BOARD OF INQUIRY
TE MIHI GEOTHERMAL POWER STATION PROPOSAL

In the Matter of the Resource Management Act 1991

And

In the matter of resource consent applications by Contact Energy Limited in respect of the Te Mihi Geothermal Power Station Proposal

And

In the matter of the consent applications being called in by the Minister for the Environment pursuant to section 141A(4)(b) of the Act

THE BOARD OF INQUIRY

Environment Judge R Gordon Whiting (Chair)
Mrs S Glenice Paine (Member)
Mr T Denis Nugent (Member)
Dr Patrick Browne (Member)

HEARING at Taupo on 21-25 July 2008, 28-30 July 2008.

APPEARANCES

Mr T Robinson and Ms R Dixon for Contact Energy Limited (Contact),
Mr D Kirkpatrick for Geotherm Group Limited (In Receivership) (Geotherm)
Mr P Lang for MacPower Ltd and Mr A McLachlan
Mr S Hickman for Taupo District Council
Ms J Bain for Transit New Zealand (Transit)
Mr M Brocklesby for Waikato Regional Council (Environment Waikato)
Ms L Price for herself and Ms A Price
Ms F Ellery for herself and Mr Ellery
Mr A Birdsall for himself
Ms L Koster for herself

FINAL REPORT AND DECISION OF THE BOARD OF INQUIRY

A The consents are granted subject to the terms and conditions of consent attached to this report as Appendix 2 and 3.

FINAL REPORT

CONTENTS

Introduction **4**

Comments on Draft Report and Discussion **4**

Consents Applied For **8**

Application Procedure and Call In **10**

The Proposal **12**

Power Station Technology 13
Power Station – Physical Description 15
Reinjection of Geothermal Fluid 17
Other Discharges 18

General Description of Site and Locality **19**

Submissions **19**

Adequacy of Information **20**

Prehearing Meetings **21**

Issues Raised By Submitters **21**

Hearing at Taupo **23**

Conditions of Consent **24**

Statutory Framework for Decisions on the Applications **25**

Consideration of Statutory Instruments **25**

National Policy Statement on Electricity Transmission 26
Regional Planning Instruments 26
Geothermal 27
Use and Development 28
Discharge and Reinjection 32
Significant Geothermal Features 34
Effects of Take, Use and Discharge 36
Air Quality 38
Energy 41
Taupo District Plan 41
Overall Conclusion in respect of the District Plan 51

Part II of the Resource Management Act 1991 ..... **51**

Section 6 53
Section 7 55
Section 8 57

Effects of the Te Mihi Proposal on the Environment 57
Positive Effects 57
Adverse Effects 58
Effects on the Reservoir 58
Effects on Other Consent Holders for Large Takes of the Geothermal Resource 60
Effects on Air Quality 60
Effects on Ground Water and Water Supplies 66
Effects of Reinjection on Surface Features including Subsidence 67
Visual Effects 70
Noise Effects 71
Traffic Effects and Management 74
Effect on Property Values / Compensation 74
Effects on the Environment from Hazardous Substances 75

Determination 75

Decision 76

Appendix 1: Summary of Submissions 77

Appendix 2: Te Mihi Waikato Regional Council Resource Consent Conditions 87

Appendix 3: Taupo District Council Resource Consent Conditions 162

Appendix 4: CS14 202

Introduction

[1] Contact Energy Limited ("Contact") has applied for resource consents for the following activities from the Waikato Regional Council ("Environment Waikato") and Taupo District Council to enable it to build and operate a new power station on a site located just to the north of the intersection of Poihipi Road and Oruanui Road near Taupo. Contact proposes to utilise a number of existing consents recently obtained to operate the Wairakei power station, as well as the consents that are the subject of the present applications.

[2] Following a hearing at Taupo between the 21st and 30th July 2008 we issued a draft report and decision on the 5th August 2008. In that decision the resource consents applied for were granted subject to the terms and conditions of consent attached to the draft report as Appendix 2 and 3. The draft decision and report was issued under section 148(1) of the Resource Management Act 1991 and contained those matters required by section 148(2) of the Act.

[3] The draft report and decision was sent to all persons as required by section 148(3) of the Act. Those persons were invited to send comments on any aspect of it to the Board within 20 working days. The Board received comments from five parties – Environment Waikato, Contact, Taupo District Council, NZ Transport Agency and Mr A McLachlan.

Comments on Draft Report and Discussion

[4] The comments from the first four parties were merely concerned with minor slip changes. The comment from Mr A McLachlan was with respect to a substantive issue relating to the conditions of consent on the Poihipi Power Station air discharge consent (116790).

[5] Environment Waikato's comments related to Appendix 2, the Regional Council Resource Consent Conditions:

i. An amendment to the last sentence of Condition 2 of consent 116786 to avoid ambiguity by adding the highlighted words as follows:

   In the event of any inconsistency between **specific Conditions 1-19** of this consent and the General Conditions, the latter shall prevail.

ii. The same amendment for Condition 1 of consent 116787

iii. To correct a typographical strikeout error in Condition 1 of consent 116787.

iv. To correct a non strikeout typographical error in Condition 15(c) of consent 116786.

v. To correct a similar non strikeout typographical error in Condition 17 of consent 116787.

[6] Contact's comments were in respect of the draft report, Appendix 2 and 3.

i. In paragraph 31 of the draft report we discussed the configuration of the alternative cooling tower structures and the elevation at which the preferred one would be sited. Contact commented that the report did not clearly identify that either configuration could require a raised site level of 518 masl. We have amended that paragraph accordingly.

ii. In paragraph 61 of the draft report we discussed the way in which issues had dropped away during the hearing. Contact commented it had not reached agreement with the McLachlan interests. We have amended that paragraph to clarify that it was the McLachlan interests refining their case that reduced the number of issues.

iii. In paragraph 66 of the draft report we discussed the process by which suggested conditions for the proposed consents went through successive revisions. Contact commented that the first draft of those proposed conditions was filed with its evidence in chief rather than the application. We have amended the paragraph accordingly.

iv. Contact identified a typographical error in paragraph 70 of the draft report. This is now corrected.

v. Contact identified a typographical error in paragraph 101. This is now corrected.

vi. Contact also identified the strike out error listed above as Environment Waikato sub paragraph iii.

vii. Contact identified that an additional page had been provided with the draft conditions in error. We have deleted that page.

viii. In Condition 14 of Taupo District Council consent RM070304 the draft condition had omitted the word "Harrison" before "Grierson" in the fifth line. This has been corrected.

ix. In Condition 17 of the same consent cross references to other conditions had not been updated following the insertion of Condition 5. They have been corrected.

x. Advice Note 2 to the same consent is identified as being superfluous with the inclusion of Condition 33. We have deleted Advice Note 2 and the subsequent Advice Notes and cross references are renumbered accordingly.

[7] Taupo District Council identified that in Taupo District Council consent RM070299 the Advice Note under Condition 2 had mistakenly been given a condition number. This has been corrected.

[8] NZ Transport Agency comments were in respect of Appendix 3 and require the replacement of "Transit New Zealand" with "NZ Transport Agency" in Condition 20, 25 and Advice Note 4 of RM070304 Consent. A further correction in Advice Note 4 replaced "Transit New Zealand" with "Government Roading Powers" This has been corrected.

[9] Mr Lang filed a memorandum dated 21 August 2008, commenting on the draft report on behalf of Mr A McLachlan. The memorandum pointed out that the draft report did not appear to address a submission raised in Mr Lang's closing. The submission related to the control of objectionable emissions including odour from the Poihipi station.

[10] The matter concerns condition 7 of consent number 116790:

7. The discharge shall not result in odour, or other gaseous emissions that are objectionable at or beyond the area bounded by the outermost green and yellow lines on plan 1224 922-RC04 in Schedule Two attached.

[11] Mr Lang proposed that condition be replaced with:

7. The discharge shall not result in odour, or other gaseous emissions that are objectionable at or beyond the area bounded by:

a) the 50 microgram/cubic metre contour surrounding the Poihipi Road power station shown in plan exhibit CS14 attached as Schedule 3;

and

b) Poihipi Road.

[12] Mr Lang's proposed change reflects the modelling carried out by Dr Stevenson and graphically represented in his exhibit CS14, attached as Appendix 4. Exhibit CS14 shows a green contour line for the 70 $\mu g/m^3$ guideline for H_2S. The 70 $\mu g/m^3$ contour line is chosen to address odour issues – that concentration being recommended as not to be exceeded.

[13] Mr McLachlan's concern was that the boundary as set out in Schedule 2 of consent 116790 extends onto farmland that we understand he farms by way of a leasehold interest. He is concerned about objectionable odours arising from high concentrations of H_2S. The matter is further complicated by, what appears from the evidence, to be a circuitous and complex legal relationship between Contact, the receiver of Mercury Geotherm (who owns the land) and Mr McLachlan, as set out in the evidence of Mr Kilty[1]. We do not propose to set out in detail this relationship. Suffice it to say that Contact maintains it has legal rights to occupy all of the land contained within the green and yellow lines referred to in Condition 7.

[14] Mr McLachlan's concern was met, at least in part, by Conditions 4 and 5 which provide for monitoring and a non statutory review to ensure that H_2S levels do not rise to an objectionable level.

[1] EIC para 24 to 36.

[15] Further, we are satisfied from the evidence of Dr Stevenson that H_2S levels from this discharge are most unlikely to cause objectionable odours on Mr McLachlan's leasehold land. Dr Stevenson said:

> *In view of the modest contribution to hydrogen sulphide concentrations compared with the guideline used in this assessment, and also the modest contribution relative to the contributions from the Rotokawa stations north of the Poihipi/Oruanui Road intersection, I consider that the odour effects from emissions from the Te Mihi and Poihipi power stations if operating continuously at the proposed emission limits will be not more than minor*[2].

[16] Accordingly we are not persuaded to amend Condition 7 as requested.

Consents Applied For

[17] The consents applied for include both regional consents from Environment Waikato and land use consents from the Taupo District Council.

Waikato Regional Council

Consent Number 116786:	to discharge up to 95,000 tonnes per day of geothermal water, steam condensate, cooling water blow-down, suspended material, and added chemicals into land and underground water through reinjection wells within the boundaries of the Wairakei – Tauhara Geothermal System;
Consent Number 116787:	to discharge by irrigation up to 6,500 tonnes per day of cooling water blowdown and condensate onto land (and by seepage into underground water);
Consent Number 116788:	to discharge up to 50 cubic metres per day of water including contaminants and

[2] EIC, para 172.

sewage into land and underground water through septic tanks and associated soakage facilities;

Consent Number 116789: to discharge contaminants to air from the proposed Te Mihi Geothermal Power Station and associated structures;

Consent Number 116790: to discharge contaminants to air from the Poihipi Road Power Station and associated structures, including geothermal wells, pipelines and geothermal steamfield equipment (to commence on 1 January 2012);

Consent Number 116791: to discharge contaminants to air from geothermal wells, flash plants, pipelines and all associated geothermal steamfield equipment within the Wairakei–Tauhara Geothermal System west of the Waikato River.

Contact sought consent terms of 35 years for all six consents.

Taupo District Council – Land Use Consents

Consent Number RM070304: to construct, operate and maintain all structures and facilities associated with a geothermal power station on the Wairakei–Tauhara Geothermal System and including all ancillary equipment, but excluding the new switchyard and 220kV transmission line;

Consent Number RM070305: to construct, operate and maintain a new switchyard adjacent to, and associated with, the new Te Mihi geothermal power station;

Consent Number RM070299:	to construct, operate and maintain a 220kV transmission line, associated support structures, equipment and facilities associated with the new Te Mihi geothermal power station on the Wairakei–Tauhara Geothermal System, including realignment of a section of the existing Poihipi Road Power Station transmission line and modification works necessary to enable connection of the new line to the existing Wairakei–Whakamaru B transmission line.

[18] A lapse period of nine years was sought under section 125 in respect of all applications, except Application 116787 (Irrigation). A lapse period coinciding with the term of the consent was sought for that activity.

[19] As the activity status of a number of the consents is discretionary, it was agreed that the activity status under the relevant plans of all the consents is to be considered under the statutory provisions that apply to discretionary consents.

Application Procedure and Call In

[20] The applications were lodged with Environment Waikato and Taupo District Council on 31 July 2007. Following review by those authorities, requests for further information were made by each Council under section 92 of the Act.

[21] The Environment Waikato request was dated 27 August 2007 and related to consultation, geothermal field modelling and air discharge matters. Taupo District Council made an initial section 92 request dated 10 August 2007 highlighting that peer reviews had been commissioned on several aspects of the project (landscape/visual, noise, traffic and hazardous substances).

Following this, and in response to queries from Taupo District Council's peer reviewers, additional requests for further information were made.

[22] Contact responded to all requests for further information by the Councils.

[23] On 20 December 2007, before the applications were publicly notified by the Councils, the Minister for the Environment advised that, pursuant to sections 141B(1) and 141C of the Act, he intended to call in the Te Mihi proposal, and that he would appoint a Board of Inquiry to consider and decide the applications for resource consent.

[24] Public Notice, pursuant to section 144 of the Act, of the Minister's direction to call in the proposal was given on 9 February 2008. In the Public Notice the Minister stated as follows:

> *I consider these matters are a proposal of national significance and I have therefore made a direction that they be called in and referred to a Board of Inquiry in accordance with sections 140 to 150AA of the Resource Management Act 1991.*
>
> *My reasons for calling in the matters involved in the proposal are as follows:*
>
> - *The proposal is relevant to New Zealand's international obligations to the global environment in terms of the Kyoto Protocol including the proposal's contribution towards the achievement of the target of 90% of electricity generation to be from renewable energy sources by 2025 as set out in the New Zealand Energy Strategy to 2050.*
> - *Geothermal systems are a natural resource that is limited to a relatively small area of New Zealand. This proposal will involve a significant use of this limited resource when viewed in the context of the totality of geothermal systems available for development.*

[25] The Public Notice invited interested persons to make submissions on any of the applications lodged by Contact for resource consents for the Te Mihi

Power Station. Submissions closed on 7 March 2008 and a total of 24 submissions were received.

The Proposal

[26] Contact has applied for resource consents to establish a new geothermal power station in the Te Mihi area of the Wairakei-Tauhara Geothermal System (the System) and consent for the discharge of contaminants to air from the existing Poihipi Power Station to commence upon the expiry of the current consent.

[27] Currently steam derived from the System is utilised in the Wairakei and Poihipi Power Stations.

[28] The Wairakei power station (Wairakei) commenced operations in 1958 and had consents granted for its continued operations in 2007. Increasing maintenance costs indicate the plant is reaching the end of its natural life and there are significant environmental issues associated with discharges from Wairakei into the Waikato River. The current Wairakei suite of consents provides for the discharge of up to 60,000 tonnes/day of separated geothermal water into the Waikato River[3].

[29] As the Wairakei borefields are likely to be able to supply steam for electricity generation for many years, Contact proposes to construct and operate a new geothermal power station at Te Mihi, some 5km west of Wairakei. It is intended that the station will comprise three 78MW generating units, with the first two commencing operations in 2011 and the third in 2016.

[30] The Te Mihi Power Station (Te Mihi) will generate some 220MW of electricity, 60MW more than is now generated at Wairakei, for the same fluid take. Once Te Mihi is fully operational, Wairakei will be phased out

[3] EW Consent No.104711

and ultimately decommissioned. However, one of the Wairakei Low Pressure (LP) units may continue to operate for some years if LP steam from the Western Borefield can be economically used in this way. The existing binary cycle station at Wairakei, commissioned in 2005, will continue to operate.

[31] Once Te Mihi is fully operational, the concentrations of H_2S and mercury in the Wairakei cooling water discharges into the Waikato River will decrease to negligible levels. The total heat discharge will also decrease significantly as Wairakei is phased out.

[32] Construction of Te Mihi would also require the construction of a new switchyard adjacent to it and rearrangement of the existing 220kV transmission line. This would loop from the existing Wairakei–Whakamaru 220kV line, which is located about 1km from the new power station site.

[33] Currently, the Wairakei consents held by Contact provide for the taking of up to 245,000 tonnes/day of geothermal fluid for electricity generation and associated purposes. This consent[4] expires in June 2026. The geothermal fluid required to operate Te Mihi would be sourced via this consent. As this consent is now in place, issues related to accessing the resource are not of direct concern. The reinjection proposed as part of the Te Mihi consents would form part of a discharge strategy whose primary objective is to address subsidence issues.

Power Station Technology

[34] Te Mihi would draw geothermal fluid from the System using the following areas of current production:

- Western Borefield - two phase fluid[5] from wells drilled to about 600m depth; and

[4] RC 104706

[5] Steam/water mix

- Te Mihi Borefield – dry steam from a shallow steam zone and two phase fluid from deeper in the reservoir. This borefield also provides steam for Poihipi.

[35] The proposed power station is to be a conventional steam turbine plant. In the Assessment of Environmental Effects (AEE) forming part of the applications, the option of adopting a binary cycle plant**,** rather than a steam turbine**,** was put forward. However, Contact confirmed through evidence that the binary plant option is no longer being pursued. A full description of the geothermal power plant and process was included in the AEE forming part of the application.

[36] The use of 'double flash'[6] technology would enable the generation of about 20 – 25% more power from the same amount of fluid currently extracted for Wairakei.

[37] At the well head, geothermal fluid is separated into intermediate pressure steam (IP) and mineralised water. Both are to be piped to Te Mihi where the separated water is flashed to generate LP steam. The IP and LP steam expand through steam turbines to drive electricity generators.

[38] After passing through the turbines, the steam would be condensed using direct contact condensers[7]. Mechanical draft cooling towers are to be used. After the steam is condensed, some non-condensable gases remain and are removed by gas extractors. These would be discharged to the atmosphere within a plume of condensed vapour.

[39] The proposed construction staging is:

- Stage 1 – installation and commissioning of the first two turbine units, along with all associated plant. The first turbine unit would take 26 months to be commissioned, while the second turbine unit

6 Double flash technology provides for the use of steam at different pressures in a dual admission turbine

7 Pummer EiC, para. 40

would take a further two to three months. It is planned that Stage 1 be concluded in 2011. Two turbines would then be operating at Te Mihi and four at Wairakei.

- Stage 2 – the third turbine unit would be installed and commissioned in 2016. After the third turbine is operating, one 11.2MW LP turbine would continue to operate at Wairakei, together with the binary plant, as will Poihipi.

Power Station – Physical Description

[40] The site of the proposed power station is about 10ha in area with some 6.5ha of this being occupied by structures. A new sealed access road would be constructed from Oruanui Road to the site. This would be used for construction and access purposes. All roads, parking areas and other permanent hard-standing areas are to be paved with asphalt. The site would be surrounded by a security fence and some areas within the site, such as the switchyard, would be surrounded by safety fencing.

[41] The primary buildings at the power station would be the turbine hall and the cooling towers. Various secondary structures would be required. A large electrical switchyard would be located adjacent to the turbine hall. An existing transmission line from Poihipi would be diverted and reconstructed to connect to the new switchyard.

[42] Various other plant, including transformers, gas extraction equipment, steam separation vessels, steam discharge silencers and steam/water pipelines would also be required. Pipelines on the borefield would be located above ground due to insulation and thermal expansion requirements, and to facilitate maintenance and inspections.

[43] The turbine hall is to be 130m long x 22m wide, plus a further 8m on the north side for an electrical annex. The building would be 26.4m high (indicative) from the reconfigured site level of 516 masl[8]. The building

[8] Metres above sea level

would be of concrete foundations and lower walls with steel portal framing and metal cladding.

[44] The mechanical draft cooling towers would be the other major structures making up the development. There would be three cooling tower blocks, one for each turbine**,** each comprising either eight cells or an alternative arrangement involving six cells.

[45] The cooling tower structures (eight cells) would be 80m long by 35m wide and 16m high, from a site level of 516 masl – the same as for the turbine hall. The alternative arrangement of six cells would involve a cooling tower structure of 60m long x 40m and 16m high. It may be necessary to locate the cooling tower structure on a raised site level of 518 masl; that is effectively 18m high. The three cooling towers would be set out in a row directly south of the turbine hall. To reduce recirculation of the cooling tower plumes back into the tower inlets, the orientation of the cooling towers is required to be parallel to the prevailing wind. The cooling towers would be similar in appearance to the existing tower at Poihipi.

[46] A switchyard would be located adjacent to the power station in order to combine the outputs of the three generators and connect them, via a transmission circuit, to the Wairakei–Whakamaru B transmission line. The switchyard would be approximately 170m x 110m. The approximate height of the switchyard equipment would be 5.5m with lightening poles extending to 25m. Since the applications were lodged, Transpower has decided that the configuration of the switchyard would be a 'breaker and a half' arrangement. This would result in a switchyard of the above dimensions, which would be slightly larger than originally proposed and extends outside the application area. This would result in the area extending some 10m into the area shown on the consent applications for power transmission lines. No one objected to the proposal being amended. We amend accordingly.

[47] Currently a single circuit 220kV transmission line connects Poihipi to the Wairakei–Whakamaru B transmission line. Transpower, owner and

operator of the line, requires that this line be looped in and out of the new switchyard, for security of supply. There would be four double circuit lattice steel towers constructed from the line to the switchyard. The new double circuit line would be located to the west of the present Poihipi line. Poihipi would be connected to the Te Mihi switchyard still as a single circuit line, but one tower would require relocation. Once Te Mihi is constructed the redundant sections of the existing Poihipi line would be dismantled.

[48] The heights of the towers of the new double circuit line are subject to detailed design and site surveys. However, Contact confirmed that the maximum height of any of the tower structures would not exceed 45m.

Reinjection of Geothermal Fluid

[49] Contact currently holds several resource consents allowing for the injection/reinjection[9] of separated geothermal water, steam condensate and cooling water blow down from Wairakei and Poihipi. Due to a significant volume of separated geothermal water and condensate being discharged into the Waikato River, Contact's consents to take geothermal fluid for these power stations allow for a much larger volume than is allowed to be injected/reinjected.

[50] The Te Mihi proposal includes an application to reinject[10] up to 95,000 tonnes/day of geothermal water, condensate and cooling water blowdown into the System. Adding this volume to those provided for by consents already held would enable Contact to inject/reinject all separated geothermal water, condensate and cooling water blowdown produced from the operation of Poihipi and Te Mihi. Some of the condensate and cooling water blowdown is likely to be used to irrigate farmland if this proves to be the best strategy. One of the applications included in the current package seeks

[9] Injection refers to injecting fluid outside the System while reinjection refers to injecting fluid inside the System

[10] No outfield injection is proposed by these applications

to allow irrigation of up to 6,500 tonnes/day. There is an existing consent[11] to irrigate up to a further 8,500 tonnes/day.

[51] The current applications to provide for additional capacity to discharge would allow a greater degree of flexibility in the management of the System. The existing consents require the preparation of a Discharge Strategy as part of a required System Management Plan. The same approach is proposed in regard to the current applications. In terms of discharges, the greater flexibility now proposed would implement the objectives of the draft discharge strategy submitted with the current applications.

[52] The current reinjection application covers a wide area and is limited to the System. Unlike the Wairakei and Poihipi reinjection consents, no outfield injection is proposed. The current application excludes some areas within the general application area, including the Wairakei Golf Course, the Geotherm site and industrial areas on Centennial Drive immediately north of Taupo Town.

Other Discharges

[53] The Te Mihi proposal involves emissions to the air comprising plumes of warm, moist air from the cooling towers, which would also contain non-condensable gases. Such non-condensable gases comprise primarily carbon dioxide and H_2S. There are also trace concentrations of several other gases, including hydrogen, ammonia, methane, nitrogen and mercury. A consent is sought for these discharges.

[54] An air discharge consent is also sought for Poihipi as the current air discharge permit for that plant expires in December 2011.

[55] A permit to discharge contaminants to the air from all geothermal steamfield equipment within the System is also sought.

[11] EW Consent No. 104723

[56] Discharge of domestic sewage from Te Mihi is proposed to be by ground soakage from a septic tank system. An application has been made for this discharge.

General Description of Site and Locality

[57] The proposed site for Te Mihi is located on rolling, rural, open pastureland above gullies that form the catchments of the Te Rautehuia and Wairakei streams. These contain the production wells of the existing Te Mihi and Western borefields. Existing steamfield pipelines cross to the north and to the south of the site. The single circuit Poihipi transmission line passes the east side of the site, and joins the Wairakei–Whakamaru B transmission line approximately 1km to the northeast.

[58] The surrounding farmland includes some shelter belts of exotic trees and the occasional native tree. The Wairakei borefield land is generally covered with scrubby vegetation. The soils are mostly derived from volcanic ash and pumice and are generally free-draining.

[59] The legal description of the power station site is part of Section 4.50 355555 and part of Section 1 SO 58808 (CT SA4GC/233). The land is owned by the Commissioner of Crown Lands (Section 4) and Contact (Section 1).

[60] In addition to grazing, other uses in the vicinity of the Te Mihi site include the Taupo Saleyards, a horse riding school on Oruanui Road, the Taupo Pony Club, the Poihipi Power Station and a number of lifestyle blocks.

[61] Access to the site is from Oruanui Road, which is a sealed collector road off Poihipi Road. Pohipi is a regional road intersecting with State Highway 1 some 1km north of Taupo.

Submissions

[62] Of the 24 submissions received the outcomes sought were as follows:

3 Support

8 Neutral

6 Oppose

5 Mixed outcomes

2 Not stated

[63] Appendix 1 contains a brief summary of the submissions.

[64] In broad terms, the topics and issues raised in the submissions fell into the following categories - some submissions fell under more than one category:

- Impact on the environment – 14 submissions
- Impact on local residents – 8 submissions
- Cultural issues – 4 submissions
- Impact on geothermal systems – 5 submissions
- Implications for Policies, Plans and/or Consents – 7 submissions
- Impacts on national energy strategy – 5 submissions

Adequacy of Information

[65] Before the applications were called in by the Minister, both Environment Waikato and Taupo District Council requested and received further information from Contact regarding the applications. We are satisfied that that information, and all the information subsequently provided by Contact and submitters, has been sufficient to allow us to make a decision on the applications.

[66] The Board commissioned Mr Dave Burton and Mr Grant Eccles to prepare a report on the information provided by Contact under section 42A of the Act. The report provided was sent to Contact and all the submitters for their comment. Comment was received from Contact and one submitter. The section 42A report and the comments thereon were considered by us.

Prehearing Meetings

[67] Formal prehearing meetings were conducted with Contact and submitters on 21 May and 6 June 2008. Reports by the chairpersons[12] of those meetings were prepared and sent to us and to all parties to the proceedings. As a result of the prehearing meetings, the parties negotiated agreements on a number of issues pertaining to the consents applied for. This greatly reduced the number of issues in contention at the commencement of the hearing.

Issues Raised By Submitters

[68] At our direction, counsel for Contact filed a memorandum listing all issues which it understood to be in contention as at 30 June 2008, based on the evidence which had been circulated.

[69] The issues listed were as follows:

1) Whether the Geotherm project is part of the existing environment for the purpose of assessing Contact's Te Mihi applications:

Subsidiary Issues:

(a) Potential adverse effects of Contact's reinjection on Geotherm's project;

(b) Suggested conditions for avoiding, remedying or mitigating adverse effects of Contact's reinjection on Geotherm's project;

(c) Cumulative effects of Contact's air discharges as a potential constraint on Geotherm's project;

(d) Cumulative effects of Contact's noise emissions as a potential constraint on Geotherm's project; and

(e) The potential for the Te Mihi project to constrain Geotherm's output as a result of constraints on the Wairakei transmission ring.

[12] Ms Dorothy Wakeling on 21 May and Mr Morrie Love on 6 June 2008.

2) Reinjection Issues – potential issues arising from increased reservoir pressures;
3) Air discharges – proposed emission limits;
4) Air discharges – extent of ambient air quality modelling;
5) Noise emissions – adequacy of conditions to limit noise levels assessed;
6) Traffic issues:
   (a) Adequacy/robustness of assessment of potential effects;
   (b) Suggested conditions to avoid, remedy, mitigate adverse effects;
7) Poihipi Air Discharges – extent of adverse effects;
8) Contact's outfield reinjection under existing consents;
9) Contact's well drilling and extractions under existing consents;
10) Contact's land access rights;
11) Potential constraints on output of other consented renewable energy projects, other than the Geotherm project, arising from any transmission system constraints;

[70] Technical condition issues regarding:

(a) Cross references to the Wairakei General Conditions;
(b) Noise measurements;
(c) Wording of the landscape conditions;
(d) Construction management;
(e) Hazardous substance management;
(f) Wording of protocol on cultural issues.

[71] Counsel for Geotherm and for Transit confirmed agreement with the list filed by Contact. Mr Brockelsby for Environment Waikato and Ms Feary for EECA similarly confirmed their respective agreement. Counsel for the McLachlan interests filed a memorandum identifying one additional issue:

> *The extent and definition of the activity areas that are to be used in connection with the Poihipi Power Station.*

[72] Counsel for the Taupo District Council filed a memorandum listing the issues on land use resource consents which the District Council regarded as still in contention. The only additional matters identified were:

- Consent condition review timeframes; and
- Advice notes as specified in draft consent conditions.

[73] By the time of Mr. Robinson's opening, and as a result of further negotiations, six of the identified issues had been resolved.

[74] During the hearing, amenity issues such as noise, visual, landscaping and groundwater monitoring were mitigated by changes to the conditions of consent. These changes were made to address concerns raised by affected neighbours at the hearing.

[75] Also during the hearing another five issues dropped away as a result of agreement being reached with Geotherm, and the McLachlan interests refining their case. As a result, by the time of Mr Robinson's closing submissions, there were only three remaining contested issues, all relating to the Poihipi Station air discharges.

[76] We discuss in more detail the issues that have been resolved and the extent to which they impact upon our draft decision. We also determine the contested issues that relate to the Poihipi Station air discharges.

Hearing at Taupo

[77] We carried out an extensive site visit on 9 May 2008. A second site visit was made on 28 July 2008. These site visits assisted us to understand the evidence and issues.

[78] The hearing commenced at Taupo on 21 July 2008. The following parties were present for all or part of the hearing:

Contact Energy Limited
Taupo District Council

Environment Waikato

Geotherm Group Limited (In Receivership)

Transit New Zealand

MacPower Limited

Mr A McLachlan

Ms L Price – neighbouring landowner

Ms F Ellery – neighbouring landowner

Mr A Birdsall – neighbouring landowner

Ms L Koster – neighbouring landowner

[79] By the time the hearing commenced and during the hearing period, the majority of the issues had been agreed between the parties, leaving the following issues outstanding:

Visual effects

Noise effects

Air quality effects

Effects on groundwater

Conditions of Consent

[80] At the time of filing its evidence in chief, Contact proposed conditions of consent. They went through several iterations as the application wound its way through the prehearing process and the hearing itself. Contact's latest proposed conditions of consent were lodged with the Board on the last day of the hearing. Attached as Appendix 2 are the conditions of consent for the regional consents. Attached as Appendix 3 are the conditions of consent for the land use consents.

[81] The conditions, included in Appendices 2 and 3, include minor changes made by us, to ensure consistency, clarity and certainty but do not alter their substance.

[82] As we have said, the only challenge to the conditions as now drafted, relate to the Poihipi air discharge consents - a matter that we address later in this decision.

Statutory Framework for Decisions on the Applications

[83] In considering the applications before it and the submissions received, the Board must, subject to Part II of the Act, have regard to the provisions of section 104. The relevant matters under that section are:

> *(a) any actual and potential effects on the environment of allowing the activity; and*
> *(b) the relevant provisions of –*
> *(i) a national policy statement:*
> *…*
> *(iii) a regional policy statement …:*
> *(iv) a plan or proposed plan; and*
> *(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

[84] The Board is also required under section 147(4)(b) to have regard to any relevant factor taken into account by the Minister, and the reasons stated by the Minister, when exercising his power to call in the proposal. As some of the consents applied for are for the discharge of contaminants, section 105 of the Act applies.

[85] The following sections of this report provide a commentary on these matters to which the Board has had regard to in reaching its decision.

Consideration of Statutory Instruments

[86] We have had regard to the relevant provisions of the applicable statutory instruments. Those relevant to the proposal are as follows and are discussed below:

- National Policy Statement on Electricity Transmission.
- Waikato Regional Policy Statement
- Waikato Regional Plan
- Taupo District Plan

National Policy Statement on Electricity Transmission

[87] The National Policy Statement on Electricity Transmission (NPS) came into effect on 10 April 2008. The NPS sets as a matter of national significance the need to operate, maintain, develop and upgrade the electricity network. The realignment of the existing transmission line and the integration of the new power station into the national transmission network is proposed in a manner consistent with the contents and purpose of the NPS.

Regional Planning Instruments

[88] The Waikato Regional Policy Statement (policy statement) and the Waikato Regional Plan (regional plan) are the two regional planning instruments that govern the use and development of the geothermal resources of the Waikato region.

[89] The relevant provisions of the policy statement became operative on 21 December 2007. The regional plan became operative on 30 August 2007, save for the Geothermal module which is the subject of Variation 2. The latest version of Variation 2 is no longer subject to challenge. The analysis set out below addresses the relevant provisions of the latest version of Variation 2 to the regional plan.

[90] Three chapters of the policy statement and the regional plan are relevant. These are the sections covering Energy, Geothermal, and Air Quality. The relationship of the proposed activity to these policy sections is examined as follows.

Geothermal

[91] Under the policy statement and regional plan geothermal provisions, the Waikato Regional geothermal resource is divided into management units termed "Geothermal Systems". Within the Geothermal Systems, specific "geothermal features" are also identified, some of which hold the further classification of "Significant Geothermal Features". Policy 3 "Classification of Systems" of the policy statement stipulates that five classes of Geothermal Systems can be identified in the regional plan, based upon:

- System size;
- Vulnerability of Significant Geothermal Features to extractive uses; and
- Existing Use.

[92] One class of Geothermal System is called a Development Geothermal System, within which development will be enabled because:

i) the system contains few Geothermal Features that are moderately to highly vulnerable, or

ii) the existing Geothermal Features are significantly impaired by lawfully established large takes, or

iii) the system is already subject to large scale energy use and development.

[93] Policy 1, "Identification of Geothermal Systems", in Section 7.4 of the regional plan classifies the Wairakei-Tauhara geothermal system as a Development Geothermal System.

[94] Table 7.1 of the regional plan sets out the following reasons why the System is so classified:

- *The system is already subject to large scale energy use and development.*
- *Existing surface features are significantly impaired by legally established large takes.*

- *No evidence of a flow of subsurface geothermal fluid to or from a Protected Geothermal System.*

[95] The policy statement and regional plan policy provisions relate to geothermal systems in general, and also include more targeted provisions that relate to various aspects of the use and development of specific Geothermal Systems according to their classification.

Use and Development

[96] The following group of policy provisions from the policy statement and regional plan specifically address the use and development of Development Geothermal Systems:

WRPS*[13] *3.7.2.1 – Development Geothermal Systems

Objective: *Large scale take, use and discharge of geothermal energy and water enabled within Development Geothermal Systems in a manner that:*

- *is efficient and allows the controlled depletion of energy so as to provide for the energy needs of current and future generations;*
- *remedies or mitigates significant adverse effects of Significant Geothermal features; and*
- *avoids, remedies or mitigates adverse effects on other natural and physical resources including overlying structures (the built environment).*

Policy One: Management of Use and Development in Development Geothermal Systems

Provide for large scale use and development of geothermal energy and water, promote efficient use of the resource and recognise there will be controlled depletion.

[13] WRPS refers to policy statement and WRP refers to regional plan

Policy Two: Integrated System Management Required for Development Geothermal Systems

Each Development Geothermal System shall be managed in an integrated manner through:

a. A System Management Plan that defines, by reference to all relevant policies in Chapter 3.7 of this Policy Statement, the objectives for the management of the system and provides as appropriate for:

i. operational flexibility and adaptive management including provision for subsequent uses;

ii. reservoir modelling and subsidence modelling;

iii. a discharge strategy, including provision for reinjection/injection;

iv. a mechanism(s) to ensure coordination and promote cooperation between all consent holders for large takes;

v. research, monitoring and reporting;

vi. non-statutory review of the System Management Plan if in the opinion of the consent holders and the Waikato Regional Council, such amendments are minor.

b. a peer review panel for the purpose of assisting the consent authority to manage the system so as to achieve the objectives of the System Management Plan;

c. resource consent conditions; and

d. a system liaison group/forum where appropriate.

WRP Objective 1

Where geothermal energy and water is taken, it shall be used and managed efficiently.

WRP Policy 3: Management of Use and Development in Development Geothermal Systems

Control the depletion of energy in Development Geothermal Systems through stepped production based on reservoir modelling that:

- *considers the capacity of the system as a whole; and*

- *considers the reasonably foreseeable needs of present and future generations; and*
- *promotes efficient management and use of the system.*

WRP Policy 4: Integrated System Management of Development Geothermal Systems

Each Development Geothermal System shall have an up to date approved System Management Plan that defines the objectives to be achieved in relation to the System having regard to the relevant policies in the RPS.

Policy 5: Multiple Operators

Ensure mechanisms (multiple operator agreements such as steamfield management agreements and field operation protocols) are in place where more than one consent holder for large takes is to exist within a system. Any such mechanism shall address the following matters to the satisfaction of the Waikato Regional Council (Environment Waikato):

i) coordination and cooperation between consent holders

ii) processes and procedures for assignment of responsibility and/or liability between consent holders for adverse environmental effects

iii) identification of potential interference effects between consent holders

iv) processes and procedures for avoiding, remedying or mitigating significant adverse environmental effects related to ii) and iii) above

v) amendment of the System Management Plan

vi) processes and procedures for dispute resolution of technical and consent related matters

vii) processes and procedures for changes to the mechanisms, such as changes incorporating consent durations and transfers to new parties

viii) siting of wells to avoid interference effects and to achieve efficient use and appropriate reinjection/production

ix) monitoring, information and data access arrangements, including the apportioning of costs

x) compliance with consent conditions, including joint reporting.

There is a strong preference for formal agreement(s) between consent holders but an applicant may demonstrate achievement of this policy by other mechanisms.

[97] We consider that the proposal is consistent with the relevant provisions of the regional statutory instruments for the reasons set out below.

[98] The Te Mihi station would, through controlled depletion of the geothermal resource, provide for the energy needs of current and future generations in an efficient manner. At the same time the proposal includes measures intended to remedy or mitigate adverse effects on other natural and physical resources, including the Waikato River, significant geothermal features and the built environment. This would be achieved by way of a continuation of the existing management regime codified in the consents already held by Contact for the System.

[99] Contact has submitted a draft System Management Plan as part of the information accompanying the applications. This plan has partially been prepared to support the consent applications and partially to ensure compliance with conditions of the 2007 consents. It contains the information required by Policy Two of the policy statement and Policy Four of the regional plan and to that end is consistent with those regional policy provisions.

[100] Policy 5 of the regional plan seeks to ensure that where there are multiple large take consent-holders, activities are undertaken in a co-ordinated manner to ensure integrated management of the resource, and adequate control of adverse effects. This includes amendment of the management plan if required. In this case the only other holder of a consent to take a large amount of geothermal fluid from the System is Geotherm. Geotherm was concerned about the possible effects of discharge and reinjection on its likely production. Their concerns were met by agreed changes to the conditions of consent constraining Contact's area of reinjection, and a side

agreement. Further, compliance with the provisions relating to discharge and reinjection, that we discuss below, assists in meeting their concerns.

Discharge and Reinjection

[101] The following group of policy provisions from the policy statement and regional plan specifically addresses discharges from and reinjection to Development Geothermal Systems:

WRPS Policy Three: Reinjection / Injection

For large takes of geothermal energy and water from Development Geothermal Systems, the geothermal water remaining after use is to be reinjected / injected in accordance with a Discharge Strategy forming part of a System Management Plan which shall consider the following matters, as relevant to:

i. Dispose of waste water;

ii. Return geothermal water to that system;

iii. Facilitate further extraction of energy from the system;

iv. Avoid or mitigate potential differential subsidence, and remedy or mitigate the adverse effects of subsidence, particularly in the built environment

v. Reduce the risk of hydrothermal eruptions particularly in the built environment;

vi. Remedy or mitigate significant adverse effects on Significant Geothermal Features; and

vii. Avoid, remedy or mitigate contamination of surface and ground waters.

Such Discharge Strategy shall also have regard to:

i. Any likely benefits to or adverse effects on the system or its productive capacity;

ii. The need for adaptive management and flexibility over time.

iii. The benefits, costs and adverse effects of the Discharge Strategy;

iv. The need to avoid or mitigate potential differential subsidence, and remedy or mitigate the adverse effects of subsidence, particularly in the built environment; and

v. The need to reduce the risk of hydrothermal eruptions particularly in the built environment.

WRP Objective 7

Significant adverse effects on fresh water and land arising from the discharge of geothermal energy and water avoided.

WRP Policy 12: Discharges of Geothermal Energy and Water onto Land and into Fresh Water

Ensure that discharges of geothermal energy and water onto land and into fresh water after efficient and appropriate use are limited such that the adverse effects are no more than minor.

WRP Policy 13: Discharge Strategy for Large Discharges of Geothermal Energy and Water in Development Geothermal Systems

For large discharges of geothermal energy and water, reinjection / injection is to be undertaken in accordance with a Discharge Strategy prepared for each Development Geothermal System.

[102] We consider that the proposal is consistent with the discharge and reinjection provisions of the regional statutory instruments for the following reasons.

[103] The draft management plan provided with the application contains a Discharge Strategy as required by the policy statement and regional plan. The Discharge Strategy adequately addresses the matters that must be considered.

[104] In particular the Discharge Strategy addresses the need for adaptive management and flexibility over time. The large reinjection area sought would allow flexibility of reinjection locations, that may be required to

avoid subsidence effects, as is required by Policy 3 of the policy statement and proposed General Conditions 3.3.

[105] Measures to mitigate any adverse effects on significant geothermal features are also set out. Measures are discussed in greater detail in the next subsection of this report headed "Significant Geothermal Features".

[106] The proposal to establish and operate Te Mihi with the consequent increase in the amount of geothermal fluid to be reinjected, is consistent with Objective 7 and Policy 12 of the regional plan. Significant adverse effects on fresh water would be avoided by reducing discharges of geothermal water into the Waikato River. Surface irrigation of the condensate and cooling water blowdown may benefit rural land. The establishment of the power station itself represents an efficient and appropriate use of the geothermal energy resource, as explained in greater detail earlier in this draft report.

Significant Geothermal Features

[107] The following group of policy provisions from the policy statement and regional plan specifically address Significant Geothermal Features within Development Geothermal Systems:

WRPS Policy Five: Management of Significant Geothermal Features in Development Geothermal Systems

Allow for the efficient take, use, and discharge of geothermal energy and water in Development Geothermal Systems while remedying or mitigating within the Regional Geothermal Resource, significant adverse effects on Significant Geothermal Features.

WRP Objective 2

In Development Geothermal Systems, significant adverse effects on Significant Geothermal Features arising from the take of geothermal energy and water to be remedied or mitigated within the Regional Geothermal Resource.

WRP Policy 6: Significant Geothermal Features in Development Geothermal Systems

Where significant adverse effects on Significant Geothermal Features in Development Geothermal Systems are to be remedied or mitigated, the remediation and mitigation may include:

- *the take and return of geothermal water being managed to remedy or mitigate significant adverse effects on those Significant Geothermal Features affected, or*
- *adverse effects on features of the same or similar type (defined in the glossary) being remedied or mitigated to an extent commensurate with the adverse effect being caused ('like for like' mitigation).*

WRP Policy 10: Adverse Effects of Land Use and Take, Use and Discharge of Water on Significant Geothermal Features

Ensure that land use and the take, use and discharge of non-geothermal water avoid significant adverse effects on Significant Geothermal Features.

[108] We consider that the proposal is consistent with the provisions of the regional statutory instruments that relate to the protection of significant geothermal features for the following reasons.

[109] Within the System there are 11 different Significant Geothermal Features. Among the features are Karapiti/Craters of the Moon and the Broadlands Road Reserve. Contact recognises that the Significant Geothermal Features within the System may be adversely affected due to declining heat flow across the System as a whole, which may be exacerbated by the proposed increased volumes of re-injection. However, Contact contends in the draft management plan, that any such adverse effects will not be significant, and

if they do occur, will be on the dimensions of the features rather than on their intensity or other characteristics.

[110] Contact proposes to continue the current approach of providing off-site mitigation of any adverse effects caused on significant geothermal features. This mitigation is primarily through the Wairakei Environmental Mitigation Charitable Trust and the Wairakei Charitable Trust.

[111] The off-site mitigation measures address whatever level of effect that may occur on the Significant Geothermal Features regardless of their magnitude. The increased reinjection volume would itself be a mitigation measure. The Discharge Strategy is an instrument which has amongst its objectives "remedying or mitigating adverse effects on significant geothermal features".

Effects of Take, Use and Discharge

[112] The following group of policy provisions from the policy statement and regional plan specifically address adverse effects of take, use and discharge in Development Geothermal Systems.

WRPS Policy 6: Adverse Effects of Take, Use and Discharge in Development Geothermal Systems

When taking, using, or discharging geothermal energy and water in Development Geothermal Systems, avoid, remedy, or mitigate the adverse effects on non-geothermal natural and physical resources, including overlying structures (the built environment).

WRP Objective 5

In Development Geothermal Systems, adverse effects on other natural and physical resources including overlying structures (the built environment), such as those resulting from subsidence and land instability, arising from the take, use, and discharge of geothermal energy or water to be avoided, remedied or mitigated.

WRP Policy 11: Effects of Geothermal Resource Use on Other Natural and Physical Resources, including Overlying Structures (the Built Environment)

When taking, using, or discharging geothermal energy and water in Development Geothermal Systems, avoid, remedy or mitigate the adverse effects on non-geothermal natural and physical resources, including overlying structures (the built environment).

Where there is scientific uncertainty and a threat of serious or irreversible adverse effects on natural and physical resources including overlying structures (the built environment) adopt a precautionary approach.

[113] We consider that the proposal is consistent with those provisions for the following reasons.

[114] The System underlies significant urbanised areas of Taupo, and peri-urban areas around the fringes of the town. In the past, subsidence has occurred at various locations around Taupo. The draft management plan records that in some of those areas, subsidence results from geothermal power generation. At other locations, such as the Crown Road and Invergarry Road areas, it has not been universally accepted that Contact's activities have caused subsidence.

[115] The primary objective of the Discharge Strategy is to address the adverse effects of subsidence. In order to achieve this objective, Contact proposes the following measures:

- Repairing any damage to buildings and structures caused by subsidence resulting from Contact's activities;
- Continuation of benchmark modelling and house inspection programmes, in association with BRANZ and consultant civil engineers;

- Enhancement of existing reservoir simulation models, and development of a rock mechanics modelling package that can be integrated with the reservoir simulation model to produce a 3D subsidence model;
- Instigation of a long term investigation project that provides greater clarity on the cause and extent of subsidence; and
- Specifically with regard to minimising potential subsidence in the Taupo urban area, the maintenance of required minimum pressures at a specified depth in the Tauhara part of the System.

[116] It has been identified through previous consenting processes, that there is a lack of certainty to predict future subsidence adequately. The modelling and investigation work proposed would reduce that uncertainty. The ongoing building and benchmark surveys will detect any differential subsidence. The large reinjection area sought by Contact would assist in remedying and mitigating subsidence related effects through providing alternative reinjection locations.

Air Quality

The following policy provisions from the policy statement and regional plan are most relevant to air quality issues as they are relate to the proposed activities:

WRPS Regional and Local Air Quality

Objective:

Significant characteristics of areas of:

- *High air quality protected*
- *Degraded air quality enhanced*
- *Other air quality maintained*

WRPS Policy 4: Adverse Effects on Human Health

Discharges to air managed in a way that is designed to avoid adverse effects on human health

WRP Objective 1:

Significant characteristics of air quality as identified in Table 6-1 are:

a. protected where they are high

b. enhanced where they are degraded

c. otherwise maintained.

WRP Objective 2:

No significant adverse effects from individual site sources on the characteristics of air quality beyond property boundary.

WRP Objective 3:

Cumulative effects of discharges on ambient air quality do not:

a. present more than a minor threat to the health of humans, flora and fauna

b. cause odour that is objectionable to the extent that it causes an adverse effect

c. result in levels of suspended or deposited particulate matter that are objectionable to the extent that they cause adverse effects

d. have a significant adverse effect on visibility

e. cause accelerated corrosion of structures

f. cause significant adverse effects on the relationship tangata whenua as Kaitiaki have with their identified taonga such as air, ancestral lands, water and waahi tapu.

WRP Policy 2: Managing Effects of Other Discharges

Manage other discharges of contaminants to air through controlled and discretionary activity rules having particular regard to the effects of the discharge on:

a. ambient air quality compared to the Regional Ambient Air Quality Guidelines (RAAQG) levels provided in Chapter 6.3,

b. ambient air quality compared to internationally accepted air quality guidelines or standards for managing and understanding the effects of contaminants on human health, the health of flora and fauna and amenity values,

c. ambient odour and particulate matter levels compared to the guidelines for assessment provided in Chapter 6.4 of the Plan for odour and particulate matter

d. adverse effects from contaminants that are hazardous in ambient air, particularly with respect to human health,

e. the significant characteristics of air quality within an area,

f. significant adverse effects of the discharge on the identified values of tangata whenua as Kaitiaki,

g. the sensitivity of the receiving environment,

h. existing ambient air quality and any cumulative effects as a result of the discharge on the receiving environment,

i. nationally accepted codes of practice for the relevant activity.

WRP Policy 5: Positive Benefits of Resource Use

Recognise the positive benefits to people and communities arising from activities that affect air quality by enabling a range of activities to use the air (including existing activities) whilst ensuring that:

a. high quality air resources are protected,

b. degraded air quality is enhanced,

c. adverse effects on air quality are avoided, remedied or mitigated.

[117] We consider that the proposal is consistent with the Air Quality provision of the regional statutory instruments for the following reasons.

[118] The proposed air discharges would contain non-condensable gases, which most significantly include H_2S. This gas has the potential to cause nuisance odour and adverse health effects. We heard uncontested expert evidence that the proposed air discharges would not pose an adverse effect to human health. We accept this view.

[119] For reasons given later in this draft report, we consider that the odour effects of the discharges are appropriately addressed by the conditions of consent.

Energy

[120] The policy statement energy provisions sets out the following objective and policy of relevance to the proposed activities.

Objective:

Efficient use of energy within the Waikato Region.

Policy One: Energy Efficiency and Conservation

To promote efficiency and conservation in the production, transmission and consumption of energy.

[121] The proposed activities would contribute to the efficient use of energy within the region. The extraction, generation and disposal techniques proposed, would promote efficiency and conservation. To that end the overall project is consistent with the policy provisions.

Taupo District Plan

[122] The Taupo District Plan became operative on 11 October 2007. We were not made aware of any changes relevant to these proceedings. The site of the proposed Te Mihi power station is partly within the Rural Environment and partly within the Industrial Environment.[14] Section 3 of the Plan sets out the Objectives and Policies applicable within the relevant Environments and generally throughout the District. We set out below those relevant to these applications.

[14] Drawing 124922-RC06 attached to applications for consent

Objectives and Policies

RURAL ENVIRONMENT OBJECTIVES AND POLICIES – SECTION 3B.2

OBJECTIVE 1

3b.2.1 The protection of the rural amenity and character of the Rural Environment.

POLICIES

i. Maintain and enhance the amenity and character of the Rural Environment by providing land use performance standards and subdivision rules to manage the scale and density of development.

...

iii. Maintain the open space and dispersed building character.

iv. Provide for a range of productive land use activities within the Rural Environment while ensuring any adverse effects are avoided, remedied or mitigated.

...

[123] This objective and the related policies seek to protect the existing amenity levels provided by Rural Environments. The Explanation to the objective and policies makes it clear that Policy iv recognises that the Rural Environment contains a wide range of resources that require the location of activities close to the resource.

[124] Objective 3b.2.2 and Policy 3b.2.2.iii & vi are focussed on limiting the potential for subdivision in the Rural Environment to diminish the rural amenity or character and increase urbanisation. These provisions will limit the ability of further development in the vicinity of the power station which could lead to reverse sensitivity issues arising. The Explanations make it clear that the Plan gives encouragement to electricity generation facilities on geothermal systems such as Wairakei-Tauhara.

OBJECTIVE 4

3b.2.4 The efficient and effective functioning of the Rural Environment by enabling the use and development of natural and physical resources, while ensuring appropriate environmental outcomes are achieved.

POLICIES

i. Control activities which may potentially restrict or compromise the operation of existing activities of the Rural Environment including the creation of new rural allotments that may lead to conflict between residential and rural activity.

...

iii. Avoid subdivision and development of rural land that will put pressure on rural infrastructure and may require an increase in the level of service now or in the future.

...

v. To recognise the important role of resource use and development in the Rural Environment, by providing for the continued operation and associated development of existing electricity generation facilities and network utilities by allowing their use, maintenance and minor upgrading where all significant adverse effects are avoided, remedied or mitigated.

[125] These provisions, and the relevant Explanation, support the use of the geothermal resource for electricity generation and transmission.

OBJECTIVE 5

3b.2.5 The protection of adjoining Environments from the adverse effects of activities within the Rural Environment.

POLICY

iii. Manage the potential for adverse effects of activities in the Rural Environment at the interface of this and other more sensitive Environments.

[126] The majority of the site is within the Rural Environment, with a smaller area being within the Industrial Environment. The latter is less sensitive to the potential adverse effects so protection of adjoining environments is not considered necessary.

INDUSTRIAL ENVIRONMENT OBJECTIVES AND POLICIES – SECTION 3D.2

OBJECTIVE 1

3d.2.1 The maintenance of the environmental qualities and functioning of the Industrial Environment.

POLICIES

i. Maintain the qualities of the Industrial Environment through controlling the bulk, location and nature of activities, to ensure an appropriate scale and intensity of buildings and activities that are consistent with an industrial scale of development; i.e. an appropriate density of activity and level of environmental effects, while allowing the functioning of the area to be maintained.

ii. Encourage a wide range of activities within the Industrial Environment, including any activity with nuisance elements not appropriate for any other Environment, while ensuring any adverse effects are avoided, remedied or mitigated.

OBJECTIVE 2

3d.2.2 The protection of adjoining Environments from the adverse effects of activities within the Industrial Environment.

POLICY

i. Control the effects of activities within the Industrial Environment so the scale of development and level of environmental effects does not adversely affect the amenity of the other Environments of the District.

[127] The above objectives and policies enable the establishment of a wide range of activities provided that adverse effects can be appropriately avoided, remedied or mitigated, particularly the amenity values in adjoining Environments, which in this case is the Rural Environment.

LAND DEVELOPMENT OBJECTIVES AND POLICIES – SECTION 3E.2

OBJECTIVE 4

3e.2.4 Avoid the degradation of Taupo District's lakes, waterways and aquifers from effluent and waste water resulting from land development.

POLICIES

i. Implement integrated land management strategies in conjunction with Regional Authorities that will avoid, remedy or mitigate adverse environmental effects on Taupo District's lakes, waterways and aquifers.

OBJECTIVE 5

3e.2.5 Ensure land development does not detract from the amenity value or qualities of the local environment.

POLICIES

i. Ensure that proposals for the subdivision and development of land assess the particular amenity values of the area including the physical characteristics of the land and avoids, remedies or mitigates any adverse effects.

[128] The proposed power station would be consistent with the character and amenity of the surrounding environment. This area is clearly identified by the plan as being suitable for development and use of the geothermal resource both in the objectives and policies of the Rural Environment and the partial zoning of the site as Industrial.

TRAFFIC AND TRANSPORT OBJECTIVES AND POLICIES – SECTION 3F.2

OBJECTIVE 1

3f.2.1 The safe and efficient operation of the roading network, and movement of traffic, including cyclists and pedestrians within the District.

POLICIES

i. Ensure activities avoid, remedy or mitigate any adverse effects on the operation and function of the roading network, including the movement of traffic cyclists and pedestrians, as accordance with the Roading Hierarchy.

ii. Encourage activities, including the design and location of new vehicle crossings, to provide for the safe and efficient movement of traffic, including cyclists and pedestrians.

[129] Uncontested evidence of Mr Harries, called by Contact, showed that this objective and these policies were met in respect of the local roading network. Immediately prior to the hearing, Contact, Transit and Taupo District Council advised us by a joint Memorandum that all residual traffic issues as between those parties would be satisfied by the amended draft conditions proffered with the Memorandum. Two other submitters raised traffic concerns. At the hearing Ms Koster raised concerns in respect of children riding horses on Oruanui Road. In his submission, Mr R Houghton raised concerns regarding the intersection of Poihipi Road and State Highway 1. We are satisfied that the proffered conditions accord with the objectives and policies in this section and adequately address the submitters concerns.

TANGATA WHENUA CULTURAL VALUES OBJECTIVES AND POLICIES – SECTION 3G.2

OBJECTIVE 1

3g.2.1 Recognise and provide for the cultural and spiritual values of Tangata Whenua in managing the effects of activities within the District.

POLICIES

i. Take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) in the management of the natural and physical resources of the District.

ii. Ensure activities have regard for the cultural values of Tangata Whenua as Kaitiaki of their culture, traditions, ancestral lands, water and other taonga.

iii. Ensure activities on or near Sites of Significance to Tangata Whenua are undertaken in a manner which provides for the cultural and spiritual value and significance of the site.

[130] Contact consulted local iwi and both agreed a procedure to apply in the event that kōiwi or other culturally significant items are discovered during construction. Culturally significant sites have been identified in a Cultural Impact Assessment prepared by iwi, and protection mechanisms for these sites are proposed in the draft conditions of consent.

NATURAL HAZARDS AND UNSTABLE GROUND OBJECTIVES AND POLICIES – SECTION 3L.2

OBJECTIVE 1

3l.2.1 Protection of activities, development and life from the adverse effects of natural hazards.

POLICIES

i. Control the design and location of activities and development within identified natural hazard areas, or areas which have significant potential to be affected by a natural hazard, to avoid or mitigate the effects of the natural hazard.

ii. Manage the location, design, and type of new activities and development to avoid or mitigate the adverse effects of flooding, erosion, ground rupture and deformation, hot ground and land instability on development and the community.

OBJECTIVE 2

3l.2.2 Activities and development do not create, accelerate, displace, or increase the effects of a natural hazard.

POLICIES

i. Ensure that activities do not alter or change the nature of a natural hazard event, increase the intensity of a natural hazard event or increase the risk of the event occurring.

ii. Ensure that activities and structures do not increase the risk to the community or the environment from the effects of natural hazards.

iii. Ensure that where development occurs within areas subject to the effects of natural hazards, property owners and/or occupiers are informed of and manage the risk.

iv. Control the location and presence of hazardous substances in areas subject to natural hazards to ensure that there is no increase in the effects of the natural hazard or risk to the community from hazardous substances.

[131] The Plan identifies two fault lines traversing the subject site. The proposed power station and associated structures have been located so as to avoid these fault lines. While the power station is located outside of the Hot Ground Hazard Area, the site is within a geothermal field and it is subject to some risk of subsidence. This risk can be mitigated by the adoption of the Discharge Strategy discussed above.

[132] We consider that the proposed activity would not result in any acceleration or displacement of these hazards and would not present an increased risk to the community.

HAZARDOUS SUBSTANCES OBJECTIVES AND POLICIES – SECTION 3M.2

OBJECTIVE 1

3m.2.1 Protection of the environment and the health and safety of the community, from the adverse effects of hazardous substances associated with hazardous facilities.

POLICIES

i. Ensure that hazardous facilities are appropriately located to avoid or mitigate adverse effects on the environment and unacceptable risks to the environment and community.

ii. Ensure that hazardous facilities are designed and managed to avoid or mitigate adverse effects and unacceptable risks to the environment and community.

[133] The above objective and policies seek to ensure that the storage and use of hazardous substances are undertaken in a manner that does not present a risk to the community and potential adverse effects are avoided, remedied or mitigated. The draft conditions proposed to attach to the land use consents for Te Mihi include specific provisions to achieve these.

NETWORK UTILITIES OBJECTIVES AND POLICIES – SECTION 3N.2

OBJECTIVE 1

3n.2.1 To enable the operation, maintenance and upgrading of existing Network Utilities and the provision of new Network Utilities.

POLICIES

ii. Provide for the establishment of new Network Utilities in a way that, as far as practicable, recognises the characteristics and amenity of the different Environment areas.

iii. Have regard for the technical and operational requirements of Network Utilities and the contribution they make to the functioning and well being of the community.

OBJECTIVE 2

3n.2.2 Network Utilities are designed and located to avoid, remedy or mitigate adverse effects on the environment and protect the health and safety of the community.

POLICIES

i. The establishment, operation, maintenance or upgrading of Network Utilities does not compromise the health and safety of the community

ii. Avoid, remedy or mitigate the potential adverse effects of the location and siting of new Network Utilities on significant landscape features and the amenity and character of the District.

…

iv. Encourage Network Utilities to avoid, remedy or mitigate adverse effects on the environment by co-siting or sharing facilities where this is technically practical and feasible while having regard to the best practicable option for the siting or sharing of facilities.

v. Recognise that Network Utility services can maintain and enhance the social and economic well-being of communities.

[134] The above objectives and policies recognise the essential need for network utilities, but require that consideration be given to the amenity of the area in which they are located, and the health and safety of the community. As part of this application, a minor realignment of the existing 220kV transmission line from Poihipi is proposed to connect it to the Te Mihi switchyard. The present connection from there to the Wairakei-Whakamaru line largely follows the existing alignment. Given that the transmission towers are an existing feature of the environment it is considered that the realignment would largely maintain the current character of the area and sufficient separation is provided between the lines and public areas such as roads.

GEOTHERMAL ACTIVITY OBJECTIVES AND POLICIES – SECTION 3O.2

OBJECTIVE 1

3o.2.1 Enable and manage the effects of land use activities associated with geothermal resource use and development.

POLICIES

i. To provide for the continued operation, maintenance and minor upgrading of existing developments utilising geothermal resources.

ii. To enable land uses associated with the use of geothermal resources in a manner which avoids, remedies or mitigates adverse effects on the environment.

iii. To control the land use effects associated with the use of geothermal resources by way of environmental performance standards in rules and conditions on resource consents.

[135] When these objectives and policies are read in conjunction with the "Explanation" and "Principal Reasons for Adoption", it is clear the District Plan enables the development of Development Geothermal Systems.

Overall Conclusion in respect of the District Plan

[136] We consider that the Plan as a whole supports utilisation of Geothermal Systems to generate electricity and for the associated infrastructure. The Plan is designed to protect neighbouring activities from the adverse effects of such developments. We are satisfied such protection can adequately be achieved by the conditions proposed for the land use consents.

Part II of the Resource Management Act 1991

[137] In deciding the applications for the Te Mihi proposal, we have had regard to Part II of the Act. Section 5 (1) establishes the purpose of the Act as being:

– to promote the sustainable management of natural and physical resources …

Section 5 (2) defines "sustainable management":

> *(2) In this Act, "sustainable management" means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –*
>
> *(a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
>
> *(b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
>
> *(c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

[138] Section 5 of the Act requires a broad overall judgement on whether or not a proposal promotes the sustainable management of natural and physical resources. That approach allows comparison of conflicting considerations, their scale or degree and their relative significance.

[139] Geothermal resources are a natural and physical resource. Contact already holds consents to extract from the resource, and use it for the generation of electricity. The current applications seek authority to use that resource in a new power station at Te Mihi and generate more electricity.

[140] In reviewing whether this proposal enables people and their communities to provide for their social, economic and cultural wellbeing, and for their health and safety, we are mindful that Te Mihi would produce electricity from a renewable resource. As such, it would provide for the general needs of the community.

[141] In terms of sustaining the potential of natural and physical resources to meet future needs, we note that the reinjection proposal would be undertaken in a

manner that enables reservoir pressures to be maintained at required levels. In this context, we also acknowledge the improvement in water quality of the Waikato River that would result from this development.

[142] Issues regarding the implications for the Te Mihi project for the life supporting capacity of air, water or soil were addressed in the evidence, particularly that of Mr Bromley and Dr Stevenson. We will discuss in some detail the issues relative to air quality and groundwater when considering the effects of the proposal. The conditions as proposed adequately address those issues.

[143] We also discuss the potential adverse effects resulting from the proposal on the environment. The conditions of consent adequately remedy or mitigate these potential adverse effects.

Section 6

[144] We are required to recognise and provide for the following matters of national importance:

> *(a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:*
>
> *(b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:*
>
> *(c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:*
>
> …
>
> *(e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.*
>
> *(f) the protection of historic heritage from inappropriate subdivision, use, and development*
>
> *(g) the protection of recognised customary activities.*

[145] We find that there are no outstanding natural features or landscapes affected by the applications. Two of the Landscape Amenity Management Areas identified in the District Plan, Karapiti and Kiriohineki are located within the reinjection application area and the air discharge application area. While these features are identified, the proposed steamfield activities are permitted by the plan.

[146] As discussed by Mr Bromley,[15] any increase in pressure within the reservoir at depth arising from reinjection will reduce the steam upflow. This could have an adverse effect on thermo–tolerant vegetation. Any such effect can be addressed in the Discharge Strategy.

[147] With regard to section 6(e), a Cultural Impact Assessment prepared by Te Kapa O Te Rangiita Ki Oruanui identified three culturally significant sites. These are:

- Raparapa Maunga;
- A rock art feature; and
- Te Mihi Maunga.

The first two features are located to the north of the power station site and Te Mihi Maunga is located to the south of the site, close to Poihipi Road.

[148] The land use consent conditions provide that Contact shall not operate within 100m of these features. A plan showing the exclusion zones is attached to the draft conditions, and this plan reflects recent consultation between Contact and Te Kapa O Te Rangiita Ki Oruanui.

[149] We also note that these sites are well clear of the power station site. Two sites are within the area proposed for the discharge by irrigation of condensate and cooling water blowdown. All are within the area proposed for reinjection. While the infrastructure associated with the irrigation and the reinjection is a permitted activity, we consider that the management plan

[15] EiC, para 4.8-4.9

and discharge strategy would also adequately protect the culturally sensitive sites.

[150] In terms of the protection of historic heritage – section 6(f) - the Archaeological Assessment forming part of the application identified two recorded archaeological sites:

- U 17/17 – rock art and shelter site; and
- U 17/65 – Te Mihi earthworks site.

[151] These are not within the power station site area, nor are they identified in the district plan. These are the same rock art feature and Te Mihi Maunga identified by the Cultural Impact Assessment. Their protection is ensured by the agreement reached between Contact and the local hapu. In addition they are subject to the provisions of the Historic Places Act.

Section 7

[152] We must also have particular regard to the matters set out in section 7. These are:

(a) Kaitiakitanga:

(aa) The ethic of stewardship:

(b) The efficient use and development of natural and physical resources:

(ba) the efficiency of the end use of energy:

(c) The maintenance and enhancement of amenity values:

(d) Intrinsic values of ecosystems:

…

(g) Maintenance and enhancement of the quality of the environment:

(h) Any finite characteristics of natural and physical resources:

(i) The protection of the habitat of trout and salmon:

(j) the effects of climate change:

(k) the benefits to be derived from the use and development of renewable energy.

[153] We now discuss the relevant matters.

[154] The role of Kaitiaki rests with Te Kapa O Te Rangiita ki Oruanui, the local hapu in the area. They are a submitter and their views are supported by a submission from the Tuwharetoa Maori Trust Board. Agreement was reached by a consent condition putting in place an appropriate protocol to be adhered to in the event of a discovery of a cultural or archaeological site.

[155] Further, the General Conditions require that the Peer Review Panel comprise three independent technical experts and one representative appointed by the Wairakei hapu.[16] The General Conditions also provide for the exercise of the Kaitiaki role. Further, a Memorandum of Understanding has been agreed between Contact and the Wairakei hapu.

[156] At the Prehearing Meeting of 6 June 2008, the issue of hapu representation on the Peer Review Panel was discussed. While a representative of the Wairakei hapu will sit on the Peer Review Panel, the three individual Wairakei hapu and the Tauhara hapu felt that a mechanism was needed to enable their particular issues to be addressed where matters peculiar to their own rohe were affected. It was agreed that a Hapu Review Panel be formed to liaise with the representative on the Peer Review Panel.

[157] Other aspects in section 7 of particular relevance include:

- The proposal would provide by way of adaptive management for the efficient use and development of the Wairakei geothermal resource – section 7(c) and 7(h);
- More electricity will be produced from Te Mihi than is currently generated at Wairakei, from the same resource take[17] - section 7(ba);
- The conditions of consent would adequately maintain and enhance amenity values of the area – section 7 (d);

16 General Condition 1.2

17 Pummer, EiC, para 7

- The conditions of consent would adequately address and protect the intrinsic values of the geothermal ecosystem and the reduction of discharge to the Waikato River would improve its ecosystem – section 7(e) and 7(i);
- While the Te Mihi Power Station would discharge greenhouse gases, the emission factor per GWh would be much less that that produced by a gas or coal fired station[18] - section 7(j); and
- The benefits derived from the use and development of renewable energy are discussed in the evidence in chief of Mr D Hunt[19]. The term "renewable energy" is defined in section 2 of the Act to include energy produced from geothermal sources – section 7(k).

Section 8

[158] In considering the application by Contact, we are required to take into account the principles of the Treaty of Waitangi. We take into account the following:

- The consultation with iwi and the outcomes of that consultation;
- The measures that are proposed to provide protection to sites and items of cultural significance; and
- Measures proposed to recognise and provide for Kaitiakitanga.

Effects of the Te Mihi Proposal on the Environment

Positive Effects

[159] There was no dispute that implementing the proposal and its ongoing operation would have a number of positive effects:

i. There would be a significant reduction in the volume of geothermal fluid discharged into the Waikato River in the event of the Te Mihi

[18] C Stevenson, EiC, para 213

[19] para 15

proposal being implemented. This is a significant positive effect on the environment;

ii. An additional 60MW would be generated for the same fluid take. This is equivalent to the electricity requirements of approximately 70,000 households between 2011 and 2026;

iii. There would be $60 million less in electricity generation costs over the first 25 years of the project compared with alternative supply options;

iv. There would be increased diversification of electricity generation sources, thereby reducing supply risks;

v. The station would be base load. This enables a continuous supply to the national grid;

vi. It would displace other sources of generation with higher greenhouse gas emissions;

vii. There would be a reduction in electricity transmission losses, at present day values amounting to approximately $1 million per year;

viii. There would be a contribution to the regional economy during the construction phase, including employment of up to 400 people and approximately $50 million directly injected into the local economy; and

ix. There would be some roading improvements.

[160] In reaching our decision we have regard to these uncontested positive effects.

Adverse Effects

Effects on the Reservoir

[161] The proposal relies on the existing Wairakei consents, which expire in 2026, for access to the geothermal resource. The General Conditions forming part of the existing consents are mirrored by the proposed General Conditions of the Te Mihi consents. They include the requirement that Contact develop a System Management Plan. This plan is to be approved by Environment

Waikato on the advice of the Peer Review Panel. A draft management plan has been provided by Contact[20].

[162] The management plan is to include a Discharge Strategy. This is to have as its primary objective the need to address the adverse effects of subsidence. Secondary objectives[21] are:

a. Facilitating further extraction of energy from the Wairakei / Tauhara Geothermal System;

b. Remedying or mitigating adverse effects on significant geothermal features including maintenance of geothermal features at Karapiti as long as practicable;

c. Avoiding, remedying or mitigating contamination of surface and groundwater bodies;

d. Integrating takes, uses (including cascade users) reinjection, injection and other discharge methods.

[163] The existing Wairakei injection/reinjection consent[22] provides for the discharge of up to 144,000 tonnes/day of geothermal fluid. The injection areas currently being utilised are at Aratiatia and Poihipi West.

[164] The management plan requires complex monitoring and annual reporting of a wide range of variables, including reservoir pressures, differential subsidence, fluid geochemistry, well data, surface heat flow, thermal features and groundwater.

[165] This proposal seeks consent for an additional 95,000 tonnes/day of reinjected fluid and 6,500 tonnes/day of water for irrigation. Contact proposes that the reinjection and irrigation would be in accordance with the Discharge Strategy, in the same way as the existing Wairakei injection/reinjection consent. The additional reinjection capacity would give greater flexibility in managing the System.

---

20 Condition 1 of the General Conditions

21 Condition 3.3 of the General Conditions

22 RC 104718

[166] **Finding of Fact:** We find that the conditions of consent would adequately remedy or mitigate actual and potential adverse effects on the reservoir.

Effects on Other Consent Holders for Large Takes of the Geothermal Resource

[167] Geotherm expressed concern through submissions that this proposal may have an adverse effect on implementing consents granted in early 2007 for the proposed Geotherm Power Station.

[168] On 25 July 2008 Geotherm and Contact filed a Joint Memorandum with the Board setting out that they agreed on conditions that met Geotherm's concerns. These were approved by Environment Waikato and Taupo District Council.

[169] **Finding of Fact:** We find that the conditions agreed between Geotherm and Contact will adequately avoid or mitigate any potential adverse effects on Geotherm.

Effects on Air Quality

[170] A number of submitters expressed concern regarding the effects of the proposal on air quality. These concerns included the cumulative effects resulting from the proposal, and from existing and consented proposals. The current set of applications includes a discharge to air application for the existing Poihipi Station as the air discharge consent for that operation will expire at the end of 2011.

[171] Contact's air quality adviser, Dr Craig Stevenson, described the processes leading to emissions to air as follows.[23]

> *The geothermal fluid that is extracted from the wells in the Wairakei steamfield contains carbon dioxide, hydrogen sulphide, and mercury that*

[23] EiC, para 20-23

transfer into the steam phase when the geothermal fluid is flashed to produce the steam used in the power station turbines. These substances are the predominant constituents of the non-condensable gas that must be removed from the turbine condensers to avoid excessive backpressure that would otherwise reduce turbine efficiency.

In the proposed Te Mihi power station, the non-condensable gas will be discharged to air in the buoyant plumes of warm air from the cooling towers.

Hydrogen sulphide is a contaminant of potential concern, largely because of its characteristic "rotten egg" odour. Mercury is of potential concern because of its toxicity. Carbon dioxide is of concern because it is a greenhouse gas.

The non-condensable gas stream also contains trace levels of a range of other gases, including hydrogen, methane and nitrogen. These gases are essentially non-toxic. Methane emissions are included in the assessment of greenhouse gas emissions.

[172] Dr Stevenson stated that there are essentially no contaminant discharges to air during the normal operations of the borefield. It is the cooling tower plume that contains contaminants, being the non condensable gases.

[173] Dr Stevenson undertook a cumulative dispersion modelling assessment of the emissions from the existing and proposed geothermal power stations in the area. These were Wairakei, Poihipi, Rotokawa, Rotokawa 2 (under construction), Te Mihi (proposed) and Geotherm (consented but not developed). H_2S concentrations of 70µg/m^3 (1 hour average) have been used as a guideline for assessing acceptability of odour effects from this gas. We note that the World Health Organisation guideline for risks of adverse health effects is 150µg/m^3 of H_2S (24 hour average) – this is more than the 70µg/m^3 (1 hour average) odour effects level.

[174] Dr Stevenson concluded that current H_2S emissions from Wairakei dominate H_2S concentrations within about 3-4 km of that plant. He concluded that[24]:

- *with the commissioning of the Rotokawa 2 power station and decommissioning of the Wairakei station, the emissions from the Rotokawa power stations will dominate hydrogen sulphide concentrations over much of the modelling domain*
- *the maximum concentrations of hydrogen sulphide in the vicinity of the Te Mihi and Poihipi power stations will originate predominantly from emissions from the Rotokawa power stations*
- *the maximum contributions to hydrogen sulphide concentrations resulting from emissions from the Te Mihi and Poihipi power stations will not exceed the 70 ug/m3 guideline used in this assessment, except within the Te Mihi site*
- *maximum contributions to hydrogen sulphide concentrations fall below 20 ug/m3 beyond 2.5 km in any direction for emissions from Te Mihi power station and beyond 1.4 km for emissions from Poihipi power station*

[175] Dr Stevenson also concluded that[25]:

- *maximum predicted mercury concentration contributions in the immediate vicinity of any of the power stations are at about the global background mercury concentrations, so that there is no appreciable risk of adverse effects to human health or the biosystem*
- *shadowing by cooling tower plumes will almost always be contained within the power station sites*
- *no grounded visible plumes are predicted, so that ground level fogging or icing is not likely to occur*
- *cooling tower plumes will often be visible to people who have a view to the tops of the cooling towers or slightly above, and will,*

[24] EiC, para 7

[25] EiC, para 8

less frequently, be visible to heights up to 350m above the cooling towers

- *There will be essentially no contaminant discharges to air during normal operation of the steamfield.*
- *Cooling tower drift losses will have negligible effects on local icing or ground contamination.*
- *Greenhouse gas emissions from the proposed Te Mihi power station will be about 1% of those from the New Zealand electricity generation sector. The greenhouse gas emission factor, in terms of tonnes of carbon dioxide equivalent per GWh of electricity generated will be about 12% of that for a modern high efficiency gas powered station and about 5% of that for a coal-fired power station like Huntly.*
- *There are significant process, health and safety, or cost problems associated with all of the identified alternatives to discharge of non-condensable gases to air. None were considered satisfactory alternatives to the present discharge of non-condensable gases at Wairakei power station at the time of the consent renewal for those discharges. The proposed Te Mihi power station will greatly reduce the ambient air concentrations of hydrogen sulphide, to the level where any odour nuisances arising from the Wairakei discharges (which are very infrequent, to judge by the complaint record) are unlikely anywhere as a result of the operation of Contact Energy geothermal power stations in the area. Accordingly, there is even less reason to consider that alternatives to the proposed discharge of non-condensable gases from the Te Mihi or Poihipi power stations to air in the cooling tower plumes are required than for the case at Wairakei.*

[176] Prior to the Ministerial Call in, Environment Waikato had engaged an air quality specialist, Dr B Graham, to review the work of Dr Stevenson. There has been subsequent liaison between Contact and Environment Waikato regarding air discharges, including the framing of conditions. The conditions were modified slightly during the course of the hearing by a

further condition requiring an air quality monitoring site to be established specifically at Poihipi.

[177] While we note that with the decommissioning of Wairakei, H_2S concentrations in the Te Mihi and Poihipi areas will be dominated by emissions from the Rotokawa power stations, the Te Mihi and Poihipi Stations will nevertheless contribute to H_2S loading. The modelled concentrations would be below levels where effects on health are an issue. But for part of the time, the models show values higher than 70µg/m^3, the acceptable guideline for odour, occurring in the vicinity of Link Road. However, the model shows that such concentrations would still occur in this area, even excluding the contribution from Te Mihi.

[178] In the draft conditions a consent limit for H_2S was set. This limit was above the emission rates used in the dispersion modelling for Te Mihi and Poihipi. Dr Stevenson[26] explained that the rates were calculated to accommodate the "variability in the H_2S content of the geothermal fluid combined with future changes in the source of steam supplied to the power stations …..". In his rebuttal evidence, Dr Stevenson emphasised that the effects of H_2S emissions would not be more than minor. Dr Graham, Environment Waikato's air quality expert, said that the requirement for annual monitoring and testing of the emissions would provide an appropriate check[27].

[179] The draft consent conditions included ambient H_2S monitoring at locations to be agreed by Environment Waikato. Dr Graham confirmed[28] that a properly designed and operated ambient air monitoring programme for H_2S is important and would be an essential resource to investigate complaints about odour. We agree.

[180] Mr Lang, Counsel for the McLachlan interests, submitted that the area for the air discharge consent sought for Poihipi should be restricted to the areas

[26] EiC, para 165

[27] EiC, par 5.2

[28] EiC, paras 5.3 and 5.4

of the Poihipi site that contain existing infrastructure. This is because the proposed consent area includes areas where Contact has no current development plans, and where modelling shows H_2S concentrations would be higher. Further, he submitted that a specific air quality monitoring site should be established at Poihipi. No evidence was called in support of that contention and Mr Lang relied on the evidence of Dr Stevenson and his cross examination of him.

[181] Mr Robinson, in his closing for Contact[29], refuted the need for any amendments to the proposed area of the Poihipi air discharge consent. On the matter of the monitoring site, he confirmed that Contact was willing for such a site to be established. Contact proffered a condition to achieve that end.

[182] We consider that the area of the Poihipi air discharge consent is appropriate, and that there is no factual basis for requiring a reduction in the area, as sought by Mr Lang. We note the uncontested evidence of Dr Stevenson that air discharges from borefield activity contain virtually no contaminants. On that basis, it can be logically inferred that any discharges to air from future borefield development at Poihipi, would not result in the emission of contaminants in sufficient quantity or concentration to have any adverse effect.

[183] The condition of consent proffered by Contact allowing for the establishment of an air quality monitoring site at Poihipi is accepted.

[184] **Finding of Fact**: We find that the conditions would adequately remedy or mitigate actual and potential adverse effects on air quality. This includes cumulative effects.

[29] Paras 11-18

Effects on Ground Water and Water Supplies

[185] Contact seeks a consent to discharge up to 50m^3/day of sewage to ground through a soakage system following septic tank treatment. Consent is also sought to discharge, by irrigation, up to 6,500 tonnes/day of cooling water blowdown and condensate onto a large area of grazing land in the northern sector of the reinjection area.

[186] Concerns about the potential contamination of their groundwater were raised by Mr Birdsall and Ms Koster in their submissions and evidence. Their concern was the potential contamination of their groundwater bores used for water supply.

[187] The nearest domestic bores are located to the west of the site. The evidence indicated that groundwater flow in the vicinity is west to east, towards the Waikato River. The domestic bores are "upstream" of the site and the proposed irrigation area[30]. Accordingly, the sewage discharge and the discharge by irrigation should have no effects on these bores. Further, the irrigation water would not contain harmful contaminants. The closest bores used for domestic purposes on the downstream side of the site are understood to be far enough away for groundwater contamination not to be an issue.

[188] Discussions at the first prehearing meeting included an agreement by Contact to undertake water quality sampling of one neighbour's well. Mr Birdsall and Ms Koster were made aware at the hearing of the General Conditions of Consent that allow for replacement by Contact should any domestic water supplies be contaminated.

[189] The concerns raised by the neighbours relating to groundwater contamination are also addressed by the General Conditions requiring a discharge strategy to form part of the management plan. We find that this is a sensible and flexible approach.

---

[30] Cameron, EiC, par 20

[190] **Finding of Fact**: We find that the conditions would adequately remedy or mitigate actual and potential adverse effects on groundwater and domestic water supplies.

Effects of Reinjection on Surface Features including Subsidence

[191] Contact seeks consent to discharge up to 95,000 tonnes/day of geothermal fluid, condensate and cooling water blowdown by reinjection. This is in addition to currently consented reinjection.

[192] In its submission, the Taupo District Council stated that it:

> *has consistently maintained that "infield" reinjection of all geothermal fluid (plus the addition of other "make up" fluid) is necessary to stop current subsidence and to prevent future subsidence. Council therefore welcomes any increase in the amount of geothermal fluid reinjected by Contact Energy infield.*

[193] The Council did not advance that submission at the hearing. Nor did it call any evidence that the proposed discharge of 6,500 tonnes/day of cooling water blowdown and condensate onto land by irrigation should instead be reinjected. Mr Hickman for the Council, emphasised in his closing submission, the need for the discharge strategy to have as its primary objective the need to address the adverse effects of subsidence. We consider that General Condition 3.3 would achieve Mr Hickman's concern.

[194] Mr C Bromley in his evidence in chief stated[31]:

> *There is no certainty at this point that increased reinjection will slow or halt subsidence or even that slowing or halting subsidence rates is necessary in order to implement the primary objective of the Discharge Strategy under Contact Energy's existing consents (which addresses the adverse effects of subsidence)*

[31] Para 4.13

[195] Mr Bromley noted that infield reinjection is likely to result in a decline in steam upflow into the shallow steam zones feeding surface discharges. Thus, domestic bores tapping the shallow upper aquifer may be adversely affected[32]. Conversely the predicted rise in deep liquid pressures over a long period (decades) may result in the gradual recovery of some chloride springs, such as those at Spa Park[33]. Reinjection could also trigger hydrothermal eruptions, although these events are generally rare.[34]

[196] Mr Bromley stated there may be a mix of benefits and adverse effects from targeted reinjection designed to slow subsidence. The potential for a mix of such effects will be managed by Contact through adaptive management by successive revisions of the discharge strategy.

[197] Further, Mr Bromley stated[35]

> *I believe that Contact Energy's reinjection application will provide the flexibility in future to increase the volume of geothermal water injected, and to allow reinjection over a wider area than that currently consented. The extension of the reinjection area southwards to encompass much of northern Tauhara will allow targeted reinjection of Wairakei fluid adjacent to subsidence bowls on the outskirts of Taupo if this forms part of the approved Discharge Strategy in future. It will also better facilitate integrated management of the Wairakei-Tauhara Geothermal System.*

[198] Dr Watson noted[36] that, in earlier Environment Court hearings, a minimum reservoir pressure was set at Tauhara. In his view subsidence may be most extreme where steam condenses in a localised zone, producing a rapid and large localised pressure reduction and hence compaction. This could be caused by cooling or by an increase in reservoir pressure around the steam zone. Dr Watson noted, however, that while his opinion is firm and based

---

32 Bromley, EiC, para 4.6

33 Bromley, EiC, para 4.1

34 Bromley, EiC, para 4.11

35 EiC para 4.16

36 EiC, paras 27-33

on physics, there is no evidence to support it. Earlier, he expressed confidence in Professor O'Sullivan's reservoir modelling results for Tauhara where the pressure is monitored[37].

[199] His concluding paragraph on the subsidence issue is as follows:

> *I have suggested that Contact not inject near to Geotherm if the protection of Geotherm's project is important, thus depriving Contact of reinjection area, and for entirely different reasons I have suggested that the rate of injection near Taupo be low enough to avoid increasing the reservoir pressure until subsidence research has produced results, thus preventing it from taking advantage of the injection capacity of that area. At the same time I can clearly see the wider benefits of the Te Mihi application, and in particular the benefit of undertaking the extra injection. These are competing requirements, because the injection area is not unlimited. I believe my reasoning to be correct, but I am not able to suggest how this conflict of requirements can be met, except to suggest as a first step that Contact re-examine its infield injection options.*

[200] Mr Brocklesby for Environment Waikato suggests that the issue of the effects of increased reinjection on subsidence is best considered by the Peer Review Panel. It has the ability to recommend changes by way of adaptive management to the reinjection regime. Mr Bromley, in his rebuttal evidence, supported this suggested approach, instead of imposing an arbitrary maximum pressure rate increase through consent conditions. We agree.

[201] We note that notwithstanding the potential consequences of reinjection on the reservoir, surface features and subsidence, reinjection provides an alternative to discharging geothermal fluid and condensate into the Waikato River. That would be a significant benefit.

[202] Adaptive management relies in part on modelling the behaviour of the reservoir and of subsidence. Professor O'Sullivan over many years has

[37] EiC, para 30

developed a reservoir model with a powerful predictive capability, although there are some limitations particularly on the margin of the reservoir. Professor O'Sullivan told us that he is working on a computer model for predicting subsidence. This also uses the TOUGH2 programme.

[203] We have confidence that computer modelling using the TOUGH2 programme is an appropriate way to predict the effects of reinjection on the reservoir and subsidence. Notwithstanding this confidence, we consider that decisions about optimum methods to model and predict reservoir behaviour and subsidence, should not be a matter for the conditions of consent. But should instead be a matter for the Peer Review Panel.

[204] **Finding of Fact**: We find that the conditions of consent adequately address the potential adverse effects on surface features.

Visual Effects

[205] Evidence regarding landscape and visual effects was provided by Mr B Coombs called by Contact. Mr Coombs proposed visual and landscape mitigation measures. These were set out in a Landscape Mitigation Plan that went through a number of iterative changes in response to concerns raised by the neighbours, both prior to the hearing and during it. A final Landscape Mitigation Plan has been incorporated as part of the conditions of consent[38]. The affected neighbours were given the opportunity of advising the Board whether they still had concerns. No one did.

[206] We agree with Mr Coombs when he said:[39]

> *When considered and assessed in the context of the existing landscape character, the established pattern of electricity generation and transmission infrastructure in the wider area, the sensitivity of the receiving environment, and the proposed landscape mitigation*

[38] Consent 70304, conditions 27 & 28, Schedule 1

[39] EiC, para 6

recommendations, the landscape and visual effects of the Power Station are appropriate.

[207] The landscape and visual assessment undertaken by Mr Coombs as part of the applications was subject to peer review, for which the Taupo District Council engaged Boffa Miskell Limited. This review confirmed that the visual and landscape effects of the development could be appropriately mitigated.

[208] The conditions include a requirement for a Landscape Management Plan to be prepared and reviewed by the Council. A specific requirement of the landscape mitigation was to mitigate the existing effects on adjacent neighbours.

[209] We consider that the conditions and landscape mitigation plan proffered by Contact on the final day of the hearing would provide for the ongoing mitigation of the visual effects arising out of the proposal. We note that Counsel and staff representing Taupo District Council at the hearing did not oppose the revised conditions and landscape mitigation plan.

[210] **Finding of Fact**: We find that the conditions of consent would adequately avoid, remedy or mitigate actual and potential adverse visual effects of the proposed activities.

Noise Effects

[211] A Technical Report on Noise Effects was prepared by Mr M Hunt as part of the AEE. The noise assessment confirmed that:

- Operational noise from the Te Mihi Station would comply with the Taupo District Plan noise limits for the Rural Area, including night time levels; and
- Construction noise would comply with the relevant NZ Standard – NZS6803:1999 Acoustics – Construction Noise.

[212] Noise from emergency steam venting cannot effectively be controlled by the application of general District Plan noise standards. Steam venting occurs during start up and occasionally at other times. Usually, steam venting occurs for a short time only, but on rare occasions may continue for an hour or so. Mr Hunt recommended that Contact be required to adopt the best practical option to address planned and unplanned steam venting noise. Conditions to this effect are proposed.

[213] Other proposed conditions to address noise require construction activities to be undertaken in accordance with NZS 6803:1999, sealing of the construction access road, and management of the construction laydown area to minimise disruption to sites to the north. All these conditions have been reviewed and are regarded as appropriate by the District Council to mitigate adverse noise effects on the dwellings closest to the construction area.

[214] The Taupo District Council engaged Mr G Warren of Marshall Day Acoustics Ltd to peer review Mr Hunt's report. It was his view that the noise conditions relating to steam venting would be appropriate to minimise the potential noise nuisance effects of the proposal.

[215] Mr Hunt also addressed concerns regarding cumulative noise effects of multiple power stations raised in submissions by Geotherm, and Mr & Mrs McLachlan and MacPower Ltd[40]. Mr Hunt did not consider these cumulative effects to be an issue. Notwithstanding, Contact proffered a condition that sets an operational noise limit for the station that must also take into account the noise levels that would result from the commencement of the unimplemented Geotherm consent.

[216] Several other submitters raised concerns regarding noise. These were addressed by Mr Hunt in his evidence. He did not consider the Power Station construction and operation would cause any unreasonable noise levels at the properties of those submitters.

---

[40] Refer Hunt, EiC, paras 112 – 113, 115

[217] At the Prehearing Meeting of 21 May 2008, Miss L & Miss A Price, whose property is close to the site, expressed concerns that construction noise, in particular, may adversely affect activities at the riding school operated on their property. Concern was expressed that the entry road to the site was located close to their boundary and that noise effects arising from the construction laydown area may upset horses and potentially result in danger to riders and horses.

[218] To meet their concerns, Contact proposed a buffer of 100m width be established between the laydown area and the boundaries of the Price and the adjacent Ellery properties. Further, Contact proposed to move the access road further away from these properties and to seal it. It also proposed to establish activity specific management regimes for the use of construction laydown areas.

[219] Miss L Price further elaborated on her concerns at the hearing. In response to questions from the Board, she confirmed that her main concern was with unpredictable sudden noise events from the construction laydown area. The Board suggested that an opportunity existed for the ridge nearest the Price and Ellery properties to be raised by the deposition of overburden material generated by the contouring works of the site.

[220] Drawing to a degree on our combined experience of acoustic matters, our view is that raising of the ridgeline by up to 2m will mitigate noise levels, given that the construction laydown area would be lower. Contact agreed to this suggestion and included the raising of the ridgeline as part of the revised landscape mitigation plan presented on the final day of the hearing.

[221] We understand that requiring the ridgeline to be raised would delay the screen planting proposed in the landscape mitigation plan, until after the fill has been deposited and shaped on the ridge. It is our view that the need to establish visual screening in that part of the site is not as pressing as in other parts, given the presence of an existing row of mature trees along the

boundaries of the neighbouring sites. Further, Contact has offered to offset the delay by planting more mature trees.

[222] **Finding of Fact**: We find that the conditions of consent would adequately avoid, remedy or mitigate actual and potential adverse noise effects arising out of the proposal.

Traffic Effects and Management

[223] Vehicles would access the power station site off Oruanui Road. This is a District Council collector road and links with Poihipi Road (a District Council Regional arterial road) and State Highway 1, close to Taupo. Oruanui Road also connects with Link Road which intersects State Highway 1 several kilometres to the north.

[224] Transit and Taupo District Council expressed concern, through their submissions, that the amount of traffic during the construction phase may have an adverse effect on traffic safety and efficiency.

[225] On 20 July 2008 Transit, Taupo District Council and Contact filed a Joint Memorandum with the Board setting out that they had agreed on conditions that would meet traffic issues. The conditions suggested in the memorandum are in our view appropriate.

[226] **Finding of Fact**: We find that the conditions of consent would adequately avoid, remedy or mitigate actual and potential adverse effects on traffic safety and efficiency.

Effect on Property Values / Compensation

[227] Several submitters consider that the proposal would devalue their properties.

[228] No evidence on this matter was presented. Without evidence, further consideration was not warranted.

Effects on the Environment from Hazardous Substances

[229] A range of hazardous substances will be stored and used at the proposed site. These include oils, acids, alkalis, diesel, biocides, miscellaneous solvents and paint.

[230] Best practice management procedures would be implemented through Contact's Environmental Management System. The conditions of consent include a requirement for an Emergency Management Plan for hazardous substances.

[231] The Taupo District Council obtained a peer review of the hazardous substances component of the applications by Mr Norbert Schaffoener of Resources Limited. In his review, he proposed amendments to conditions of consent to address the management of hazardous substances on the site. Contact agreed.

[232] **Finding of Fact:** We find that the conditions of consent would adequately avoid, remedy or mitigate actual and potential adverse effects of the storage and use of hazardous substances.

Determination

[233] We summarise the main matters and findings of fact that underlay our decision[41]:

i. The Minister's reasons:
   a. The proposal is relevant to New Zealand's obligations as a signatory to the Kyoto Protocol; and
   b. The proposal involves a significant use of a limited renewable resource;

ii. We have identified a number of potential positive effects that will result from the proposal – all of them uncontested;

[41] Not in order of importance

iii. There is the potential for a number of adverse effects. However, the conditions of consent will adequately avoid, remedy or mitigate those effects – for the reasons set out in our draft report;

iv. The proposal is generally, and in some cases specifically, consistent with, and in accordance with, the relevant provisions of Part II of the Act – for the reasons set out in our draft report; and

v. The proposal is generally, and in some cases specifically, consistent with, and in accordance with, the relevant statutory instruments – for the reasons set out in our draft report.

[234] We find that the proposal, subject to the terms and conditions of consent, set out in Appendix 2 and Appendix 3, meets the single purpose of "sustainable management" as defined in, and informed by, the provisions of Part II of the Act.

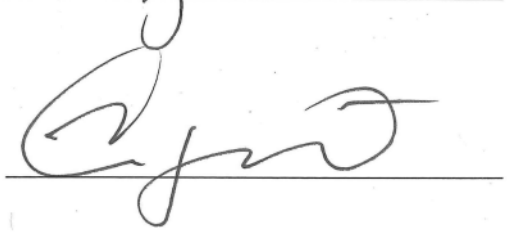
Decision

[235] The consents are granted subject to the terms and conditions of consent attached to this report as Appendices 2 and 3.

Dated at Wellington 3 September 2008.

Judge R Gordon Whiting (Chair) 

Mrs S Glenice Paine (Member) 

Mr T Denis Nugent (Member) 

Dr Patrick Browne (Member)