effects of activities outside the road reserve on the safety and efficiency of the transport network are avoided, remedied or mitigated.

The associated policies seek to manage land use, vehicle access and traffic management to maintain the safe and efficient operation of the transport network (particularly the regionally significant roading infrastructure). In addition, they refer to the development of financial and/or development contributions strategies to ensure that roads and streets are upgraded and formed to match the demands that specific subdivision and development activities will place upon them.

The actual and potential transportation effects associated with Project Martha are discussed in Section 5.12 of this AEE, which notes that the total number of staff and contractors on site are generally expected to be commensurate with current and recent staffing levels (and lower than the peak numbers working at the site in recent years). Traffic generation on public roads is expected to mostly comprise of staff movements to and from the site, along with occasional delivery and maintenance access. Heavy vehicle movements associated with the mine activity will be limited to within the OGNZL site. Overall, it is assessed that Project Martha will have less than minor effects and maintain the safe and efficient operation of the transportation network.

It is also noted that the re-alignment of Bulltown / Cambridge Roads will be undertaken in accordance with the relevant standards imposed by the HDC and will maintain the current overall network connectivity.

8.4.9.16 Financial and Development Contributions

Objectives 1 and 2 of Section 7.10 of the Hauraki District Plan relate to the imposition of financial and development contributions for subdivision and development. In particular, they seek the following outcomes:

- To ensure that the District's network infrastructure is able to cater for the additional demand generated by new subdivision and development and to avoid, remedy or mitigate adverse effects on the environment; and
- To ensure that subdividers and developers pay a fair and reasonable share of the costs of upgrading or providing new infrastructure to meet demands generated by the development.

The associated policies state that the adverse environmental effects of subdivision and development that can be addressed by a financial contribution should be identified, and the cost of new and off-site infrastructure associated with the development.

Project Martha accords with the above provisions on the basis that:

- OGNZL will meet the total cost of all road re-alignment and relocation of network utilities required for Project Martha; and
- OGNZL will reimburse the HDC for the cost of road maintenance caused by the cartage of aggregate and backfill along Baxter Road, and will return Baxter Road to the agreed road pavement condition (as per the consent conditions for the Correnso Underground Mine).

8.4.9.17 Subdivision

Section 9.1 of the Hauraki District Plan relates to the management of subdivision (which in this case is required in order to re-align Bulltown / Cambridge Roads). The relevant objectives seek:

- Subdivision that provides for and reinforces the existing built form and distinct urban character of the established urban areas;[62]
- Subdivision is provided with the necessary infrastructure and services to ensure that the land is able to be used for its intended purpose, the future needs and health and safety of people and communities are protected, and amenity values are maintained and enhanced, while avoiding, remedying and mitigating adverse effects on the environment; and[63]
- The creation of lots and intensification of subdivision does not create or increase a risk (including residual risk) to people, property, infrastructure and the environment due to natural hazards.[64]

As already noted in this AEE, the subdivision is required to accommodate the re-aligned section of Bulltown / Cambridge Roads. The road re-alignment is relatively minor and does not alter the existing form or character of Bulltown / Cambridge Roads or the properties that are located off these roads.

OGNZL will also relocate all network utilities in the road reserve of Bulltown / Cambridge Roads that are affected by the re-alignment works, so that the network utilities remain in the road reserve and away from the noise bund.

Finally, it is noted that the subdivision does not involve the creation of additional lots or intensification of development – it is for boundary adjustment purposes – and will not increase any risk to people, property, infrastructure or the environment from natural hazards.

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62 Objective 2, Section 9.1 of the Hauraki District Plan.

63 Objective 3, Section 9.1 of the Hauraki District Plan.

64 Objective 6, Section 9.1 of the Hauraki District Plan.

8.4.9.18 Overall Conclusion

Based on the analysis in the sub-sections above, it is considered that the activities associated with Project Martha will be managed such that the project is not contrary to the relevant objectives and policies of the Hauraki District Plan. Of particular note:

- Project Martha will not have any surface manifestations in the Town Centre, Reserve (Active) and Reserve (Passive) Zones;
- Particular consideration has been given to the mitigation of noise effects such that compliance with the permitted noise standards for the Residential and Low Density Residential Zones can be achieved in most circumstances. For those three residentials which will experience operational noise above the permitted levels in the Hauraki District Plan, the extent of exceedance will be approximately six months and is unlikely to amount to a noticeable exceedance;
- Vibration limits have been proposed to control potential effects on amenity. These limits are generally in line with the permitted limits in the Hauraki District Plan;
- Project Martha does not involve any disturbance of any listed heritage features, trees or landscape areas; and
- The subdivision associated with the re-alignment of Bulltown / Cambridge Roads will not alter the urban form of Waihi and will not create any additional allotments.

8.4.10 Other Matters

Section 104(1)(c) of the RMA allows a consent authority to have regard to any other matter it considers relevant and reasonably necessary to determine a resource consent application. In this context, the Hauraki Iwi Environmental Plan is considered relevant and notes the following in relation to mining activities:

- The extraction of gold, silver and other mineral resources has left long-standing environmental problems in the Hauraki rohe. The disposal of wastewater, chemicals and spoil from the mining process, although much improved, remains an environmental concern to Hauraki iwi;
- The loss of waahi tapu, including Pukewa;
- Hauraki iwi seek reduced environmental risk from mining in the Hauraki rohe; and
- Hauraki iwi seek to enhance their capacity by monitoring mine sites.

A number of these matters have been discussed above in relation to the RPS, Waikato Regional Plan and the Hauraki District Plan. However, it is also noted that Project Martha will operate in accordance with appropriate environmental practices and management techniques such that environmental risks are minimised as far as practicable.

As already noted, the relationship of iwi with Pukewa remains a matter under discussion. However, OGNZL is proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan.

8.4.11 Part 2 of the Resource Management Act 1991

It is understood that a consent authority is not required to consider Part 2 of the RMA beyond its expression in the relevant statutory planning documents. In effect, in most circumstances there is no requirement to refer back to Part 2 of the RMA in determining a resource consent application unless there is invalidity, incomplete coverage or uncertainty of meaning within the statutory planning documents. However, for completeness and in accordance with Schedule 4(2)(1)(f) of the RMA, Part 2 of the RMA is considered in the following paragraphs.

The purpose of the RMA is to promote the sustainable management of natural and physical resources. In this regard, Project Martha will enable the social and economic wellbeing of Waihi and the Hauraki District through the provision of additional and continued employment, and the generation of significant benefits to the local, regional and national economy. This is discussed further in Section 5.3 of the AEE.

As noted in the analysis concerning the RPS, Waikato Regional Plan and the Hauraki District Plan, Project Martha will safeguard the life-supporting capacity of air, water, soil and ecosystems.

The avoidance, remediation or mitigation of adverse effects does not require that there be no residual effects on the environment. Instead, Section 5(2)(c) of the RMA contemplates adverse effects, the acceptability of which depends on the circumstances of the particular case and is a question of fact and degree. Sections 5 and 6 of this AEE provide details on the measures proposed by OGNZL to avoid, remedy or mitigate the actual and potential effects of the project on the environment and to manage effects on the wellbeing of people in accordance with section 5 of the RMA.

With respect to the key matters in Sections 6, 7 and 8 of the RMA, the following points are pertinent:

- The activities in the Ohinemuri River and the Mangatoetoe Stream will retain the existing characteristics and qualities that contribute to the natural character of these waterbodies. In this regard, it is noted that the sections of the waterbodies where activities will take place are relatively modified by the surrounding land use activities (Section 6(a) of the RMA);
- Project Martha will not create any additional constraints on public access to the Ohinemuri River or the Mangatoetoe Stream (Section 6(d) of the RMA);
- Treated water will be discharged to the Ohinemuri River in accordance with the existing river flow and water quality discharge compliance limits, such that there will be no change to the water quality or life-supporting capacity of the Ohinemuri River. Further, while the relationship of iwi with Pukewa remains a matter under discussion, OGNZL is proffering the existing consent conditions that apply to the Correnso Underground Mine – which provide for the preparation of a cultural balance monitoring plan and an iwi advisory group to provide a forum for reviewing the implementation of the plan (Sections 6(e) and 7(a) of the RMA);
- Project Martha will not adversely affect any scheduled sites of historic heritage in the Hauraki District Plan. With respect to the heritage sites that will be disturbed by

Project Martha, measures are proposed by OGNZL to remedy or mitigate adverse effects (Section 6(f) of the RMA);

- Particular consideration has been given to the management of significant risks from natural hazards in the technical assessments commissioned by OGNZL, and it is considered that there are appropriate factors of safety in the design of the remediation of the north wall of the Martha Pit and the management of the Martha Underground Mine (Section 6(h) of the RMA);
- The amenity values of Waihi will be maintained by the imposition of appropriate limits on noise, vibration and dust from mining activities in Martha Pit and the Martha Underground Mine (Section 7(c) of the RMA);
- Based on the conclusions outlined in Section 5 of this AEE, it is considered that particular regard has been given to the intrinsic values of ecosystems and to the maintenance of the quality of the environment. Matters related to the quality of the environment enjoyed by adjacent landowners are also addressed in detail in relation to amenity values (Section 7(d), (f) and (g) of the RMA);
- Potential effects on the ecosystem of the Ohinemuri River have been addressed in Section 5.8 of this AEE (Section 7(h) of the RMA);
- The effects of climate change, particularly changes in river flows, have been considered in the assessment of the potential effects of the proposed abstraction regime from the Ohinemuri River and the discharge of overflow water from the pit lake into the Mangatoetoe Stream (Section 7(i) of the RMA); and
- OGNZL is not a *"person exercising functions and powers under the RMA"* for the purpose of Project Martha. In this regard, the WRC and HDC have the *"functions and powers under the RMA"* with respect to the resource consent applications being sought by OGNZL. That said, OGNZL is undertaking consultation with iwi in good faith and in a manner that reflects the scale and significance of the proposal.

Overall, and based on the technical assessments that have been commissioned by OGNZL, it is considered that Project Martha will promote the sustainable management of natural and physical resources in accordance with Part 2 of the RMA.

8.5 SECTION 105 OF THE RESOURCE MANAGEMENT ACT 1991

Section 105 of the RMA sets out additional matters which must be considered by a consent authority when considering an application for a discharge permit. Section 105(1) of the RMA states:

> *"If an application is for a discharge permit or coastal permit to do something that would contravene section 15 or section 15B, the consent authority must, in addition to the matters in section 104(1), have regard to—*
>
> *(a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
>
> *(b) the applicant's reasons for the proposed choice; and*
>
> *(c) any possible alternative methods of discharge, including discharge into any other receiving environment.*

All of the relevant matters set out in Section 105(1) of the RMA are addressed in this AEE and are summarised in Table 8.1 below. In particular, the nature of all discharges to the environment are detailed in Section 5 of this AEE, while the sensitivity of the receiving environments is discussed in Sections 2 and 5. However, it is concluded that the proposed discharges of contaminants to air, and water to the Mangatoetoe Stream are the best practicable option for managing the activities associated with Project Martha and potential effects on the environment.

Table 8.1: Consideration of Alternative Methods of Discharge

Discharge	Receiving Environment	Alternative Methods of Discharge
Discharge of contaminants to air. Section 5.13.1 of this AEE and Beca (2018) for emission sources.	Section 2 of this AEE.	Beca (2018) considered alternative methods of managing the proposed discharges to air. The recommended methods are those considered to be most appropriate considering the nature of those discharges and the receiving environment.
Discharge material to land within and adjacent to the Phase 4 Pit, including stockpiled material and material for the creation of noise bunds. See AECOM (2018a) for the composition of the discharge material.	Section 2.13 of this AEE.	The material needs to be discharged in these locations for operational reasons. AECOM (2018a) assessed potential overburden management strategies for Project Martha. The recommended methods are those considered to be most appropriate considering the nature of those discharges and the receiving environment.
To place waste rock and cement aggregate fill into land in the Martha Underground Mine as backfill and to allow groundwater to discharge from the flooded workings in the Martha Underground Mine into the surrounding ground post closure. See AECOM (2018a) for the composition of the discharge material.	Section 2.13 of this AEE.	The backfill needs to be discharged to the Martha Underground Mine for operational reasons. AECOM (2018a) has assessed the effects of this activity and considers the Martha Underground Mine an appropriate location for the discharge of this material.
To discharge surface water from the Ohinemuri River to the Martha Pit to create a lake, and to flood underground workings.	Section 2.13 of this AEE.	The surface water needs to be discharged to this location to fill the Martha Pit (the alternative – not discharging to the pit would significantly extend the time for the pit lake to form). AECOM (2018b) has assessed different means of undertaking this discharge. The recommended methods are those considered to be most appropriate considering the nature

Discharge	Receiving Environment	Alternative Methods of Discharge
See AECOM (2018b) for the nature of the river water to be discharged to the Martha Pit.		of those discharges and the receiving environment.
To discharge lime to the pit lake. AECOM (2018b) for the nature of the lime to be discharged.	AECOM (2018b) for the pit lake water quality into which the lime would be discharged.	The discharge of lime would be for environmental enhancement. AECOM (2018b) has assessed different means of achieving appropriate water quality in the pit lake. The recommended methods are those considered to be most appropriate considering the nature of those discharges and the receiving environment.
To discharge overflow water from the pit lake to the Mangatoetoe Stream. GHD (2018) and AECOM (2018b) for the nature of the overflow water to be discharged.	Section 2.14 of this AEE.	Mangatoetoe Stream is the only practical receiving environment for the pit lake overflow. GHD (2018) considered various options for managing the nature of the discharge. The recommended methods are those considered to be most appropriate considering the nature of those discharges and the receiving environment.

8.6 SECTION 106 OF THE RESOURCE MANAGEMENT ACT 1991

Section 106(1) of the RMA specifies that a consent authority may refuse to grant a subdivision consent (or may grant a subdivision consent subject to conditions) if it considers that there is a significant risk from natural hazards or sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision.

As noted in Section 5.5 of this AEE, AMC have confidence that the proposed underground mining can be developed and brought into production without compromising underground or surface stability. In addition, Section 5.5 of this AEE provides an assessment of the stability of the Phase 4 Cutback in the Martha Pit. It notes that the stability of the pit walls and the proposed works has been assessed and, overall, there are high factors of safety for the Phase 4 Cutback.

Finally, the proposed subdivision plan attached as **Appendix N** to this AEE details that appropriate physical access will be retained for all allotments subject to the boundary adjustment to accommodate the re-alignment of Bulltown / Cambridge Roads.

8.7 SECTION 107 OF THE RESOURCE MANAGEMENT ACT 1991

Sections 107(1)(a) and (b) of the RMA specify that the consent authority shall not grant a discharge permit allowing the discharge of water / contaminant into water or land if, after reasonable mixing, the contaminant or water discharged (either by itself or in combination

with the same, similar, or other contaminants or water) is likely to give rise to all or any of the following effects in the receiving waters:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- Any conspicuous change in the colour or visual clarity;
- Any emission of objectionable odour;
- The rendering of fresh water unsuitable for consumption by farm animals; and
- Any significant adverse effects on aquatic life.

Based on the assessments in Section 5.8 of this AEE, the discharge of water to ground, the pit lake and the Mangatoetoe Stream will not give rise to any of the effects listed above after reasonable mixing. Likewise, Section 5.8 of this AEE notes that the potential addition of limestone to the pit lake in order to maintain appropriate water chemistry in the long term will not give rise to adverse effects on the use of the lake for primary contact or give rise to the identified effects in Section 107 of the RMA.

9. CONCLUDING STATEMENT

OGNZL is seeking all necessary resource consents from the HDC and the WRC for the various activities associated with Project Martha, which comprises the Martha Underground Mine and the Phase 4 Cutback. Project Martha will address the existing stability issues on the north wall of Martha Pit and also extend the life of productive mining at Waihi by approximately 12 years.

In light of the above, Project Martha will result in mine employment being maintained at levels similar to those experienced over the past decade and will make a significant contribution to the local, regional and national economy over that period through the provision of wages and salaries, export earnings and capital investment.

An assessment of the potential effects of Project Martha on the environment is provided in Section 5 of this AEE, as well as the various technical assessments commissioned by OGNZL. By way of summary, it is considered that the project can be undertaken in a manner that will appropriately avoid, remedy or mitigate adverse effects on the environment. Importantly, much of the works will either be undertaken within the existing footprint of the Martha Mine (and within the Martha Mineral Zone) or will occur underground and the works are of a nature and scale that is similar to current and previous mining activities in Waihi.

It will not be possible to manage Project Martha such that there are no potential adverse effects on the environment. There will, for example, be some visual, noise and vibration effects associated with the project at various stage of its development. However, OGNZL is proposing that Project Martha be undertaken in accordance with a range of consent conditions which will limit the potential for adverse effects on the environment. In many instances the proposed conditions align with the permitted activity standards in the Hauraki District Plan or the existing resource consents held by OGNZL.

With respect to the statutory planning framework that applies to Project Martha, it is concluded that the development of the project in the manner proposed by OGNZL will for the most part align comfortably with the overall management intentions specified in the relevant national, regional and district planning documents. Many of these statutory planning documents recognise the importance of the mining sector and the need to provide for its continuation (subject to the management of potential effects on the environment). It certainly cannot be concluded that Project Martha will be contrary, or repugnant, to any of the relevant statutory planning documents.

Finally, it is noted that OGNZL has consulted with interested / potentially affected parties and the wider community with respect to Project Martha. This consultation has informed the various environmental assessments and will continue throughout the resource consent process and during the subsequent operation of Project Martha.

3

PART 3

Appendices

APPENDIX A

Legal Description of Properties
Supporting Project Martha

B

APPENDIX B

Economics Assessment
(Sense Partners)

C

APPENDIX C

Existing Resource Consents: Waikato Regional Council

D

APPENDIX D

Visual and Landscape Assessment
(Boffa Miskell)

APPENDIX E

Traffic Assessment
(Traffic Design Group)

APPENDIX F

Noise Assessment
(Hegley Acoustics)

APPENDIX G

Vibration Assessment
(Heilig Partners)

APPENDIX H

Groundwater Assessment
(GWS Limited)

APPENDIX I

Water Management Assessment
(GHD)

APPENDIX J

Freshwater Ecology Assessment
(Boffa Miskell)

APPENDIX K

Heritage Assessment
(Clough & Associates)

APPENDIX L

Air Quality Assessment
(BECA)

APPENDIX M

Geotechnical Assessment: Martha Underground Mine
(AMC)

APPENDIX N

Subdivision Plan for the re-alignment of Bulltown / Cambridge Roads

APPENDIX O

Proposed Consent Conditions

APPENDIX P

Pit Stability Assessment from the Martha Underground Mine (PSM)

APPENDIX Q

Pit Stability Assessment for the Phase 4 Cutback
(PSM)

APPENDIX R

Ground Settlement Assessment
(Engineering Geology Limited)

APPENDIX S

Geochemical Assessment
(AECOM)

APPENDIX T

Hydrodynamic Assessment of the Pit Lake
(Hydronumerics)

APPENDIX U

Martha Pit Lake Management Strategy (AECOM)

APPENDIX V

Pit Lake Limnology Assessment
(Hydronumerics)

APPENDIX W

Social Impact Summary
(Phoenix Research)

APPENDIX X

Property Valuations
(Telfer Young)

APPENDIX Y

Consultation Material