

**IN THE MATTER** of the Resource  
Management Act 1991

**A N D**

**IN THE MATTER** of submissions and  
further submissions by  
**SOLID ENERGY NEW  
ZEALAND LIMITED**  
(Submitter No. 68) to the  
**MINISTER FOR THE  
ENVIRONMENT'S  
BOARD OF INQUIRY** on  
the Proposed National  
Policy Statement for  
Freshwater Management.

**EVIDENCE OF BRETT ANDREW SINCLAIR**

## 1. INTRODUCTION

### Qualifications and experience

- 1.1 My name is Brett Andrew Sinclair. I am a senior hydrogeologist at Golder Associates (NZ) Limited, a ground engineering and environmental consultancy based in Takapuna.
- 1.2 I hold the qualifications of Bachelor and Master of Science in Geology from the University of Auckland. I am a member of the New Zealand Hydrological Society and have over 15 years' professional experience in geology and hydrogeology.
- 1.3 I have been involved in the consenting of mining and quarrying operations throughout New Zealand during the past eight years, with two focal points being the effects of mine dewatering and the management of mine water. I have undertaken hydrogeological assessments on behalf of Solid Energy New Zealand Limited (Solid Energy) for many of its North Island mining operations during this time. I am consequently familiar with the operational dewatering requirements for both underground and opencast mines and the environmental implications of these operations.

### *Scope of evidence*

- 1.4 The Board of Inquiry has received a submission and a further submission from Solid Energy New Zealand Limited with respect to the Proposed National Policy Statement for Freshwater Management, referred to as 'the Proposed NPS' throughout my evidence. Solid Energy's submissions were extensive and requested a number of changes in order to make the NPS understandable and workable. These were aimed at providing equity and clarity for water resource users nationally.
- 1.5 It is not my intention to repeat the matters addressed in Solid Energy's submissions. Rather, I will elaborate on the key themes and refer to specific situations in support of the submission. In my evidence I will focus on the areas in the Proposed NPS which I consider to be unworkable and/or unnecessary from a hydrological or hydrogeological perspective. I will also

outline some potential implications of the Proposed NPS for Solid Energy's operations.

1.6 In presenting this evidence I will draw upon:

- a) My experience of assessing the effects of large and small-scale developments on freshwater resources.
- b) My experience from site specific hydrological and hydrogeological investigations for mine water management purposes.

1.7 On the above basis, my evidence is structured in the following manner:

- c) Section 2 relates to the setting of Freshwater Standards and Environmental Flows and Levels covering all Freshwater Resources and how the Policy, once operative, may be of concern to Solid Energy.
- d) Section 3 addresses concerns with respect to the definition of Notable Values and, by extension, Outstanding Freshwater Resources. At the opposite end of the spectrum, Section 3 also addresses concerns on the definition of Degraded Freshwater Resources.
- e) Section 4 addresses the issue of mixing of Freshwater Resources where anthropogenic contaminants are not a factor.
- f) My concluding statements are presented in Section 5.

1.8 For the purposes of my evidence, where I refer to consumptive use or "consumptive users" of freshwater resources I will be specifically referring to the mining industry. The scope of my evidence does not extend beyond this industry and some of the statements made would not apply to other industries and users.

1.9 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses (July 2006). This evidence is within my area of expertise, except where I state where I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from opinions that I express.

## **2. FRESHWATER STANDARDS AND ENVIRONMENTAL FLOWS AND LEVELS**

- 2.1 In its current wording Policy 1 of the Proposed NPS requires every proposed or operational Regional Policy Statement to specify objectives, policies and methods within two years of the Proposed NPS becoming operative. These objectives, policies and methods are to determine and timetable priorities for when regional plans will set Freshwater Quality Standards and Environmental Flows and Levels.
- 2.2 It is of concern that the Freshwater Quality Standards and Environmental Flows and Levels appear intended to be set for all Freshwater Resources, irrespective of the amount of information available to characterise the water system to which these standards and levels would be applied.
- 2.3 The requirement to undertake this process for all Freshwater Resources would potentially result in:
- g) Regional Councils being pressured into setting timetables that cannot be met without a very broad brush approach to categorising the groundwater resources in a region; or
  - h) Regional Councils prioritising the schedule of groundwater evaluation and characterisation, with some low priority water flow systems consequently being allocated default characteristics based on other areas and therefore potentially wholly inappropriate; or
  - i) An increase in the consenting costs to applicants where Regional Council staff, driven by the requirement to be able to characterise groundwater quality, levels and flows, may insist on the applicants characterising the groundwater systems of entire catchments in support of relatively minor applications; or
  - j) Applicants for groundwater and surface water abstraction consents potentially being put in the situation of having to first demonstrate that a regional Freshwater Quality Standard does not apply for a general area, and subsequently be required to set out a definition of a new standard and the boundaries to which that standard applies.

- 2.4 It has already been noted in Solid Energy's submission on this matter that the establishment of environmental flows may be of little use in many streams and rivers for which there is inadequate flow data. This situation applies, to a greater extent, to many aquifers and other potential groundwater sources that have few or no current users. Such aquifers have generally been accorded low priority in research, resulting in a lack of available and appropriate information on which to base groundwater quality, level and flow standards.
- 2.5 It is not clear to me how useful and reliable environmental flows and levels may be established for many groundwater systems without undertaking costly intrusive investigations. There is an almost complete lack of available information on many groundwater systems that are located at relatively large depths or in remote areas or are not currently utilised.
- 2.6 By way of example, background water quality for both surface water and groundwater systems surrounding mine sites at Huntly were poorly understood prior to the advent of mining operations at these sites. Despite decades of site specific investigations and environmental monitoring around coal mining sites in the Waikato Region, groundwater quality, pressures and flow patterns in the deeper aquifers remain relatively unknown or undocumented on a regional basis.
- 2.7 In some cases it is not only practically unrealistic but also unnecessary to establish Freshwater Quality Standards and Environmental Flows and Levels for entire groundwater systems. For example, the aquifer boundaries, groundwater quality and groundwater pressure within the greywacke aquifer that underlies many of Solid Energy's operations in the North Island cannot presently be defined with any certainty on a local, let alone a regional basis. In many areas there are no users of this groundwater and the groundwater discharge locations are very poorly defined.
- 2.8 If Freshwater Quality Standards and Environmental Flows and Levels are stipulated for groundwater systems in areas for which little baseline data is available, the stipulated values could potentially be highly erroneous. The quality of groundwater reflects the chemistry of the surrounding geology as well as any anthropogenic activity. It is for this exact reason that Solid Energy expends a lot of effort to characterise background surface and groundwater quality and quantity on a site specific basis at its mining operations.

- 2.9 For example, Solid Energy has been granted consents authorising the abstraction of water and the discharge of mine water for its operations at Rotowaro. The conditions attached to these consents provide for water quality triggers applicable to mine water discharges or to the receiving water downstream from all mine water discharges. On occasion, Solid Energy needs to both treat the mine water and manage mine water discharge flows to accommodate seasonal variations in upstream flow rates in order to comply with in-stream water quality targets.
- 2.10 If Freshwater Quality Standards and Environmental Flows and Levels are to be established regionally then water resources should be classified according to both their physical and chemical characteristics and their relative significance. For example, the results of the Nationally Significant Waterways programme may be incorporated to ascertain where flow limits and quality standards may be appropriate.
- 2.11 The AEEs that Solid Energy produces for its operations are site-specific, extensive, and technically robust, are prepared by suitably qualified experts and take into account regional and local differences in hydrology and hydrogeology. I am of the opinion that clearly and defensibly documented information on site specific water quality presented in AEEs and supporting documentation should be given greater weight than regional standards and characterisations of Freshwater Resources when presented in a consenting process.
- 2.12 In summary, the “bluntness” of this policy mechanism as it is currently phrased could potentially introduce unnecessary difficulties, delays and additional costs to consenting processes for some water use activities. In my opinion, the proposed NPS requires some direction and guidance on how Freshwater Quality and Environmental Flow standards are to be developed and ensuring that a scientifically robust and meaningful and practical procedure is followed.

### **3. OUTSTANDING AND DEGRADED RESOURCES**

- 3.1 It is not clear from the current phrasing of the proposed NPS how Notable Values are to be defined and established. Of more concern however is that there does not appear to be a clear framework for the development and

definition of Notable Values. By extension, it is not clear on what basis a Freshwater Resource is to be stipulated as Outstanding or Degraded.

- 3.2 Once a Freshwater Resource has been identified as having Notable Values, the consumptive use of groundwater in an area that may possibly affect the Freshwater Resource in question may become restricted in order to maintain the stipulated Notable Values. Classification of a Freshwater Resource as Outstanding under the proposed NPS would potentially shift the resource management focus from sustainable utilisation to protection.
- 3.3 To be realistic and defensible, the establishment of Freshwater Quality Standards and Environmental Flows and Water Levels for Freshwater Resources needs to be done within the context of current resource use, the surrounding land use, ecological values, and in consultation with all resource users.
- 3.4 Classification of a Freshwater Resource as Outstanding under the proposed NPS emphasises the protection of the resource under this framework. It is clear that under some circumstances mining may be considered an inappropriate land use within a catchment defined as supporting an Outstanding Freshwater Resource, for example, where complete removal of the Notable Values associated with the resource due to the mining operation would occur. Under less extreme situations however, the Notable Values associated with the resource may potentially be protected through the application of mitigation measures, such as water treatment processes that produce a high quality discharge.
- 3.5 For Solid Energy, management of water in and around its mines are key components of its operations. Solid Energy designs, installs and monitors mine water quality under their mine water management and effects mitigation systems. These systems are designed for site specific purposes with the objective of managing downstream effects. In my opinion there is no fundamental reason why a catchment identified as containing an Outstanding Freshwater Resource cannot also host a mining operation with appropriate management and mitigation measures in place. Assessments of effects of resource use need to be made on the activity and include potential for mitigation and enhancement. Maree Drury discusses these matters in her evidence.

- 3.6 The concepts of “so degraded” and “inappropriate Land-use Development” alluded to in the definition of Degraded Freshwater Resources appear to be subjective. Some form of assessment framework should be provided by which the evaluation and classification of Degraded Freshwater Resources is to be undertaken.
- 3.7 I consider it important to include in the proposed NPS some mechanism to accommodate a scale to the definition of Degraded Freshwater Resources within Regional Plans. Such a scale is necessary for the same reason that existing resource consents for the discharge of mine water do not all have to meet the same in-stream water quality targets downstream from the discharge location. Site specific factors including the perceived ecological value of the receiving water, downstream utilisation, background water quality and the nature of contaminants discharged are all factors taken into account when consenting mining operations and deciding on the level of treatment required for mine run off and dewatering discharges. Dr Ian Boothroyd discusses site-specific standards further in his evidence.

#### **4. CONSUMPTIVE USE OF GROUNDWATER**

- 4.1 Under the definitions provided in the proposed NPS, all of Solid Energy’s mining operations would involve the Consumptive Use of groundwater. Coal mining operations that extend below the local groundwater table cannot avoid lowering surrounding groundwater levels or pressures.
- 4.2 Existing mining operations in an area subsequently identified as having an Outstanding Freshwater Resource with Notable Values are unlikely to be able to reduce their water takes. These operations are however likely to be able to demonstrate that the water use is resulting in only a minor or less than minor effect and thus protect those Notable Values.
- 4.3 The water management system for a mining operation is generally designed to minimise its water take in order to minimise the volumes of water requiring treatment and thereby minimise water management costs. This primarily relates to surface water takes, which are reduced by the diversion of surface run-off around operational mine areas.

- 4.4 However, groundwater takes for the purpose of mine dewatering cannot be reduced on a seasonal or weather dependent basis in order to protect Notable Values of a Freshwater Resource. Solid Energy abstracts and discharges the minimum amount of water necessary to ensure the dewatered state of an opencast pit or underground mine is maintained for safety and economic reasons.
- 4.5 Under certain circumstances the reduction of a groundwater take during a period of low surface water flows could actually reduce the availability of water downstream from a mine. For example, a mining operation may be abstracting groundwater from a deep confined aquifer with relatively good water quality. This water is discharged to a stream denoted as having Notable Values, which consequently require the protection of a specified minimum flow regime. During a summer drought the flows in the stream decrease below the defined minimum flows, a natural occurrence that would trigger any minimum flow limitations applicable to Consumptive Users. The groundwater from the deep aquifer will continue to enter the mining operation irrespective of whether it is pumped out of the mine or not. Requiring the mine to cease abstraction of the groundwater for the duration of the drought would merely reduce the amount of water discharged from the mine to the local stream and thereby decrease further the stream flow.
- 4.6 It is clearly possible for an underground mining operation to have a less than minor effect on overlying surface water and shallow groundwater resources, even if those resources are specified as Outstanding Freshwater Resources. For example, coal extraction from the Western Sector of the Huntly East Mine has resulted in no significant effect on the availability and quality of groundwater in a major overlying aquifer since the start of operations in 1992. Mining has however physically disturbed this aquifer through subsidence of the rock mass above the mine. Should the overlying aquifer be specified as an Outstanding Freshwater Resource for any reason, the lack of past effects provides evidence to demonstrate that the mining operation is a compatible activity.
- 4.7 It is normal for mining operations to result in the reduction of surrounding groundwater pressures associated with the abstraction and subsequent discharge of groundwater. The abstraction and discharge often occurs within a single catchment although the source and receiving Freshwater Resources

may be different. Hence, the activity would be classed as a Consumptive Use of groundwater. The effects of the groundwater abstraction and discharge may be restricted to a limited area of the upper catchment. Classification of the entire catchment as an Outstanding Freshwater Resource due to a combination of water quality, flow, ecological and recreational attributes applicable to the lower catchment should simply mean that appropriate effects mitigation targets are defined and enforced on the Consumptive Use activity in the upper catchment.

4.8 By way of an example, mining operations at Rotowaro in the Awaroa Stream catchment have been undertaken by Solid Energy and its predecessors for decades. The Solid Energy mining operation only occupies a small proportion of the total Awaroa Stream catchment upstream from Rotowaro. If Environmental Levels and Flows for the groundwater system within the Awaroa Stream catchment had been defined prior to the start of mining in the catchment, the following outcomes would have been observed to date:

- a) Localised groundwater levels in the immediate vicinity of Rotowaro decreased to a level well below the bed of the stream due to the construction of underground and opencast mines below the level of the stream bed.
- b) Localised groundwater discharges to Awaroa Stream in the immediate area of Rotowaro decreased significantly for the same reason.
- c) Groundwater pressures and flows locally increased due to the disposal of waste rock in small valleys close to Rotowaro.
- d) Groundwater pressures and flows within backfilled mines differed from those in the groundwater system prior to mining because the hydrogeological characteristics of the fill differed significantly from the natural rock mass.
- e) Changes in Awaroa Stream flows at Rotowaro were barely detectable.

Large scale dewatering processes associated with mining operations at Rotowaro have had only minor effect on flow rates in the Awaroa Stream downstream from Rotowaro and had no effect on the upper reaches of the Awaroa Stream catchment. This example demonstrates that if Environmental

Levels and Flow standards were to be applied sensibly then resource use based on an assessment and management of effects can still occur.

- 4.9 With respect to Policy 1(g) in the proposed NPS, it is my opinion that the protection of Notable Values for Freshwater Resources in a catchment is not necessarily incompatible with Consumptive Use of freshwater resources within the catchment. Specifically, Consumptive Uses can potentially be maintained during times of low flow, when it can be shown that in-stream values can still be sustained and the effects on Non-consumptive Uses are no more than minor.
- 4.10 In my opinion, the proposed NPS would benefit from a strong directive emphasising site specific evaluation for sustainable use of a Freshwater Resource above the protection of stipulated Freshwater Quality, Level and Flow Standards that may not be either applicable at a local scale or particularly relevant for the protection of Notable Values.

## **5. MIXING FRESHWATER RESOURCES**

- 5.1 Mining operations tend to minimise mine water management costs through the diversion of run-off and stream flows around mine sites. In effect, the quality of the water remains unaffected by the mining operation once the diversion is in place and effective rehabilitation of the diversion channel completed.
- 5.2 Diverted water flows are not necessarily discharged back into the same catchment from which they have been diverted. It is possible that a diversion could take water from one catchment and discharge it into a neighbouring catchment.
- 5.3 With respect to water quality standards it is possible that the catchment from which water is taken and the catchment to which water is discharged may be characterised by entirely different geological features and the quality of the natural water in the two catchments differs significantly.
- 5.4 Under the current Resource Management framework, the discharge would be assessed against the projected effects on the receiving water and its instream values. Defining Freshwater Quality Standards for both catchments would appear to present an additional and unnecessary process. There would

appear to be a real risk that the focus of investigation and consenting could shift to meeting standards instead of managing effects.

- 5.5 A similar scenario would also apply with the use of infiltration basins to dispose of run-off diverted from areas surrounding a mine site. It is possible that the groundwater quality in the receiving aquifer differs significantly from the water being infiltrated. This is despite the fact that the water being infiltrated may have a water quality that matches the background surface water quality for the area. The environmental effects of the activity may be less than minor however the Freshwater Quality Standards defined for the two resources may differ significantly. Again, the focus of investigation and consenting may shift to meeting standards rather than managing effects.
- 5.6 Policy 2(c)(iii)a of the proposed NPS indicates that all discharge permits affecting Freshwater Resources are to include conditions protecting against degradation of the quality of Freshwater Resources, including through the management of activities giving rise to stormwater discharges. In this sense degradation may be taken to mean a change in water quality. Such a change may not necessarily be associated with an environmental effect.

## **6. CONCLUSION**

- 6.1 I consider it important that the proposed NPS provides some direction and guidance on a scientifically based framework through which Notable Values for Freshwater Resources would be defined and evaluated. By extension, it is important that a similar framework be set out by which Outstanding Freshwater Resources and Degraded Freshwater Resources are to be defined and stipulated.
- 6.2 It is my opinion that the stipulated of Environmental Levels and Flows for all Freshwater Resources is unlikely to be achievable with any accuracy or reliability in the foreseeable future. It is also my opinion that this process is unlikely to result in any practical benefits where the use and management of many Freshwater Resources are concerned. The sustainable management of freshwater resources is already provided for under the RMA.

- 6.3 It is my opinion that Consumptive Use of Freshwater Resources is not necessarily incompatible with the sustainable use and protection of Notable Values in Freshwater Resources.
- 6.4 In my opinion, the proposed NPS requires amendment to include direction on the methodology for the establishment of a framework within which any Freshwater Quality Standards and Notable Values will be implemented.

**BRETT SINCLAIR**

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