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To the Strategy Manager, Rotorua District Council

On behalf of the New Zealand Geothermal Association

7 March 2016

### **Submission on the 2016 review of the Council's Geothermal Safety Bylaw 2008 (the "Bylaw")**

The New Zealand Geothermal Association (NZGA) would like to thank the Rotorua District Council (RDC) for the opportunity to present its submission on the proposed Bylaw changes.

The New Zealand Geothermal Association (NZGA) is an independent, non-profit association that provides information on geothermal phenomena and utilisation for industry, government and educational organisations. In addition, the NZGA, as a member of the International Geothermal Association, contributes to the international exchange of information within the geothermal development industry. NZGA membership comprises participants, regulators, and interested parties within the geothermal community. It totals 343 members currently.

The itemised submissions below relate to matters referred to in the Statement Of Proposals relating to the Proposed Amended Bylaw (which documents are located at <http://www.rdc.govt.nz/our-council/consultation-and-public-notice/geothermalbylaw/Pages/default.aspx>).

This submission will be published on the NZGA website and we have no objection to it being published in any other setting.

We trust these comments are helpful. Should further clarification or representation be sought from the NZGA, approaches should be made via the Executive Office at the address given above.

Yours faithfully

A handwritten signature in black ink, appearing to be "B R" followed by a long horizontal line.

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## Itemised Submissions

The first 4 submissions points are made on RDC's comments in the Statement Of Proposal. The remainder are on the proposed Bylaw:

	From RDC's Statement Of Proposal	NZGA Submission
1	"The objective of the Geothermal Safety Bylaw 2008 is to address problems associated with the safety of the general public from the effects of hydrogen sulphide gas through regulating the safe operation of and proper maintenance of the headworks and associated pipework and plant of geothermal production and reinjection bores."	The purpose of the Bylaw needs to be extended to addressing the safety of all aspects of bores located within the Rotorua geothermal field and over which RDC has jurisdiction: <ul style="list-style-type: none"> <li>- not just hydrogen sulphide, but all gases</li> <li>- not just wellheads and surface pipework, but to the wells themselves and to their immediate surrounds.</li> </ul>
2	"The Review of the Geothermal Safety Bylaw 2008 has concluded that it should be retained."	NZGA supports retaining the Bylaw.
3	"It also recommends three minor amendments...."	NZGA suggests that, in line with significant changes afoot in the broader NZ legislative regime relating to health and safety, it is timely and necessary for RDC to make more than "three minor changes". A review of RDC's responsibilities, liabilities, and best practice safety management for the bores in the Rotorua geothermal field is appropriate and a range of enhancements to the Bylaws could and should be made.
4	"The Council has concluded that the Geothermal Safety Bylaw 2008 is the most appropriate way of addressing problems associated with geothermal safety. Although other options, such as having no bylaw, relying only on education/information or general legal requirements are possible, the Council believes the Bylaw is the most appropriate option as it provides for greater certainty and is enforceable by the Council."	NZGA agrees that an appropriate Bylaw is the appropriate means of promoting safety.  Given the lack of knowledge among many owners and occupiers of properties containing bores, RDC should consider what complementary processes and modes of communication it might use to increase awareness around good practice and to promote owner/occupier responsibility. Consideration might be given to, among other things: <ul style="list-style-type: none"> <li>a) maintaining registers of engineers and contractors deemed competent to provide advice and undertake works</li> <li>b) Publication of further reference material to assist owner/occupiers fulfil their responsibilities.</li> <li>c) Rights available to Council to require that notices relating to bores be attached to land titles.</li> <li>d) Establishing licensing regimes to allow the Council to undertake monitoring and/or approvals processes.</li> </ul>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
General	<p>The Bylaw should reflect language and approach to safety management as contemplated in the Health &amp; Safety At Work Act 2015 (wherever wells/bores/geothermal features are being used for a commercial purpose).</p> <p>The Bylaw might also be the opportunity for Council to state (and potentially therefore constrain) how it will fulfil its duties to private residents/public.</p> <p>There is varied language used to describe the standard to which wells and equipment is maintained. Suggestions are made in the individual sections to standardise language to be consistent with that used in other geothermal standards and regulations.</p>	<p>Suggestions are made in the individual sections, to revise words and terms so as to be consistent with that used in other geothermal standards and regulations.</p>
General	<p>We support intent of the Bylaw requiring safe well construction and maintenance.</p> <p>As there are a number of public safety risks associated with geothermal use, and it is an expert job to understand what a well-maintained wellhead looks like, some form of regular safety certification of wellheads is needed. This requires a regular inspection and review to keep on top of well safety issues.</p> <p>The present construction of the Bylaw provides information on the well structural requirements that the well owner must comply with, but would benefit from an active compliance process.</p> <p>In establishing such a process, the RDC must ensure that the applicable landowner/occupier/user has primary responsibility for ensuring safe construction, operation, etc. and that any RDC compliance regime acts as a support or safety net.</p>	<p>Establish a warrant of fitness type process for well safety and integrity.</p>
2.1	<p>Re-order objectives to reflect that over-arching safety is the primary objective and broaden the scope to incorporate monitor wells and wells used for downhole heat exchangers rather than being limited to production and reinjection bores. In the alternative, the definition of geothermal well could be expanded to include these additional well</p>	<p>The objectives of this bylaw include:</p> <ul style="list-style-type: none"> <li>- The safe operation of and proper maintenance of the <u>bores, wellheads, associated pipework and plant of geothermal production and re-injection bores, monitor wells and wells used for downhole heat exchange.</u></li> <li>- The safety of the general public from the effects of <u>Hydrogen Sulphide,</u></li> </ul>

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	<p>types.</p> <p>Extend to any gases that may be discharged, not just H2S, i.e. include CO2.</p> <p>Extend to “safe operation and maintenance of any geothermal well bore, including any wellhead and associated pipework”.</p>	<p><u>Carbon Dioxide and other geothermal gases</u> so far as is practically possible.</p>
New	<p>May be appropriate to include that a purpose of the Bylaws is to promote practices consistent with <i>the Department Of Labour Health and Safety Guidelines for Shallow Geothermal Wells 2005</i>.</p>	<p><u>This bylaw seeks to promote good practice in the construction, operation and maintenance of all bores, such as set out in the Department Of Labour Health and Safety Guidelines for Shallow Geothermal Wells 2005 or comparable good practice guide.</u></p>
3		<p>In all instances replace “Closed” with “<u>Abandoned</u>”</p>
3	<p>The term “grouting” is commonly used to refer to the cementing in place of a casing string during construction, works carried out to repair a well, or cement placed as part of an abandonment.</p>	<p>Remove “Grouted” as a term meaning “permanently closed”.</p>
3	<p>“Short term exposure limit” in relation to H2S may warrant review in context of prevailing best practise safety management.</p> <p>Reference should be made to the applicable NZ standard, being Workplace Exposure Standards and Biological Exposure Indices Effective from February 2013 7th Edition. Departures from that standard should be made deliberately and explicitly.</p> <p>Expert advice should be sought on the application of the Exposure Standards to geothermal pools.</p>	<p>[Recommend seeking drafting guidance from those expert in this area]</p>
3	<p>Propose a revision that reflects the primary purpose of a quench being to ensure no positive pressure of surface. Refer NZS:2403.</p>	<p><b>Replace</b> “injection of cold liquid into a well to prevent hot fluids or steam coming to the surface”</p> <p><b>With</b> <u>Inject cold liquid into the well to condense or prevent the formation of steam, or to reduce temperatures for other purposes in order that there is no positive pressure at the wellhead”.</u></p>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
New	Insert a positive obligation on owners/occupiers to assume responsibility for constructing, operating, maintaining and abandoning wells on their property or in their use. Link to appropriate standard of good practice.	Insert: <u>Owners and occupiers of any property containing a bore, associated pipework or associated surface plant shall construct, operate, maintain and abandon any bore in accordance with good practice, such as is set out in the Department Of Labour Health and Safety Guidelines for Shallow Geothermal Wells 2005 or a comparable good practice guide or standard.</u>
4.1	Fencing pools and taking steps to protect people from danger should be stated as the default obligation of any owner/occupier.  Reference to “from any associated danger.” Not consistent with drafting throughout Bylaw nor with prevailing H&S terminology.	Replace with: <u>The owner and/or occupier of land or premises containing any natural geothermal spring, geyser, other feature of geothermal activity, or artificially created pool which may pose risk to the safety of any person shall take steps to identify health and safety hazards and risks, and take steps to prevent these from happening.</u>  <u>An authorised officer of Council may require the owner and/or occupier of such land or premises to take such further steps to manage hazards and risks as they deem necessary, including the adequate fencing of any such pool, spring, geyser or other geothermal activity.</u>
4.2-4.7	Make generic to any gas, whether H <sub>2</sub> S or CO <sub>2</sub> and make provisions apply uniformly across the entire field.  We note that the H <sub>2</sub> S levels in 4.2 are not consistent with those in 7.2 a and b and are lower levels than are required for a place of work. It is acknowledged that RDC may seek that a lower level should apply than in a workplace, but is not clear on the logic of the levels set. These levels may be lower than is practically able to be managed? Expert guidance should be sought from those qualified to comment on short term exposure limits and time weighted average	Remove instances of bold “In those parts of the Rotorua Geothermal Field where geothermal fluid is known to contain Hydrogen Sulphide gas”.  [Recommend seeking drafting guidance from those expert in this area]
4.5	We consider that the risks associated with maintaining a 100mm lip should be reviewed and propose that no lip should be allowed.  Commercial pools (i.e.: motels, hotels and spa’s) shall operate in accordance with the requirements of NZS 5826 Section 6.	Replace with: <u>With exception of specific cleaning and maintenance works that may require the lowering of water levels and therefore specific risk management, the water level of the pool/bath shall not be lower than the lip of the pool/bath unless specific measures are in place to eliminate the risks associated with a gas layer being trapped above the surface of the water, and on no case shall the lip exceed 100mm.</u>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
		<u>Commercial geothermal pools shall operate in accordance with the requirements of NZS 5826 Section 6.</u>
4.10	The bylaw as written may capture natural pools used for bathing and therefore prevent the natural discharge of these pools to streams and the Lake. Continuance of natural flows should be permitted e.g. around Ohinemutu.	Replace with: <u>Subject to clause 23.1 of the Water Services and Trade Waste Bylaw 2010, and with the exception of allowing the continuance of natural flows, no person shall cause or permit any bore effluent, geothermal water, steam, or geothermal gases from any geothermal work, pool/bath, pipes or fittings to escape or to be discharged as the case may be, into any public or private sewer or drain or storm water drain or any gutter or channel connected to any sewer or drain or storm water drain and no person shall cause or permit to be discharged any waters as above to any lake, stream or water course without having first obtained the necessary rights and permits under the Resource Management Act 1991.</u>
4.11	<p>RDC proposal is that cl 4.11 read <i>“The owner or occupier of any commercial property containing any natural or artificially created pool or bath shall ensure a Council approved safety sign is placed in a location clearly visible by persons using the pool or bath.”</i></p> <p>This language seems to reflect a generic requirement around pool safety as opposed to a geothermal specific hazard, and should therefore be left for other applicable regulation. Alternatively, this clause might be revised to address specific issues relating to geothermal pools. One such issue may be the difficulty of regulating/controlling temperature within a safe range where heat is provided directly from geothermal brine or steam.</p> <p>This also appears to create work for Council in establishing and policing an approved sign. Rather, establish a duty on the owner/occupier/operator to erect signage appropriate to address any risks or hazards.</p>	<p>Delete or replace with:</p> <p><u>Where a commercial property contains any natural or artificially created pool or bath and where that pool is directly heated by geothermal fluid, the owner or occupier shall maintain appropriate signage to warn users of the hazards associated with geothermal fluid.</u></p>
Part 5	<p>Section heading refers to Bore Headworks And Associated Pipe works, yet the text of 5.1 refers not to headworks but to “wellhead”.</p> <p>Suggest a rationalisation of the full Bylaw text to use only “wellhead”.</p>	Replace all references to headworks with <u>wellhead</u>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
5.1 & 5.2	<p>Propose combining.</p> <p>Prevailing safety regulation and good practice refers to “competence” of persons offering advice or carrying out work.</p> <p>As currently drafted, there is no indication as to what the person is to be suitably experienced/trained in.</p> <p>Need to include a reference to “safe” alongside “sound condition and fit for purpose”.</p> <p>Owner/occupier needs to maintain and be able to provide documented record of <i>well condition</i>, not only evidence that an inspection has been carried out. For example, the inspector’s invoice would appear to satisfy the requirement but is of little use in managing well integrity.</p>	<p>Reword as:</p> <p><u>The owner or occupier of any property on which is located any bore that is not abandoned shall have the wellhead and associated pipework inspected annually by a suitably competent engineer to ensure that the wellhead is in sound condition and will remain safe for the period until the next inspection. Such inspection shall be documented, including a description of any visible deterioration and remedial steps appropriate to maintain the integrity and safety of the wellhead.</u></p> <p><u>Such documentation shall be retained by the owner or occupier and be made available to an authorised officer of Council upon request.</u></p>
5.3	<p>Propose replacing 5.3 with a universal obligation to maintain well and all associated equipment, not just the headworks and pipe works.</p> <p>Refer Part 5 of the Department Of Labour Health and Safety Guidelines for Shallow Geothermal Wells 2005, which states:</p> <p>505.1 Each well which has not been abandoned in accordance with Part 7 shall be maintained in a condition to comply with Part 2 of these Guidelines at all times.</p> <p>505.2 If any condition suggesting the presence of a defect is detected in a well during production monitoring or other operations, then the nature of the possible defect shall be determined...</p> <p>Specific to pipework, include a requirement that all surface equipment shall be designed, operated and maintained in accordance with the PECPR Regulations and shall be in accordance with the “Health &amp; Safety Guidelines for Geothermal Heating Systems” and NZS 4202P Code of Practice for Geothermal Heating Equipment in Rotorua.</p>	<p>Replace with:</p> <p>Each well which has not been abandoned shall be maintained in a safe condition.</p> <p>If any condition suggesting the presence of a defect is detected in a well during production monitoring or other operations, the nature of the possible defect shall be determined.</p> <p><u>All geothermal pipework and associated surface equipment shall be designed, operated and maintained in accordance with the PECPR Regulations and shall be in accordance with the “Health &amp; Safety Guidelines for Geothermal Heating Systems” and NZS 4202P Code of Practice for Geothermal Heating Equipment in Rotorua.</u></p>
5.4	<p>Note inconsistency in standard of maintenance.</p> <p>This clause refers to “safe and reliable working order” whereas above reference is to “sound and fit for purpose”.</p>	<p>Re-draft a consistent standard around equipment condition.</p>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
5.5	<p>Extend obligation from placing the well identification number on the well to require signage on the wellhead showing the well identification number must be maintained at all times.</p> <p>All documentation pertaining to the well should also be required to identify the well by its allocated Well Identification Number.</p>	<p>Add</p> <p><u>A well identification number as allocated by the Bay of Plenty Regional Council shall be placed on or adjacent to any new well established at any time after the coming into force of this Bylaw and shall be maintained until the well is abandoned.</u></p> <p><u>All documentation and records pertaining to the well shall reference the well identification number.</u></p>
5.6	<p>This clause seeks to stop any water sitting on the top of the wellhead. However the fix proposed (of a circle of cement around the wellhead) presents different problems, making it impossible to assess the condition of the wellhead.</p> <p>The guidelines recommend (306) that surface drainage and well design should ensure that no water can pool around the well casings at ground level.</p>	<p>Reword as:</p> <p><u>At all times the <b>wellhead</b> shall be kept in such a state of repair as to ensure water cannot accumulate around the <b>wellhead</b>.</u></p>
5.6-5.9	<p>The key function of clauses 5.6 to 5.9 is presumably to protect casings from corrosion.</p> <p>Commencing with that statement, and to creating an obligation that steps be taken to mitigate against corrosion, would make the obligation clearer.</p>	<p>Reword as:</p> <p><u>Take appropriate steps to protect surface casings from corrosion, including:</u></p> <ul style="list-style-type: none"> <li>a) <u>Maintaining outer casings above a cellar floor in order to protect the production casing (where there are multiple cemented casing strings) from water ingress</u></li> <li>b) <u>Maintaining cellar drainage</u></li> <li>c) <u>Limiting ingress of water into the cellar and around the well through a cement or other capping (plus a suitable metal cowling clamped around the casing above)</u></li> <li>d) <u>Contouring surrounding area to ensure groundwater drains away from the well or cellar.</u></li> </ul>
5.10	<p>It's not clear from the clause when vent pipes are required.</p> <p>“The height of the vent pipe shall be 3 metres above the ridge line of the nearest building.” Seems problematic. Is this actually being achieved where wells are adjacent to multi-story buildings. What if the nearest building is a considerable distance away?</p>	<p>Replace with:</p> <p><u>Well vent pipes shall be required [when?] and must be designed to safely disperse geothermal gases and steam in a manner that does not pose risk to health and safety of any person.</u></p>



Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
	Question whether the term “dangerous air discharges” is appropriate. If classed as Type A Objectionable Discharges, it should comply with NZS/AS 1668.2. Should this be “steam and geothermal gases”	
Section 5.12	<p>Section 5.12, 5.18 and 7.1 all relate to the safe setback distance required, variously for access to the well by a rig, or the erection of any other structures, or the setback from other services.</p> <p>The purpose of section 5.12 is to provide access to the well with equipment, should anything goes wrong.</p> <p>For the avoidance of doubt, this clause should specify a minimum access-way width. To be consistent with the other two sections relating to safe setback distances this would be 5m.</p>	Specify for 5.12 that for all future wells <u>the site access width is 5m,</u>
5.16	The venting of geothermal fluid, steam or gases into any building, room or shelter needs an appropriate exclusion/modification for purpose built pool enclosures where geothermal fluid is discharged.	Reword as: <u>Subject to clauses 4.1 to 4.11 relating to the management of geothermal pools, the venting of geothermal fluid, steam or gases into any building, room or shelter shall not be permitted, except where approved by Rotorua District Council and then specifically for bathing where clauses 4.1 to 4.11 have been complied with and where adequate high and low level ventilation has been provided to ensure geothermal gases cannot accumulate and cause a hazard.</u>
5.17	The owner/occupier’s obligation when they observe any change in condition should not be discharged merely by notifying RDC (and therefore making it Council’s problem). The owner/occupier should be required to undertake appropriate steps to investigate, identify any well integrity issues or risks to safety, taking steps to remedy <u>and</u> to inform Council.	Reword as: <u>Wherever steam, hot water, dead or dying grass or gas or other change in condition that may pose a risk to safety is observed around or near a well, the owner or occupier of the land on which the well is located, shall inform the Rotorua District Council forthwith, and shall undertake appropriate investigations to identify cause, shall take steps to ensure well and pipework integrity and the safety of persons.</u>
5.18	Refer to “existing, or temporarily suspended, or abandoned” well. Remove reference to “closed”.	Reword as: <u>No person shall erect a structure or building within 5 metres of any well, whether existing (operating or shut-in), temporarily suspended, or</u>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
		<u>abandoned, except with the express written approval of the Council, and subject to any conditions it may impose.</u>
5.19(a)	<p>Bylaw wording proposes that cl 5.19(a) read “<i>Where in the opinion of an authorised officer, an abandoned or disused well or wells presents a potential safety hazard, that abandoned or disused well shall be grouted shut by a suitably qualified and experienced contractor and the Rotorua District Council shall be notified in writing within 14 days of completion of that grouting by the owner or occupier of the land on which the well is located.</i>”</p> <p>Propose this be replaced, separated into 4 separate clauses as set out adjacent.</p> <p>Recommend that Council adopt language comparable to DOL Guidelines for Shallow Wells and NZS2403 where wells are either “Operating/Operational”, “Temporarily suspended”, or “Abandoned”. Note that operational includes flowing <i>and</i> shut-in. Temporarily abandoned is intended to cover rendered inoperable but not abandoned to the required standard. Abandoned infers permanently abandoned.</p>	<p>Reword as:</p> <p>a) <u>Where a well presents a safety risk, the owner or occupier must act forthwith to have the well repaired or abandoned.</u></p> <p>b) <u>Authorised officers of Council may require that a well be repaired or abandoned where they reasonably consider the well presents a risk to safety.</u></p> <p>c) <u>All repair and abandonment works shall be carried out by suitably qualified personnel in accordance with Parts 5 (Operation and Maintenance) and 7 (Abandonment) of the Department Of Labour Health and Safety Guidelines for Shallow Geothermal Wells 2005, or a comparable good practice guide or standard.</u></p> <p>d) <u>All well abandonments shall be notified to Council in writing within 14 days of works being completed, confirming the location and well identification number of the abandoned well.</u></p>
New	<p>Further to this; Where a previously abandoned well has blown out the re-abandonment <b>shall</b> (not should) be inspected and approved by a qualified drilling engineer.</p>	<p>In addition to the requirements for abandonments above, Reword this clause as:</p> <p>Where a previously abandoned well has blown out or causes any leaking of geothermal fluids, steam or gas, the re-abandonment work <u>shall</u> be inspected and approved by a qualified drilling engineer.</p>
5.20	<p>Need to ensure a consistent regime/standard/process for repairing pipe works as for repair and or abandonment of wells.</p> <p>There is a reference here to “serve notice”, but that doesn't appear elsewhere i.e. here there is an obligation that evidence of satisfactory works is required, but not elsewhere.</p> <p>In the event there is an inspection regime, inspectors need to be</p>	<p>Reword as</p> <p><u>“In the event that any authorised officer is satisfied that the wellhead presents a potential threat to the safety of any person entering onto that property, that authorised officer may serve notice on the owner or occupier of the property in question, requiring the undertaking of specified remedial works forthwith.</u></p> <p><u>Works are to be designed and carried out by appropriately qualified personnel.</u></p>

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
	familiar with the OSH PECPR regulations and acceptable design, fabrication and maintenance codes.	<u>Evidence that the specified work has been carried out to a satisfactory standard and that the repaired equipment has been made safe is to be produced to an authorised officer within 14 days of completion</u> ".
6.1	This section appears under the heading of "Buildings" but not strictly about buildings. More related to "Controlling Access"?  Uses different language as to safety objective: "so as to protect any person from any associated danger/threat." Suggest standardise.	Replace the heading with: " <u>Managing And Controlling Access To Geothermal Wells And Equipment</u> "
7	Headed up as "Worksites" but clauses talk about a range of things, including buildings, which is the subject of Section 6.	[Rationalise heading]
7.1	Presently reads: " <i>No person shall, except with the express written approval of the Council, and subject to any conditions it may impose...</i> "  This should refer to the resource consent regime, rather than an unknown/undefined Council approval process?	[Drafting by those knowledgeable about resource consenting processes]
7.3	It is unclear what is actually required by way of building barriers to the ingress and egress of H2S. Are builders and developers given guidelines to allow them to comply with this? Are floors required to be impermeable for gas? Walls? How does this interface with the Building Act?  Needs to refer to all geothermal gases	[Draft with assistance of those knowledgeable in applicable building practices]
7.4 & 7.5	"Where a defect occurs in a building which permits or is likely to permit the ingress or egress of hydrogen sulphide gas..." "Where an Authorised Officer is of the opinion that any building, is in such a state or condition or has any defect, as to permit the ingress or egress of hydrogen sulphide gas in such concentrations as to be injurious or likely to be injurious or dangerous to the health of any person, he may require the owner and/or occupier to [take steps]..."  The nature of the defects referred to here are not clear. Is this about	Review description of consequence " <u>likely to be injurious or dangerous to the health of any person</u> " and standardise throughout the document  [Draft with assistance of those knowledgeable in applicable building practices]

Clause	NZGA Submission on <u>Proposed Amended Bylaw</u>	Recommend wording change to read
	<p>reticulated pipework and defects in pipework?</p> <p>Needs to refer to all geothermal gases</p>	
8	<p>Is it possible for Council to recover from a land owner or occupier costs where the Council is forced to act and where the owner/occupier has not fulfilled their obligations with respect to safe management of the well or assets?</p>	<p>[Drafting by those knowledge in Council cost recovery mechanisms]</p>