5th Submission to the Parliamentary Commissioner for the Environment

Disposal of Oil and Gas Waste – a review since June 2014

Climate Justice Taranaki

DRAFT of 28 September 2015

Contents

1. Introduction

Climate Justice Taranaki (CJT)[1], a community group based in Taranaki, is acutely aware of local issues concerning the oil and gas industry. CJT seeks to arouse public understanding of the inextricable links between climate change and social justice issues, and bring about positive change. We work closely with local iwi and communities, land owners affected by the oil and gas industry, and other environmental groups such as Taranaki Energy Watch and ECO – Environment and Conservation Organisations of Aotearoa New Zealand. CJT became an incorporated society on 26 February 2015.

CJT has made four submissions (in Nov 2012, Aug 2013, Nov 2013 and April 2014) to the Commissioner during the course of the Commissioner's investigation into fracking and the oil and gas industry. This submission aims to provide an update of the situation of oil and gas waste disposal in Taranaki since June 2014, including our concerns over central government legislation and guidelines and district and regional level regulatory and management processes. The structure of this submission is largely modelled on the Parliamentary Commissioner for the Environment's report *Drilling for oil and gas in New Zealand: Environmental oversight and regulation* (PCE, June 2014)[2] chapters 1, 2, 6, 7 and 8.

2. Government oversight of oil and gas disposal

2.1 Multi-agency Working group to address oil and gas waste disposal on farms

The most significant step taken by the government in terms of oil and gas disposal since June 2014 was the establishment of a working group to look into the problem of livestock on landfarms[3], a direct response to the PCE's recommendation (Section 8.6 of PCE, June 2014).

According to an Official Information Act (OIA) reply from the Ministry for Primary Industries (MPI) to Radio NZ (8 July 2015), a Science-Management Technical Group and a Working Group on Managing Solid Waste from Oil and Gas Wells met on 7 October and 6 November 2014. The minutes of these meetings were not released to Radio NZ.

Summaries of the meetings released by MPI to Radio NZ revealed that the technical group meeting was attended by MPI, Taranaki Regional Council (TRC), Petroleum Exploration and Production Association (PEPANZ) and Dairy Companies of New Zealand. The group recommended that national guidelines should be prepared for landfarming that include guidance for stock access to landfarms before bioremediation is complete.

The meeting on 6 November 2014 was attended by MPI, PEPANZ, MBIE, Meat Industry Association, Hawke's Bay Regional Council, South Taranaki District Council, Horizons Regional Council, TRC, MFE, Local Government NZ, Dairy Companies of NZ, Beef+Lamb and Federated Farmers. Discussions on regulatory options included the Food Act, the Animal Products Act, the RMA and the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS from here on). The key finding of the science and management work stream was:

> *"Once the soil has been bioremediated to acceptable soil standards, then there is no attributable risk to food safety or animal welfare. Before bioremediation has been completed the risks are understood to be low, but proving it would be too costly to be practical. This means the most sensible approach is to avoid grazing or cropping land before it has been bioremediated,"* MPI, November 2014[4].

2.2 MPI Guidance

2.2.1. Guidance or rhetoric?

In July 2015, the Ministry of Primary Industry (MPI) released the *Food safety and animal welfare guidance if spreading rocks and minerals from drilling oil and gas wells on land* (MPI, July 2015)[5] along with a Landcare Research report (Cavanagh, May 2015)[6]. The report concluded that:

> *"Land application of **O&G wastes** is considered to pose **no attributable risk** to food safety or animal welfare, particularly when wastes are incorporated into the shallow subsoil with topsoil overlying the soil/waste layer... Surface application of O&G wastes is considered to pose no attributable risk to food safety and animal welfare when stock are excluded and crops are not harvested until agreed endpoints for soil quality are reached,"* Cavanagh, May 2015.

The MPI guidance emphasized that:

> *"This analysis of the New Zealand and international science determined there is **no risk** to food safety or animal welfare as a result of spreading **rocks and minerals** from drilling oil and gas wells on land, other than potentially from hydrocarbons. The risk from hydrocarbons is extremely low, even immediately after rocks and minerals are spread onto land.*
>
> *If rocks and minerals are spread onto land at or near the surface, MPI advises that the land is not stocked and crops are not harvested until the concentration of hydrocarbons in the soil are at or below the values specified in Table 1 of this guidance. The Landcare Research analysis has determined that, once these values have been reached, no risk to food safety or animal welfare exists as a result of spreading rocks and minerals on the land, and the land*

can be used for any purpose, including for stock or crops to produce meat, milk, fruit or vegetables."

In a press release[7], MPI assured the public:

*"This isn't about fracking or pouring oil on land. It's about ground up **rocks, mud and minerals** left over from drilling very deep holes in the ground. … This process allows the rocks and minerals to be **recycled** to improve the **productivity** of some soils… We have set standards in the guidelines where we can be **assured** that there is **no risk**."*

The industry proclaimed that it's "*a happy ending to the landfarm debate*" (TDN, 16 July 2015)[8].

We include below an aerial map of the C Boyd landfarm (TRC, Nov 2014)[9] adjacent to the Egmont National Park (Figure 1). The map illustrates the scale of oil and gas waste spreading on the farm, the proximity to the national park, the streams that crisscross the landfarm and the variety of wastes that have been spread at the numerous plots: liquid only, synthetic based mud (SBM), water based mud (WBM) and mixed waste.

It is quite obvious that the MPI guidance was written to sanction the practice of applying oil and gas wastes on farms. The language used such as "rocks and minerals" (rather than "oil and gas wastes"), "no risk" (rather than "no attributable risk"), "recycled", "productivity" and "assured" was deliberately chosen to underplay the risks, uncertainties and complexities of the issues while making bold assurances and exaggerating the potential benefits. The phrase "no risk" was used 20 times! While full of rhetoric, the document offers little guidance to local governments, the food industry or farmers as to how the guidance may be put into practice.

2.2.2. Relationship with the NESCS

According to the MPI guidance:

"Councils may decide that the criteria identified in this guidance are appropriate for managing effects under the Resource Management Act 1991 or they may impose different controls focused on different effects or tailored to the particular circumstances of the relevant area."

This statement undermines the fact that **all territorial authorities (district and city councils) are required to give effect to and enforce the requirements of the NESCS** (MFE, 2011)[10]. In fact, the Resource Management (NESCS) Regulations 2011[11] directly affect oil and gas activities including land application of wastes. The regulations override the MPI guidance and is effectively triggered when there is a change of land use such as when a landfarm is used to graze stock on or produce

food from. Whilst MPI has acknowledged that regional councils and territorial authorities are generally responsible for the implementation and enforcement of the RMA, the NESCS was barely touched upon.

2.2.3. Contaminant endpoints

In terms of contaminant endpoints, the soil endpoints (1.1-5.7mg/kg) for **benzene recommended by Landcare, MPI and the Ministry for the Environment (MfE, 1999)[12] are orders of magnitude higher than those (0.046-0.073 mg/kg) required in Alberta** before landfarms can be returned for agriculture (ERCB, 2012)[13]. The ERCB Directive 050 is referenced by both Landcare and the Taranaki Regional Council (TRC).

The Canadian soil quality guidelines for agricultural land are even more stringent and comprehensive, with acceptable benzene concentrations from 0.0068-0.03 mg/kg, depending on soil texture and whether it is surface or subsoil (CCME, 2007; Appendix 1)[14]. CCME's acceptable value for naphthalene (0.1 mg/kg) is also much lower than that stipulated by Landcare, MPI and MfE (7.2 mg/kg). The CCME guidelines include many more contaminants, notably heavy metals and organic compounds such as ethylene glycol which are not included by Landcare, MPI or MfE. The Canadian Federated Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils recommended analyses for PAHs, Phenols, PCBs, Chromium/Cadmium, total heavy metals, lead, TPH and CWS-PHC fractions:

> *"Although landfarming is recommended for petroleum hydrocarbon contaminated soils only, it is understood that other contaminants may also be present,"* (Government of Canada, 2013) [15].

MPI's guidance includes no acceptable loading and endpoint values for metals and salts concentrations. Mc Farland et al (2009)[16] referenced in the Landcare research states:

> *"The heavy metals most commonly found in drilling fluids include arsenic, barium, chromium, copper, lead, nickel and zinc. The amounts present will depend on the formulation of the drilling fluid and the geologic formations encountered during the drilling process"*.

It appears that MPI has dismissed the risks of heavy metal contamination, based on the low concentration readings from a few TRC environmental monitoring reports. Can these few readings be extrapolated to imply that all wastes from Taranaki or other parts of the country will be equally low in metals?

2.2.4. Extremely low concentrations of hydrocarbons?

MPI repeatedly claimed that "*the risk from hydrocarbons is extremely low, even immediately after rocks and minerals are applied to land …*" and re hydrocarbons entering ground or surface water, "*there is no risk to food safety or animal welfare … because they are present at such low concentrations*." But this clearly contradicts a number of reports which documented multiple cases where hydrocarbon concentration levels remained above consent limits (Edmeades, 2013[17]; TRC, Feb 2015)[18]. The latter report revealed difficulties in degradation of longer chain hydrocarbons (C10-C14 and C15-C36), especially in plots where SBM had been spread (Appendix 2). Elevated levels of benzo(a)pyrene (BaP) were recorded in several plots where SBM or well workover fluids (WWF including frack fluids) had been spread. Benzo(a)pyrene is a well known carcinogenic:

> *"BaP is considered to be a marker for PAHs as it is one of the most strongly carcinogenic of the hundreds of PAHs that exist…"* (MfE, 2011)[19]

> *"Children may also have greater exposure than adults to contaminated soil in areas where BaP-contaminated soil from industrial contamination may be present, because of behavior patterns, particularly hand-to-mouth activity. … BaP partitions strongly to soil, but will break down when exposed to UV in sunlight. … BaP has very low solubility in water, but can be found bound to particulate matter in surface water. BaP contamination can occur as a consequence of industrial pollution,"* (US EPA , 2007)[20]

Moreover, there are some contaminants that are persistent and harmful at extremely low concentrations. On reviewing the Landcare report, Dr Mariann Lloyd-Smith (pers. comm. 28 July 2015) of International Persistent Organic Pollutants Network wrote:

> *"Any review of the toxic component in the report (Appendix 2) is based on a simplistic approach of individual components rather than the mixture of metals, salts, hydrocarbons and other toxic components. The EU has long expressed concerns about organic bromides and chlorocarbon mixtures from drilling and fracking wastes. There is also no discussion in the report about low-level endocrine impacts of individual components or the mixtures. EDCs [Endocrine Disrupting Chemicals] are known to be present in O&G waste."*

Indeed the non-disclosure of many chemicals used by the O&G industry has made the assessment of such complex toxicology nearly impossible. Moreover,

> *"Full disclosure of chemicals and the chemical composition of flowback water is a necessary but insufficient step in the assessment of the environmental risks associated with drilling and fracturing. Information is also required on* ***potentially hazardous chemicals produced down-hole by chemical interactions under high temperature and pressure****. This includes information on concentration, mobility, persistence in groundwater and surface water, and* ***bio-accumulation properties, for each chemical on its own and as a mixture****. This represents*

a major gap in understanding of the potential environmental and human impacts of hydraulic fracturing, and of how to mitigate accidental releases of chemicals or flowback water to the environment." (Council of Canadian Academies, 2014) [21]

2.2.5. How to site a landfarm and how long to operate a landfarm for?

MPI offers no guidance to the siting of landfarms. To minimize the risk of surface and groundwater contamination, the Government of Canada limits landfarms to be sited greater than 500 m from a permanent surface water body (whether it's potable or non-potable) and greater than 500 m from a potable groundwater well (Government of Canada, 2013)[22]. The same distance applies to a residential boundary. Landfarms should also be sited where the groundwater table is greater than 3 m from the surface. All these criteria are important in minimising water contamination and risks on livestock health and food safety. In terms of duration:

"Research has shown appreciable biodegradation may occur after one summer season, additional biodegradation over a second season is usually required. Therefore, it is recommended that the ***landfarm should operate for between 6 months to 2 years****. This operation period assumes optimal conditions are maintained … Soil sampling and analyses are required to confirm remediation progress and completion,"* (Government of Canada, 2013).

Most of the landfarm consents granted by TRC are over a decade long and conditions allow contaminants discharge as close as 25 m to surface water and property boundaries. Why?

2.2.6. Growing crops before endpoint values are reached

We question the safety of growing crops on such land before acceptable contaminant endpoints are reached. Canada's detailed *Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines* (CCME, 2006)[23] explained the multiple, direct and indirect exposure pathways of soil contaminants and their implications, notably:

"Root uptake and accumulation of contaminants by crops grown on-site and used as feed, or native flora used as pasture, must also be examined when they relate to livestock and wildlife ingestion scenarios …

Biomagnifying contaminants are those which may increase in concentration as they move through the food chain. Ingestion by secondary and tertiary consumers must be evaluated for these contaminants during guideline development.".

On at least one Taranaki landfarm, the Waikaikai Landfarm, maize was planted before consent limits were met (TRC, Feb 2015)[24]. What are the safeguards to ensure that there is no contaminant in the maize that may be passed onto livestock feeding on the crop offsite? Are the potential effects on secondary and tertiary consumers considered for substances that biomagnify?

2.2.7. Single verses multiple application of wastes

Importantly, the Taranaki Regional Council has generally insisted on single (no repeat) waste application. However MPI has legitimized multiple applications by stating that land with wastes spread on it more than once would follow exactly the same guidance, despite the known issues concerning the accumulation of persistent contaminants.

A range of plants are known to bio-accumulate heavy metals and have been considered for phytoremediation, e.g. mustard greens for lead, chromium and mercury[25], although trees such as willows and poplars have also been used for metals and organic pollutants[26]. Crops like Brassicas and other hyperaccumulators[27], if allowed to be grown on landfarms with elevated levels of contaminants (especially following multiple application of wastes), may not be safe for consumption by livestocks or humans.

2.2.8. Mix-bury-cover requires no exclusion of stock or cropping

MPI has considerably downplayed the issues and risks of mix-bury-cover (MBC) where drilling wastes are buried below the root zone (greater than 1 metre), by stating that:

> *"…there is **no need for stock to be excluded or crops not harvested** before hydrocarbon concentrations reach the values in Table 1. In these situations, no exposure pathway exists for hydrocarbons to be taken up from soil to plants and animals so there is no risk to food safety or animal welfare as a result of stocking or cropping the land. There is also **no risk to food safety or animal welfare as a result of hydrocarbons leaching to ground water** because they are present at such low concentrations in the rocks and minerals".*

In Alberta, MBC must follow stringent guidelines. Directive 050 (ERCB, 2012 section 13.3) says:

> *"Licensees must not manage drilling wastes resulting from hydrocarbon-based mud systems using the MBC method unless the waste has undergone biodegradation. …*
>
> *Licensees must sample the drilling waste by taking either a total waste (fluids and solids) sample, if both phases are being managed by MBC, or a solids sample, if only the solid phase is being managed by MBC. …*

Licensees must have the sample analyzed for the following parameters and use the results to determine the soil/waste mix ratio that will prevent the receiving soil from exceeding the soil endpoints set out in Section 3:

a) *pH, EC, SAR, and Na;*
b) *nitrogen (N), if the additives/products used to formulate the drilling mud system or added to the drilling waste contain any amount of N (NH4-N, NO3-N, NO2-N) or if the N content of any of the additives/products used to formulate the drilling mud system or added to the drilling waste is unknown;*
c) *metals, if the cumulative concentration of metals in mud additives/products added to the drilling mud system exceeds the values set out in Table 3.4, or if metal content of the mud additives/product is unknown;*
d) *hydrocarbons (i.e., BTEX and F1 to F4 hydrocarbon fractions), if a hydrocarbon flag was encountered; and*
e) *toxicity, if mud additives/products were used in concentrations above the luminescent bacteria toxicity test pass threshold (EC50[15] ≥ 75 per cent), or if toxicity data is unknown. The sample must pass the toxicity test; for those drilling wastes that only pass the toxicity test after being charcoal treated, disposal may only proceed if hydrocarbons are the likely source of toxicity. "*

Mix-bury-cover post-disposal requirements in **Alberta include soil endpoints of EC, metals, hydrocarbons and nitrogen** (ERCB, 2012 section 13.4 and table 13.1).

MPI requires only hydrocarbon endpoints. This has little meaning when there is no exclusion of livestock or cropping prior to reaching the endpoints. Notably whilst having refused to take milk from 'new' landfarms, **Fonterra has NOT made any public statement about refusing milk collection from MBC sites**. From the point of view of farmers and the oil and gas industry, the **MPI guidance very much favours the use of MBC** over landfarms. This is likely to result in a rise of MBC operations. Given that there are many more consents for MBC sites than landfarms (42 and 17 respectively since 1998 according to MPI), their environment effects and potential food safety risks cannot be ignored.

2.2.9. MfE Tier 1 groundwater acceptance criteria

CJT questions the basis on which MPI would be so confident about the no or low risk of groundwater contamination and subsequent impacts on animal welfare and food safety.

We also question why the MfE Tier 1 groundwater acceptance criteria were not considered at all (MfE, revised 2011)[28]:

"Groundwater monitoring should be implemented where there are reasonable grounds to suspect contamination has occurred and where it might affect an existing receptor (e.g. groundwater user) or a potential use of the aquifer.

***Monitoring of groundwater quality** should be undertaken whenever the potentially impacted aquifer is classified as sensitive … **A sensitive aquifer** is defined here as an aquifer that is:*

- ***not artesian** (in practice true artesian or confined aquifers are unlikely to be encountered as part of the shallow groundwater systems normally of interest at petroleum contaminated sites); **and***
- ***less than 10 metres below the source or suspected source of contamination** (or greater depth below ground surface where the geology suggests contamination may readily migrate to greater depth, e.g. clean sands or gravels, fractured basalts); **and***
- *is of **a quality appropriate for use**, can yield water at a useful rate and is in an area where extraction and use of groundwater may be reasonably foreseen. The definition of a useful rate depends on the potential use of the water. For example, a useful rate for a household may be 2000 L/day, whereas it would be much lower for irrigation or stock watering; **or***

- *where the **source of contamination is less than 100 metres from a sensitive surface water** body (i.e. a surface water body where limited dilution is available to mitigate the impact of contaminated groundwater discharging into the surface water body)."*

Section 3.3 below gives examples where oil and gas waste storage pits on Taranaki landfarms have been located just above groundwater and where consents allow discharge of contaminants within short distances (6, 12 or 25 metres) from surface water, usually 'unnamed tributaries' where flow and dilution is likely to be limited.

We therefore believe that the MfE Tier 1 groundwater acceptance criteria (Appendix 3) should apply in assessing the integrity of groundwater that may be impacted by oil and gas discharges on/from landfarms, MBC and worm farms.

2.2.10. Supposed benefits and exclusion from HAIL

The Landcare report stated:

*"if sufficient beneficial effects of land application of O&G wastes could be demonstrated then the land application of O&G waste could be **excluded from category G5 of the HAIL** [Hazardous Activities and Industry List] in the same manner that biosolids have been excluded when used as a soil conditioner,"* Cavanagh, May 2015.

Such an idea that supposed 'benefits' would outweigh the environmental and health risks of disposing contaminated waste on food-producing land is extremely concerning.

In Taranaki, the dairy and O&G industries are often described as the two pillars of economy that co-exist happily side by side. Dairy farmers rely heavily on urea derived from natural gas, extracted and processed locally, for keeping their pastures green. However to encourage the dumping of petroleum waste on farms and suggest that it may even be beneficial is one step too far. This is particularly relevant when the global glut of milk has meant an all-time drop in its price, and consumers such as the growing middle class Chinese are more selective in their food choices than ever.

We argue that instead of further promoting the unholy alliance between the fossil fuel industrial and intensive dairying, and risking food safety and New Zealand's relatively untarnished clean green image, the government should reflect on its goal to drill for more and more oil and gas and re-invent our agriculture sector. We need to take bold steps to break our dependence on fossil fuel fertilizers and pesticides, reduce stocking rate, diversify our products, and grow niche markets that benefit small farmers while looking after our soil, our waterways and our climate.

2.3 Regional and district plans and management

2.3.1 Regional plan

The April 2015 Draft Freshwater and Land Management Plan issued by the Taranaki Regional Council (TRC) classified "Discharge of *stormwater* and surplus drilling water from hydrocarbon exploration and production activities onto or into land where it may enter *surface water"* (Rule 22) as **Controlled** and without public notification (TRC, April 2015[29] pages 59-60). There is no definition of "surplus drilling water" and it is unclear whether it includes produced water.

"Discharge of contaminants or water into land by *deepwell injection* or *water flooding*" (Rule 25) is classified as **Discretionary**. There is no definition of "contaminants" and it is unclear whether it includes produced water and/or flow back frack fluids.

"Discharge of drilling muds onto or into land associated with *landfarming* or *mix-bury cover*" (Rule 23) is also classified as **Discretionary**. No conditions are specified, e.g. restricting such discharge to solid wastes as recommended by the PCE in June 2014.

There is no rule specific to the discharge of drilling muds and other wastes associated with oil and gas activities by vermi-composting, even though there are several such facilities operating in Taranaki (See section 3.3 of this submission).

2.3.2 District plans

All three district councils in Taranaki are undergoing district plan review. South Taranaki District Council (STDC) proposed district plan is open for submission until 12 October 2015. This proposed plan appears to be silent on landfarming, mix-bury-cover (MBC) and vermicomposting of petroleum related wastes.

Section 1 of the plan[30] defines hazardous facility as meaning:

> *"all activities and sites involving hazardous substances, including vehicles for their transport, at which these substances are used, stored, or handled."*

However, it does not include "*Trade waste, sewer and waste treatment or disposal facilities*."

As background, STDC Section 32 report on energy[31] describes landfarming as earthworks:

> *"In terms of the Operative District Plan, landfarming (effectively earthworks) is a permitted activity, unless it is located in a sensitive environment (e.g. Coastal Protection Area) or near a significant site (e.g. historic site)."*

CJT strongly disagree with this description because of the toxicity of wastes involved, the potential for longterm soil and water contamination of the site and risks on animal welfare and food safety when food producing farmlands are involved. At least two landfarms are located within Coastal Protection Area (Rural maps 14 and 10).

CJT's view is that petroleum waste facilities such as landfarms, MBC and vermicomposting sites, while they are actively receiving petroleum wastes, should be classified as hazardous facilities because of the amount and toxicity of hazardous substances involved. Once these facilities cease receiving petroleum and other hazardous wastes, comprehensive investigations and assessment must take place to determine its status in terms of contamination. These sites should be listed on the Registrar of Selected Land Uses (RSLU) and appropriately classified, the information of which should be presented on LIM and available to the public.

Deepwell injection sites where petroleum wastes are disposed of are likely to be treated like any other wellsites in the district plan. Yet such sites are especially prone to cumulative effects, as underground pressure builds up and changes through injection over time, potentially causing unpredictable, sometimes devastating outcomes, from earthquakes to groundwater contamination. Specific provisions including setback distances from sensitive activities should be made for deepwell injection sites in the district plan.

CJT is preparing its detailed submission on the STDC proposed district plan. In the meantime, refer to the submission by Catherine Cheung (Appendix 4).

2.3.3 Contaminated Land, HAIL and Registrar of Selected Land Uses (RSLU)

STDC's Section 32 evaluation report[32] on hazardous substances and contaminated land acknowledged that while the regional council has the main responsibility "*for identifying and investigating contaminated sites",* district council's role has been "*to ensure that any land, known to be contaminated, is not used or developed in a way that would pose risk to the community."*

The report also said that following NESCS provisions, STDC has processed 13 resource consent applications, mostly related to remediation of contaminated land from historic oil and gas activities. However, there appears to be no rules specific to contaminated sites in the proposed plan, except that "*site contamination remediation measures and works*" are considered matters to which council 'restricts its control' when subdivision of land occurs (Rule 9.1.2).

Through our research, we could not get a clear understanding of how the identification, investigation, classification and listing of contaminated sites in Taranaki have been conducted. The limited information available appears confusing and inadequate. The Taranaki Regional Council (TRC) stated in its 2015 State of the Environment Report[33] that "*of the 1,336 sites* [on the RSLU] *listed as potentially contaminated in Taranaki, none poses an unacceptable risk".* It appears that some 529 of these sites are actively managed to prevent the on-site contamination from causing harm, and 35 sites on the verified HAIL are not yet assessed.

In an OIA reply to Ms Sarah Roberts on 24 March 2015, TRC wrote:

> *"The Council uses two databases to track sites with activities that are relevant to HAIL. One database covers all consent activities, the other database (Register of Selected Land Uses) covers unconsented sites that the Council is investigating or otherwise holds information on."*

What is the rationale behind having a RSLU that include only "*unconsented*" sites?

TRC also wrote that it does not have a list of sites that are known to have had HAIL activities on them, however the information is available on the two databases mentioned above and are publically available on council's Regional Xplorer[34] program.

On TRC Regional Xplorer, BTW Brown Road landfarm, C Boyd landfarm and many wellsites notably Kapuni KA5/10 and KA13, are all marked as being on the RSLU and holding resource consents. For "status of site" BTW Brown Road landfarm, with "Drystock Farm" as current use, is classified "1(b)-Haz Subs Present-Risk acceptable for land use." C Boyd landfarm, with "Dairy Farm" as current use,

is classified the same; as are KA5/10 and KA13 wellsites which are currently used for “hydrocarbon exploration”. Wellsite KA13 and KA5 were remediated in 2014 and earlier part of 2015, involving removal of significant amount of contaminated soil.

We question how the two landfarms could be classified as “acceptable” for their current land use and how the district councils dealt with the change of landuse from petroleum waste disposal to farming which would have triggered the NESCS? Why was KA5 not listed as contaminated in 2014 before it was remediated this year?

3. The disposal of waste

In addition to the disposal methods described in the PCE June 2014 report, we have included in this submission the discharge of contaminants into water, vermicomposting, offshore oil and gas waste and discharge of contaminants into air.

3.1 Discharge into water

The discharge of contaminated oil and gas wastes into streams, rivers (or onto land where it may enter unnamed tributaries) was not included in the PCE report (June 2014), other than as spills or leaks. We believe this is an extremely important aspect of assessing the environmental and human health impacts of waste disposal from the oil and gas industry.

In the 18 months from Jan 2014 to 20 August 2015, TRC has issued 40 consents (new or change of conditions) for the discharge of contaminants from the oil and gas industry into streams or onto land where it may enter tributaries (See Appendix 5). Below are the summary of a few of them:

7407-1 7252 — Changed: 20 December 2012
Todd Taranaki Limited — Expiry Date: 1 June 2027
P O Box 802 Taranaki Mail Centre NEW PLYMOUTH 4340
Review Date: June 2009, June 2010, June 2011, June 2012, June 2015, June 2021
Location: Mangahewa-D wellsite, Rimutauteka Road, Inglewood (Property owner: KV & SJ Collins)
Activity Class: Discretionary
Purpose: **To discharge treated stormwater, treated produced water and surplus drill water** from hydrocarbon exploration and production operations at the Mangahewa-D wellsite into an **unnamed tributary of the Manganui River**
Change of conditions to: allow treated stormwater, treated produced water and surplus drill water; and to increase the stormwater catchment area

9506-1 7355 — Granted: 18 March 2013
Greymouth Petroleum Limited — Expiry Date: 1 June 2027
P O Box 3394 NEW PLYMOUTH 4341 — Review Date: June 2015, June 2021
Location: Dettling South wellsite, 403 York Road, Midhirst (Property owner: A & M Dettling)
Activity Class: Discretionary

Purpose: **To discharge treated stormwater, treated produced water and treated surplus drilling water** from hydrocarbon exploration and production operations at the Dettling South wellsite, **onto land where it may enter an unnamed tributary of the Manganui River**

R2/10003-1.0
BP Oil New Zealand Limited
PO Box 99873, Auckland 1149

Commencement Date: 04 Nov 2014
Expiry Date: 01 Jun 2019
Review Dates:
Activity Class: Discretionary

Location: 71 Powderham Street, New Plymouth
Application Purpose: New
To discharge treated water from dewatering activities, associated with the placement of an underground petroleum storage tank, **into the Huatoki Stream**, via the New Plymouth District Council stormwater network

R2/6269-1.1
Shell Exploration NZ Limited
Shell (Petroleum Mining) Co Ltd, Pohokura Operations, Private Bag 2035, New Plymouth 4342

Commencement Date: 20 Nov 2014
Expiry Date: 01 Jun 2033
Review Dates: June 2015, June 2021, June 2027
Activity Class: Discretionary

Location: Lower Otaraoa Road wellsite, Lower Otaraoa Road, Motunui, Waitara
Application Purpose: Change
To discharge treated stormwater from hydrocarbon exploration and production operations at the Lower Otaraoa Road Wellsite to an existing stormwater control system, being a body of water commonly known as 'The Duck Pond' within **the Manu Stream**

A number of the consents relate to change of conditions. E.g. Consent R2/9453-1.3 for Todd Energy Mangahewa-E wellsite was issued on 18 August 2015 for "*change of conditions to allow for an increase in chloride concentration in the discharge of 230 g/m^3* [five times higher than the original condition]" (Appendix 5). Notably, Todd Energy was found to be non-compliant with consented chloride limit on 17 July 2015. According to TRC, "The consent breach was minor and the Company have applied to change the consent limits to align them with recent stormwater discharge conditions on resource consents for other sites" (TRC, Sep 2015b[35]).

It is impossible to quantify the amount and compositions of such discharge because of the lack of monitoring data available in TRC monitoring reports. It appears that any treatment of the wastes afforded by consent holders is rudimentary, involving skimmer pits.

3.1.1. Todd Energy Mangahewa-D wellsite

According to the TRC monitoring report on Todd Energy's Mangahewa-D wellsite (TRC, March 2015)[36]:

> *"Todd Energy Limited holds water discharge permit 7407-1 to discharge **treated stormwater, produced water, surplus drill water and water collected from the flare pit** from*

*hydrocarbon exploration and production operations at the Mangahewa-D wellsite into a manmade drain and then into an **unnamed tributary of the Manganui River**. …"*

Samples from stormwater discharge, skimmer pits and receiving environment (unnamed tributary of the Manganui and Waitara River) were tested simply for pH, chloride, hydrocarbons and suspended solids. No exceedences were recorded in relation to consent 7407-1. However,

*"In the period under review, two resource consent breaches were observed and recorded during routine monitoring inspections. On 7 June 2013 the second **skimmer pit** (located on the exploration side of the wellsite) was inspected and found to have **failed due to external pressure on the lining via groundwater intrusion**, causing the lining to balloon inwards and substantially decreasing the storage capacity of the pit. … On 14 February 2014 inspection found that drilling had commenced prior to the Council receiving the required 7 days notification… Neither of these incidents has environmental consequences of any significance, but represented administrative non-compliance."*

Why did Todd place the skimmer pit so close to groundwater? Did the water table rise because of heavy rainfall or it's just part of the natural recharge cycle? Could well drilling and fracking have affected groundwater movements?

According to the consent, even the water in the flare pit was only required to be tested for pH, suspended solids, total recoverable hydrocarbons and chloride.

In our first two submissions to the Commissioner (CJT, Nov 2012[37] and Aug 2013[38]), we raised the serious issue of **contaminated soil and groundwater below Shell Todd's Kapuni flare (blowdown) pits**. Since those submissions, contaminated soil from these flare pits that had to be removed has amounted to **thousands of tonnes**, including 455 tonnes from KA2, 2688 tonnes from KA3, 1500 tonnes from KA13, plus yet-to-be quantified amounts from KA1/7, KA4, KA5, KA6 and KA9 (South Taranaki District Counil, pers comm. 6 Oct 2014). Some of the groundwater samples below these pits were shown to be unfit for stock and irrigation, due to the presence of benzene, xylene, napthlalene and or benzo(a)pyrene (TRC, Feb 2013)[39].

The discharge of contaminated stormwater, produced water, surplus drill water and water in flare pits into waterways, after just **casual testing and 'treatment'**, poses serious and far-reaching risks on both surface and groundwater quality. Even established municipal wastewater treatment plants cannot deal with oil and gas wastes, as demonstrated in a number of US studies (Vengosh and Jackson, 2013[40]), and more locally in Eltham, Taranaki:

*"…Fonterra dumped about 3 million litres of the milk byproduct, along with another 150,000 litres of **milk tainted with drilling wastes**, at the plant in an effort to deal with spring's record milk production."* (Stuff Business, 31 Oct 2013[41] and 12 Sep 2014)[42]

The stench caused by the dumping was still affecting local residents months later (3 News, 23 Dec 2013[43] and 13 Mar 2014[44]).

3.1.2. Taranaki Ventures Copper Moki wellsite

The discharge consent (no 7761-1) for Copper Moki-1 wellsite was issued in Jan 2011 (TRC, Sep 2013)[45]:

*"**To discharge treated stormwater, produced water and surplus drilling water** from hydrocarbon exploration and production operations at the Copper Moki-1 wellsite onto and into land …"*

and some of the conditions include:

"Stormwater discharged shall be collected from a catchment area of no more than 1 ha.

*All stormwater and produced water [with a maximum chloride concentration of 50 ppm] shall be directed for **treatment through the skimmer pit[s]** before being discharged.*

Any significant volumes of hazardous substances [e.g. bulk fuel, oil, drilling fluid] on site shall be:

a) Contained in a double skinned tank, or
b) Stored in a dedicated bunded area with drainage to sumps, or to other appropriate recovery systems, and not directly to the site stormwater system."

It is unclear whether there was a double skinned tank for such storage on site, but in Taranaki where rainfalls are high, **bunding is unlikely to be effective at all times**. Although this wellsite does not have a discharge consent to water, what is there to stop rising stream levels during rain storms to breach bundings, resulting in water and soil contamination? See Figures 5 and 6.

This is the same wellsite where a major incident had occurred in April 2012, resulting in **discharge of oil into a tributary of the Ngaere Stream** and a fine of $20,000:

"An investigation into the incident found that the acts of Taranaki Ventures Limited's contractor caused liquid hydrocarbon (oil) to discharge into the flare pit in circumstances where the pit was not fully contained. Most of the oil caught alight, leading to a discharge of

contaminants to air. The remaining oil (estimated at less than 50 litres) soaked into the base of the flare pit and eventually discharged into a tributary of the Ngaere Stream." (TRC, Sep 2013)

With the expansion (and intensification in some areas) of the oil and gas industry both on- and off-shore, and the increasing use of fracking in new wells or to extend the production life of old wells (well workovers), the amount of wastes (especially flow back and produced water) that require safe disposal will increase significantly, as will the number of incidents with environmental, health and safety consequences.

3.1.3. Health and ecology concerns

In July (then Dec) 2014, the Concerned Health Professionals of New York published a *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking* (CHPNY, Dec 2014)[46]:

*"… **drinking water is at risk from drilling and fracking activities and associated waste disposal practices.** As documented by the Pennsylvania Department of Environmental Protection in a review of its records, 234 private drinking water wells in Pennsylvania have been contaminated by drilling and fracking operations during the past seven years. These do not include drinking water wells contaminated by spills of fracking wastewater or wells that went dry as a result of nearby drilling and fracking activities. … In California, the injection of liquid fracking waste directly into groundwater aquifers threatens contamination of large numbers of public drinking water supplies".*

… northeast British Columbia (NEBC) …has experienced increased rates of cancers and other illnesses that have been linked to the contaminants and stressors associated with UOG [upstream oil and gas]. ***Contaminants reach human receptors through environmental pathways, namely air, soil, water, and food**. Each contaminant or stressor has specific sources, transport, exposure mechanisms, and biochemistry; and each can impact health both **directly and indirectly**. Of particular concern are airborne sulphur and nitrogen oxides, hazardous volatile organic compounds, hydrogen sulphide, ozone, noise, and radiation; as well as **soil- or water-borne hydrocarbons, heavy metals, and radiation** — some of which can also impact human health through food pathways. It has been determined that UOG is negatively impacting human health in NEBC; however, further information, such as environmental monitoring, is required before the actual health risks and impacts posed by UOG can be quantified"* (Krzyzanowski, 2012)[47].

The potential of radioactive contaminants from naturally occurring sources (NORMs) and radioactive tracers requires regular testing and monitoring. The results from radioactivity

investigations based on Taranaki oil and gas wastes (TRC, Feb 2013[48] and TRC, Oct 2014a[49]) cannot simply be extrapolated to all other sites. As the Commissioner pointed out (PCE, June 2014):

> *"In particular, because shales typically have higher levels of radioactivity than sandstone, samples of the produced water and sludge from wells drilled in the East Coast Basin should be taken and tested by an accredited lab."*

Moreover, the extent of use of endocrine disrupting chemicals (EDCs) in drilling and fracking, and their ecological and health effects are only gradually being understood. Kassotis et al. (2014)[50] has revealed elevated estrogenic, antiestrogenic, or antiandrogenic activities in most of the surface and ground water samples collected from a drilling-dense region of Colorado, when compared with nearby areas with limited drilling operations. More than 100 chemicals used in fracking are known or suspected EDCs while others are toxicants and/or carcinogens. In a subsequent study, all of the 24 chemicals most commonly used in fracking were shown to block the activity of one or more important hormone receptors (The Endocrine Society, June 2014)[51]. The health and ecological impacts of industry derived EDCs in the environment is yet to be investigated.

Although TRC has not issued any consent for the discharge of returned frack fluid into streams (or onto land where it may enter a tributary), it is critical to understand that:

> *"The produced water is composed of naturally occurring compounds from the shale* [or tight sand in Taranaki] *formation and the* ***remaining hydraulic fracturing fluids*** *that come to the surface over the life of a producing well."* (Kassotis et al, 2014) and

> *"Given the high pressure and temperature in the underlying strata, both flowback and produced waters have the potential to contain* ***transformation products*** *that originate from the drilling muds and fracturing chemicals as well as methane, petroleum condensate, salts, metals, and, depending on the formation, naturally occurring radioactive materials (NORM)"* (Adgate, et al. 2014)[52].

3.2 Deepwell injection

The Sept 2015 monitoring report on Cheal-A deepwell injection (DWI) activities revealed that:

> *"Low levels of hydrocarbons were detected during the October 2014 sampling of GND1139. No hydrocarbons were detected during the May 2015 sampling event from the same well. It is not suspected that the hydrocarbons detected were caused by injected fluids migrating to freshwater aquifers. It is thought that either cross-contamination from an injectate sample collected earlier the same day or a laboratory error resulted in the detection of hydrocarbons."* (TRC, Sep 2015a[53])

It is unclear how such a deduction arose. Can the potential groundwater contamination be simply dismissed by a potential cross-contamination of samples or a laboratory error?

To be continued…

3.3 Landfarming, vermicomposting and mix-bury-cover

Since June 2014, a number of TRC landfarm and worm farm (vermicomposting) monitoring reports were published, documenting a range of unauthorized incidents, cases of non-compliance, some of which had resulted in effects on the environment.

3.3.1 C Boyd landfarm

At C Boyd landfarm, two incidents were reported, one of which resulted in "*minor short term effects on the Mangatengehu Stream*" (TRC, Nov 2014) [54]:

> *"It was thought that some surfactant had been used in drilling activities and the recovered material had been discharged into the drilling mud pit. This had moved through the skimmer pipes and settling pond system into the receiving waters. An abatement notice was issued requiring all noncompliant. … Samples were obtained of the discharge and unnamed tributary of the Mangatengehu stream. Biochemical oxygen demand, suspended solids and total dissolved solids sampled from the discharge (IND001067) of the stormwater ponds at the Surrey Road stockpiling facility, did not comply with the permitted activity conditions. This incident also breached Rule 23 of the Regional Fresh Water Plan for Taranaki, which stipulates that discharges must not produce any conspicuous scums or foams. …*
>
> *MI Swaco conducted a comprehensive internal investigation into this incident. They contracted in an industrial chemist who identified the particular surfactant that had caused the foaming. They traced the source of the foaming back to a detergent used in the cementing process."*

During another investigation, Council sampling staff found two perforated pipes that were discharging into the periphery drain.

> *"The discharge … had a strong hydrocarbon odour and the water running down the drain had a distinctive sheen, and some foaming was occurring directly below the perforated pipes. Naturally occurring iron oxide sheen and staining of the substrate was also present in the drain."*

Sampling results:

"… confirmed the presence of significant hydrocarbons in both of the perforated pipes (PP1, PP2) and in the periphery drain downstream of the perforated pipes (DRAIN D/S). However, the periphery drain discharges into two settling ponds, separated by gooseneck pipes, prior to the final discharge point (IND001067). The results from the final discharge show no hydrocarbons, but the suspended solids result sits at the RFWP limit for a permitted activity, and chloride is elevated. The downstream receiving results differ from the upstream control results with an increase in chloride and conductivity, but levels are low and unlikely to affect overall stream health at these concentrations. No BTEX compounds were detected in any of the samples. …

The consent holder advised that the perforated pipes were installed to drain a groundwater spring that runs through the site. Through the course of the investigative sampling it became evident that ***the pipes were draining the spring below the pit bases and collecting and transporting residual hydrocarbons into the periphery drain****. The initial site set up used* ***bentonite lined pits*** *and it is likely there would have been some* ***leaching of hydrocarbons through the pit bases into the underlying soil****."*

It seems extraordinary that operators would be allowed to site a drilling waste storage pit above a known spring and indeed to site such an extensive landfarm right next to the Egmont National Park (Figure 1). It also seems extraordinary that this particular consent (number 7591) for the Surrey Road site would allow drilling waste to be discharged within:

a) *"**12 metres** of property boundaries; or*
b) ***12 metres*** *of the Mangamawhete, Mangatengehu and Waipuku Streams; or*
c) ***6 metres*** *of any other surface water courses [including farm drains]."*

For comparison, most landfarm consents require discharge at least 25 metres from property boundaries or surface water.

More recently in May 2015, an abatement notice was issued to C Boyd for the storage of drilling muds over the maximum period of one year. In June 2015, an infringement notice was issued for the foaming of an unnamed tributary at its Derby Road site. In July 2015, it was found that resource consent conditions were not complied with regard to giving notifications to Council 48 hours prior to delivery of sludge to site, and some information supplied to TRC was incorrect including the omission of some spreading activities for the 2013-2014 monitoring period (TRC, Sep 2015b)[55].

3.3.2 Remediation NZ Worm farms

Remediation NZ produces organic fertiliser (worm casting) and soil conditioner for national and international markets. Its operations at two sites near Waitara and one at Uruti incorporate oil and

gas wastes into green and animal wastes and utilize worms to process them (TRC, Oct 2014b)[56]. The discharge consent (no. 5839-2) allows disposal of **solid drilling cuttings, WBM, SBM and produced water** on site as part of the vermicomposting process. This is contrary to the PCE's recommendation that the produced water should best be disposed of by deep well injection.

Below is the treatment process at the extensive Uruti site (Figure 2):

> *"The composting operation and drilling mud processing at the Mokau Rd site generates **a significant amount of leachate and contaminated stormwater** from three main processing areas. These are the drilling wastes remediation pad and two composting pads (known as 'pad 1' and 'pad 2').*
>
> ***Synthetic hydrocarbon contaminated drilling muds and cuttings are piled up on the remediation pad and the liquids are allowed to drain**. The runoff is treated in the series of ponds. Between each pond there is a baffle that skims off any floating hydrocarbons as the leachate passes through. These ponds also treat the leachate and stormwater from pad 1 where **remediated drilling wastes are blended with green waste and other organic matter** for composting. The treated liquid is held in the final two ponds and then irrigated to cut and carry pasture on two irrigation areas.*
>
> *Run off and leachate from composting pad 2 and a paunch grass maturation pad is pumped up to the top of **a seven tier wetland**. Under dry conditions the wetland water from the bottom pond of the wetland is reticulated back to the top tier of the wetland. **Under high flow conditions the wetland discharges the treated stormwater and leachate to a tributary of the Haehanga Stream…***
>
> *During the monitoring year routine compliance monitoring found … **unauthorised direct discharges of irrigation fluid and drilling waste leachate to the Haehanga Stream system**. These discharges resulted in abatement notices and infringement notices being issued. The Council also received one complaint about the Uruti site in regards to odour. The complaint was investigated and not substantiated.*
>
> *During the monitoring year, the Council received **seven complaints in regards to odours** in the vicinity of RNZ's Waitara Rd and Pennington Rd sites. … an abatement notice was issued on the likelihood of causing objectionable odour on one occasion."* (TRC, Oct 2014b)

Interestingly, the Uruti vermicomposting site was established in late 2001 following removal of composting operations from an old quarry site in Bell Block which was closed:

*"…due to the **incompatible nature of the activity with surrounding land use** (nearby residential houses), which resulted in odour incidents".*

It seems odour and incompatibility with surrounding land use are persistent problems of this industry. The report also noted:

*"… that as the site is now accepting a far larger volume of hydrocarbon exploration drilling wastes that the **level of hydrocarbons** found in the irrigation ponds is rising over time. It is also noted that in this period the highest level of chloride since monitoring began in the irrigation fluid has been detected.*

*The **increased chloride, potassium and sodium levels** in the irrigation fluids are of concern as this has flow effects on soil characteristics and groundwater quality."*

3.3.3 Mix-bury-cover

Operators of most Taranaki wellsites hold resource consents for mix-bury-cover (MBC) onsite, such as the Todd Energy Mangahewa-D and Taranaki Ventures Copper Moki wellsites mentioned in section 3.1. Many of these consents have not been exercised because in recent years wastes are more commonly taken to established landfarms instead. E.g. The mix-bury-cover consent for Mangahewa-C wellsite was exercised just once from 2012-2014 "*to dispose of lightly contaminated soil from the redundant flare pit from the original section of the wellsite*" (TRC, Oct 2014c[57]).

We believe MPI's recent guidance stating that there is no need to exclude livestock or cropping on MBC sites is likely to encourage more MBC operations.

In CJT's second submission to the Commissioner (Aug 2013), we gave examples of poor management where non-compliances were documented. E.g. Tag Oil's Cheal-B MBC site exceeded consent limit on nitrogen loading and failed to provide pre-disposal analyses and discharge records (TRC, Nov 2008)[58]. This inspector's quote at Hursthouse MBC site is worth repeating:

*"21 June 2007 - The landowner was not happy with reinstatement of the site. The weather was very wet at the time MBC was carried out in the sump. Mud was mixed with soil, then cover was applied but when compacted the mud came to the surface up the sides of the sump. This mud was spread out on the southern side of the sump. A soil sample was collected from this area and **mud was evident a few inches below the surface**."*

There were also multiple **cases where monitoring was impossible** because of poor site and record management. E.g. The location of the **disposal area could not be accurately determined** following reinstatement works (TRC, Nov 2008). TRC could not determine whether some of the older

consents were ever exercised and whether there might be sumps containing drilling wastes buried on site (TRC, Nov 2010).[59]

3.3.4 Legacy issues – groundwater contamination

In Taranaki, legacy issues are expected to persist, as oil and gas waste storage pits were/are often unlined or poorly lined and landfarms and MBC sites are often not operated to the required standards. E.g. The three pits at Oeo landfarm were only lined in 2012 and elevated levels of hydrocarbons in soil remain (TRC, Oct 2014a)[60]. Quarterly groundwater sampling was conducted from four monitoring bores. The results revealed **elevated salinity** in two of the bores and trace levels of hydrocarbons in one of the bores. There remained some difficulties with establishing pasture in isolated areas.

At the Waste Remediation Services' Symes Manawapou landfarm (formerly operated by Remediation NZ), "***a significant impact*" on the groundwater** down gradient of the storage pit was detected, indicated by "*a significant increase in **chloride** and **total dissolved solids** as well as trace Monocyclic Aromatics such as **benzene and toluene***" (TRC, Sep 2015c[61]).

> *"The mechanisms occurring during the landfarming process are various degrees of volatilization, dissolution into surface and ground water, sorption to the subsurface soils, and biodegradation. … Responsible landfarming remediation manages these mechanisms such that biodegradation is the dominant mechanism; volatization is minimized; contaminated surface waters are treated or re-circulated; and groundwater contamination is prevented through the use of lines,"* (Government of Canada, 2013) [62].

Groundwater contamination is extremely difficult to resolve (if possible at all), as in the case of the BTW Brown Road Landfarm:

> *"In respect of consent 7884-1, hydrocarbon concentrations for recent disposals had not yet attained the reductions that would be required at the time of ultimate surrender, but are expected to do so based on results from previous disposals. Further monitoring of the site will ensure that any consent limits potentially exceeded, are complied with prior to surrender.*
>
> *The monitoring in 2011-2012 showed that **effects of site activities were detected in the groundwater** in the immediate vicinity of the storage area. The Council's concerns over the extent of control of wastes while in storage meant that the Company's overall performance in the 2011-2012 year was rated as 'good' rather than 'high'. Upon further investigation, these effects were found to have reached the site boundary via pre-existing artificial drainage beneath the site. Overall adverse environmental effects were less than minor, given the lack of any groundwater use, but operational shortcomings were identified and*

*subsequently enforcement action was undertaken. There were **four Unauthorised Incidents** (UIs) recording non-compliance in respect of consent 7884-1 during 2012-2013. As a result, the Company was rated as demonstrating a poor performance in respect of consent 7884-1 for the 2012-2013 year, based on these failures in administrative compliance"* (TRC, July 2014)[63].

*"The monitoring showed that contaminant concentrations in the soil were generally low, but that **groundwater at the site remains partially impacted** by the previous period's activities"* (TRC, Feb 2015) [64].

Lessons should be gained from high profile cases such as the tar pit in a former gasworks site in South Dunedin which has recently been included in the top ten list of the country's most contaminated sites (Radio NZ, 27 Aug 2015)[65]. Clean up operations would be extremely costly and risky, often beyond the capability of local governments.

3.4 Disposal of offshore drilling wastes on land and in coastal waters

3.4.1 Disposal on land

Another issue that was no covered in the PCE June 2014 report concerns the disposal of offshore drilling wastes on land, primarily through landfarming, and in coastal waters.

CJT was involved heavily in the Shell Todd Oil Services (STOS)' marine consent application under the EEZ Act to drill another 22 wells and continue operation at the Maui gas field for 35 years (CJT website)[66]. STOS' response[67] to the Environmental Protection Authority (EPA)'s further request for information stated:

"The ROC [Retention on Cuttings] *target for this programme is 6.9% per section of well drilled with SBM. Drilling mud management, including monitoring of cuttings discharges and corrective actions in the event of an **exceedance to 6.9%**, will be the responsibility of M-I SWACO. ... Apart from the residual mud discharged on drilling cuttings, all SBM drilling mud will be collected at the end of the campaign and be **shipped onshore for disposal**."*

C Boyd Landfarm is one such onshore disposal site for offshore drilling wastes that don't meet the environmental criteria for dumping at sea. Together with the landowner, M-I SWACO manages the stockpiling and landfarming operations at this site. The Derby Road site has already received wastes from the OMV Maari oil field offshore of Taranaki (Figure 3).

CJT was also involved in the OMV Maari marine consent application[68] under the EEZ Act. During hearing, we were told by OMV that **SBM cuttings, produced water and completion fluids may all be taken ashore for disposal**:

> *"The SBM cuttings, our plan is we would have on average for that particular whole section of the reservoir where we are using SBM that our average oil and cuttings will be less than 4.9 percent that we would discharge overboard.* ***There will be a considerable volume of cuttings that are greater than 4.9 percent*** *and mostly they come from the centrifuges.*
>
> *Where we have got these fine particles going through the centrifuge we typically see* ***oil on cuttings there of about 12 to 13 percent*** *which we are currently seeing. They are by oil putting into a skip and they are* ***shipped to shore and disposed of*** *at a regulated site in New Plymouth. …*
>
> *An 8 and a half inch hole is roughly a quarter of a barrel per metre drilled, and in a day, a very good day, we can achieve 400 metres in a day. So you are looking at 100 barrels which is what,* ***16 cubic metres in a day****,"* Mr Barker, 30 Oct 2015[69]*.*

It appears that other than landfarms such as C Boyd's, vermicomposting operations notably the Remdiation NZ Uruti site, are also involved in offshore oil and gas waste disposal. An inspector at the Uruti site noted in September 2013:

> *"There were metal* ***offshore drill waste containers*** *stacked around truck wash where they had been cleaned out,"* (TRC, Oct 2014b) [70].

In addition to SBM cuttings, OMV may also discharge produced water and completion fluids (from the offshore Maari oil field) on land:

> *"The* ***produced water*** *may be discharged to sea under the discharge management plan provided it is less than 15 parts per million. That is the limit stipulated in the discharge management plan. The completion fluids tend to be a calcium chloride brine but again once you reach the completion phase of a well they will potentially have oil mingled with the completion fluids. …*
>
> *And* ***if the level is not at an acceptable range, if it is contaminated in some way, particularly with completion fluids****, then they will not be discharged to sea. They will actually be pumped into totes (ph 1.59) and* ***they will be sent back onshore and disposed of onshore****,"* Mr. Lawrie, 29 Oct 2015[71]*.*

It is not clear whether produced water and completion fluids unfit for dumping offshore will be disposed of on land by deep well injection, landfarming or mix-bury-cover.

Nevertheless, with the many offshore oil and gas permits and drilling programs planned in the EEZ, this issue of using farmlands to dispose of offshore drilling wastes needs to be examined closely.

3.4.2 Disposal in coastal marine areas

The discharge of drilling fluids, cuttings, produced water and other wastes in coastal waters and on the shallow seabed is a serious and complex issue which must be examined. While offshore sites beyond the 12 nm are regulated by EPA under the EEZ Act, waste discharge within coastal marine areas falls under the jurisdiction of regional councils. Here're a few examples of such discharge consents granted by the TRC in the last year:

R2/9847-1.0
NZOG Energy Ltd
PO Box 10725, Wellington 6143

Commencement Date: 31 Oct 2014
Expiry Date: 01 Nov 2017
Review Dates:
Activity Class: Discretionary

Location: Kaheru-1 wellsite, 12.2 km west/south-west of the Patea Rivermouth
Application Purpose: New
To deposit drilling fluids and cuttings on the seabed at the Kaheru-1 wellsite

R2/9847-1.1
NZOG Energy Ltd
PO Box 10725, Wellington 6143

Commencement Date: 24 Feb 2015
Expiry Date: 01 Jun 2017
Review Dates:
Activity Class: Discretionary

Location: Kaheru-1 wellsite, 12.2 km west/south-west of the Patea River Mouth
Application Purpose: Change
To deposit drilling fluids and cuttings on the seabed at the Kaheru-1 wellsite
Change to conditions to **exclude monitoring requirement for shellfish**

R2/1020-4.0
New Zealand Oil Services Ltd
PO Box 180, New Plymouth 4340

Commencement Date: 23 Apr 2015
Expiry Date: 01 Jun 2032
Review Dates: June 2020, June 2026
Activity Class: Discretionary

Location: 8-22 Ngamotu Road, New Plymouth
Application Purpose: Replace
To discharge stormwater and treated wastewater from a petroleum storage facility into the Coastal Marine Area of **Ngamotu Beach**

Consent 9847-1.0 allows NZOG to deposit water based mud with 100 ppm oil-in-water concentration on the seabed. The TRC officer's report on the change of consent condition to remove monitoring of metal and hydrocarbon contaminants in shellfish stated:

> *"The monthly sampling requires at least 30 individual mussels to obtain enough tissue for analysis therefore there is a high risk of depleting the number of large mussels at this*

particular site. As a result, the environmental effects of the changes are less than minor, and instead may have some beneficial impact on the mussel population in this location."

This kind of 'rationale' is totally illogical. How can a purported lack (or low number) of local mussels be used as justification for an otherwise unsupported assumption of 'less than minor' environmental effects of dumping drilling mud to the sea bed? This gives no confidence as to the scientific underpinning of monitoring programmes, and indicates little if any desire, or indeed competency, in the monitoring of environmental effects.

3.5 Discharge into air – Flaring and fugitive emissions of natural gas and other pollutants

3.5.1 Flaring

Although often described as a way of reducing greenhouse gas effects (compared to venting) and supposed to be very limited in duration, **the flaring of natural gas is often motivated by costs-benefits reasons and lasts for substantial periods of time**. While the illegal flaring at Tag Oil Cheal-A wellsite in Ngaere (near Stratford) for over ten months in 2012 caught media attention and imagination with descriptions like "*bowels of Mordor*" (Stuff Business, 22 Nov 2012)[72], most flaring are unnoticed other than by neighbours and nearby residents. An example:

"The Copper Moki wellsite was constructed in 2011. Four wells have been drilled from the site to date. The Copper Moki-1 well moved into full production in December 2011, followed by Copper Moki-2 in April 2012 and Copper Moki-3 in July 2012. Surface facilities were commissioned to accommodate well production of up to 1,000 barrels of oil per day. ***Oil was trucked to the New Plymouth tank farm and associated gas was flared****. A pipeline tie-in from Copper Moki to Waihapa Production Station was completed in mid-2012. Artificial lift pump jacks were installed on the three producing wells in October 2012 and additional surface facilities were commissioned during June 2013 to improve production efficiency."* (TRC, Sep 2013)[73]

In this case, flaring would have **continued for well over six months** because oil was more valuable than gas and a pipeline was not ready.

"A complaint was received regarding air pollution caused by continuous ***black smoke*** *being emitted during flaring. … concentrations of known pollutants at the boundary of the site were below guideline values and complied with all resource consent conditions."*

This is a common and an extremely wasteful and damaging practice in terms of economics, human and environmental health and climate change.

Tikorangi residents have been especially affected by oil and gas activities, notably smoky flares, noise and heavy traffic with trucks carrying hazardous chemicals, because of the **increasing density of wellsites and other infrastructures, and the associated activities that have been intensifying.** Complaints are often deemed "*unsubstantiated*" despite photographic documentation (TRC, March 2015[74]; Jury, 2015[75]; Figures 7 and 8).

Ingraffea et al. (2014)[76] has shown that unconventional gas wells are at far greater risk of casing impairment, leading to methane migration into the atmosphere and/or groundwater.

> *"… **well integrity problems** have occurred at Todd Energy's Mangahewa-C wellsite in Tikorangi where four of their eight wells were damaged, two of which will be plugged and redrilled to different directions. Todd Energy explained[x], "In late 2014 Todd had unexpected well activity at Mangahewa C site. This resulted in no production of gas. Attempted repair to the well in early 2015 was partially successful. Subsequently the well has returned to no production. As a result, we need to complete a more substantial repair. The repair requires plugging the bottom section of the well and re-drilling the bottom section using the Bentec rig. A second well at C site has a similar completion and this will be remediated at the same time to minimise future repairs and maintenance."* (Cheung, May 2015)[77]

Since the above communication, more drilling and fracking has resumed at various Mangahewa wellsites. More cases of well casing failure have also been documented elsewhere in Taranaki, although no attempt has been made to assess methane and other leakages resulting from such failures (CJT, May 2015)[78].

3.5.2 Invisible air pollutants and their health impacts

Not all air pollutants are visible to the naked eye. Using specialised infrared cameras, industry and regulators are able to detect leakages from oil and gas infrastructures.

> *"Methane and other pollutants, like benzene and toluene, that are released from oil and gas operations absorb infrared radiation at certain wavelengths on the electromagnetic spectrum. For use in oil and natural gas operations, the camera is specifically designed and calibrated to "see" those wavelengths."* (Jonathan Banks, 2015)[79]

Increasingly such cameras are being used by environmental groups and communities to document otherwise invisible air pollution from the oil and gas industry. Earthworks has produced almost 150 videos taken by citizens from seven US states that document **pollution from oil and gas infrastructures; not just from smoky flares, but from venting valves, compressor stations, storage tanks and pipes** (Lewis, 2015)[80]. In an Earthworks video, Dr Theo Colborn explained:

"What most people don't know is that when methane, natural gas, comes up out of the ground, it also comes out with a lot of what I call hitchhikers – very dangerous toxic chemicals".

McKenzie et al (2012)[81] conducted a detailed human health risk assessment of air emissions from unconventional gas development in Garfield Country, Colorado. Using US EPA guidance to estimate chronic and subchronic non-caner hazard indices and cancer risks from exposure to hydrocarbons, the researchers demonstrated:

*"**Residents living ≤½ mile** **[700 m]** **from wells are at greater risk** for health effects from NGD* [natural gas development] *than are residents living >½ mile from wells. Subchronic exposures to air pollutants during well completion activities present the greatest potential for health effects. The **subchronic non-cancer hazard** index (HI) of 5 for residents ≤½ mile from wells was driven primarily by exposure to trimethylbenzenes, xylenes, and aliphatic hydrocarbons. **Chronic HIs** were 1 and 0.4. for residents ≤½ mile from wells and >½ mile from wells, respectively. **Cumulative cancer risks** were 10 in a million and 6 in a million for residents living ≤½ mile and >½ mile from wells, respectively, with **benzene as the major contributor** to the risk".*

Many more health studies have been published since the above (CJT website[82]; PSE, 2015[83]), including McKenzie, et al. (2014)[84] who examined associations between maternal residential proximity to NGD and **birth outcomes** in a retrospective cohort study of 124,842 births between 1996 and 2009 in rural Colorado. The researchers observed:

*"an association between density and proximity of natural gas wells within a **10-mile radius** **[16 km]** of maternal residence and prevalence of CHDs* [congenital heart defects] *and possibly NTDs* [neural tube defects]".

3.5.3 Implications on Climate Change

The argument that **gas is cleaner and less damaging to climate than coal and therefore we must embrace gas and ditch coal is a spin promulgated by the fossil fuel industry** to keep itself prospering. Shell, Chevron, Exxon Mobil and BP recently declared:

"Natural gas as a core pillar for a sustainable future of the planet" (BBC, 9 June 2015)[85].

However:

"…if in the process of drilling, fracking, transporting by pipeline, compressing, processing, storing … some of it leaks into the atmosphere, that some had better be really small.

Otherwise we are not helping the situation at all by switching our vehicles or electricity from coal or oil to natural gas… " (Anthony Ingraffea, 2014[86] and Howarth, 2014[87])

In reality, **fugitive methane is largely unaccounted for** in oil and gas operations in New Zealand. In Taranaki, resource consents[88] for air emissions, whilst restricting the concentrations of carbon dioxide, carbon monoxide, nitrogen oxides and other particular contaminants emitted, do not place any limit on the total amount of natural gas flared or vented.

With the spread of fracking, in both new wells and workover procedures of old wells, across Taranaki and expected to take place in other regions, the quantification of fugitive methane emissions must be undertaken in order to fully understand the implications of oil and gas industry on climate change and human health.

In southwest Pennsylvania in 2012:

"Large emissions averaging 34 g CH_4/s per well were observed from seven well pads determined to be in the drilling phase, ***2 to 3 orders of magnitude greater than US Environmental Protection Agency estimates*** *for this operational phase. The emissions from these well pads, representing ~1% of the total number of wells, account for 4–30% of the observed regional flux. More work is needed to determine all of the sources of methane emissions from natural gas production, to ascertain why these emissions occur and to evaluate their climate and atmospheric chemistry impacts."* (Caulton, et al. 2014)[89]

Since September 2014, **North Dakota energy regulator began to impose new restrictions[90] on the flaring of natural gas from oil wells**, to reduce the amount of gas burn-offs and to support its gas-capture plans for all new drilling permits. The goal was to reduce the state's gas burn-off from 30% of the gas produced to 10% by 2020, thus minimising waste and conserving oil and gas resources.

In early 2015, the Obama administration announced plans to impose new regulations on the industry, including **reduction in methane emissions from oil and gas production** by up to 45 percent by 2025 from the levels of 2012 (New York Times, Jan 2015)[91]. By mid 2015, the president had announced the "*All-of-the-Above Energy Strategy*", with strong emphasis on renewable energies (The White House website[92]).

In our submissions to ECO and the Ministry for the Environment, we have made detailed arguments for moving away from fracking and natural gas to truly sustainable energy, agriculture and transport systems (CJT, 3 June 2015[93] and CJT, 20 June 2015[94]).

4. Lessons from overseas – Cumulative impacts

In 2014, the Council of Canadian Academies published a 266 paged document titled *Environmental Impacts of Shale Gas Extraction in Canada*[95] which stated:

> *"The primary concerns are the **degradation of the quality of groundwater and surface water (including the safe disposal of large volumes of wastewater)**; the risk of increased greenhouse gas (GHG) emissions (including fugitive methane emissions during and after production), thus exacerbating anthropogenic climate change; disruptive effects on communities and land; and adverse effects on human health. Other concerns include the local release of air contaminants and the potential for triggering small- to moderate-sized earthquakes in seismically active areas. These concerns will vary by region."*

In July (then Dec) 2014, the Concerned Health Professionals of New York published a *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking* (CHPNY, Dec 2014)[96]:

> *"As documented by the study citation database maintained by Physicians, Scientists and Engineers for Healthy Energy, three-fourths of the available studies on the impacts of shale gas development have been published within the past 24 months. The number of peer-reviewed publications doubled between 2011 and 2012 and then doubled again between 2012 and 2013. In the last year alone, 154 peer-reviewed studies on the impacts of fracking were released. Almost all of them reveal problems. …*
>
> *First, growing evidence shows that **regulations are simply not capable of preventing harm** …*
>
> *Second, **drinking water is at risk** from drilling and fracking activities and associated waste disposal practices…*
>
> *Third, drilling and fracking **emissions often contain strikingly high levels of benzene**…*
>
> *Fourth, **public health problems** associated with drilling and fracking are becoming increasingly apparent…*
>
> *Fifth, **natural gas is a bigger threat to the climate** than previously supposed."*

Indeed, for people living within an oil or gas field such as Tikorangi or Ngaere residents, their health, wellbeing and environment are undeniably compromised by such **cumulative impacts**.

It is of crucial importance that all government legislation, guidelines, regulatory and planning frameworks are designed with this in mind, and their implementation at all levels is conducted to the highest standard, transparently, and with communities and the environment as the priority.

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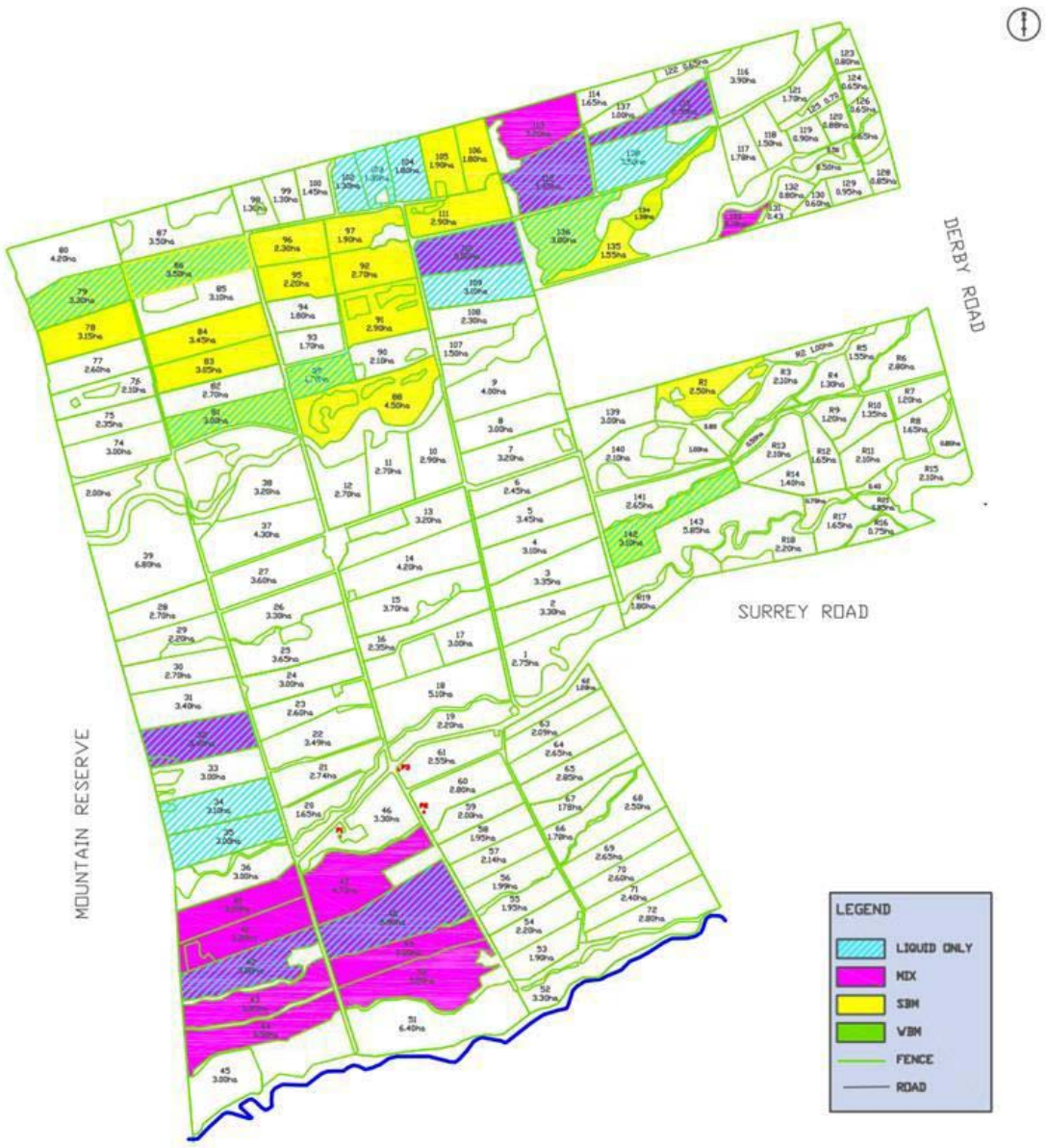
Figure 1. Aerial map of the extent of Colin Boyd's property and land spread areas as of 2012

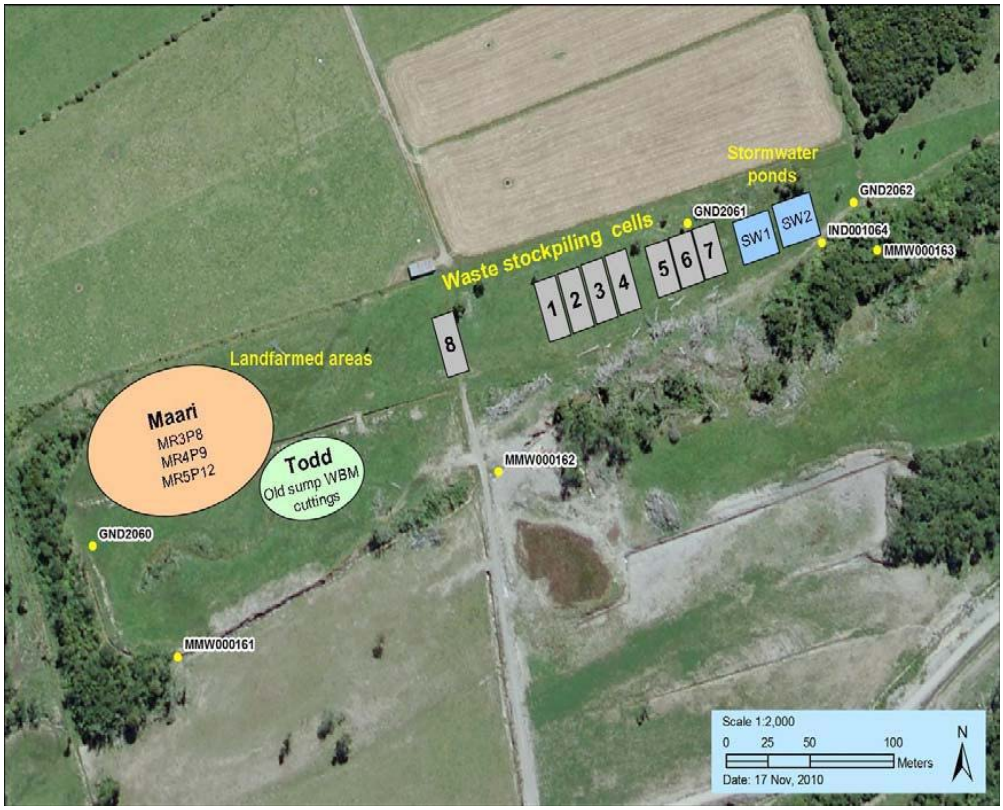


Source: Taranaki Regional Council, Nov 2014. C Boyd – Drilling Waste Disposal Monitoring Programme Biennial Report 2011-2013. Technical Report 2013 – Report No 63. http://www.trc.govt.nz/assets/Publications/technical-reports/oil-and-gas-compliance-monitoring-reports/1431016w2.pdf

Figure 2. Aerial map of Remediation NZ Uruti vermicomposting site

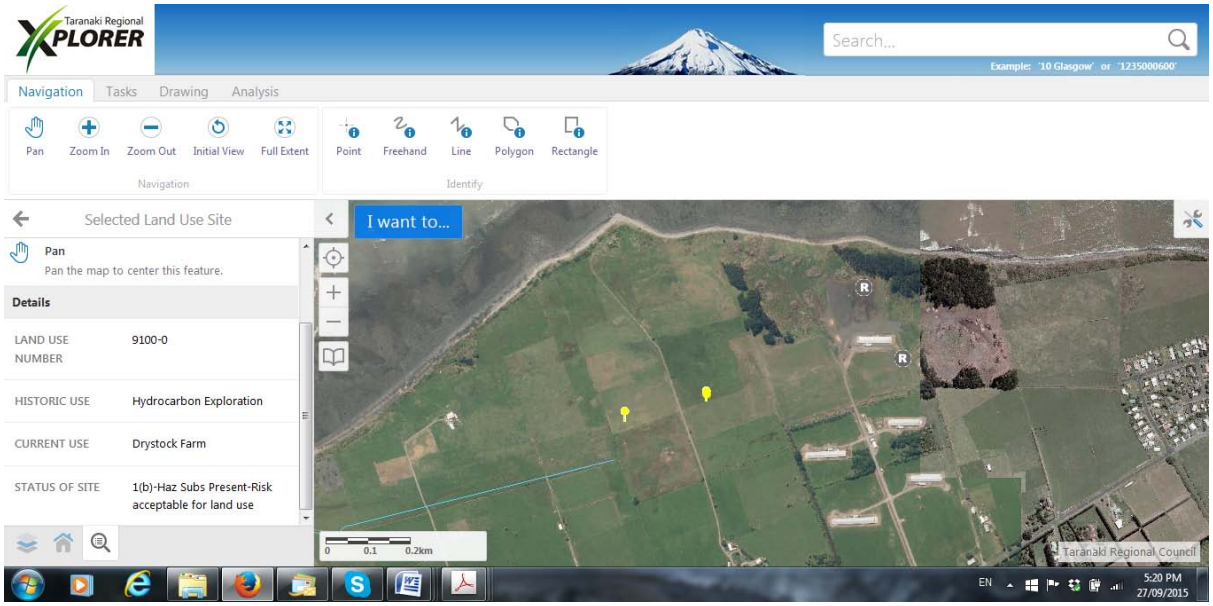
Source: Taranaki Regional Council, Oct 2014. *Remediation NZ Limited Monitoring Programme Annual Report 2013-2014. Technical Report 2014-53*. http://www.trc.govt.nz/assets/Publications/technical-reports/industry-compliance-monitoring-reports/1295396w2.pdf

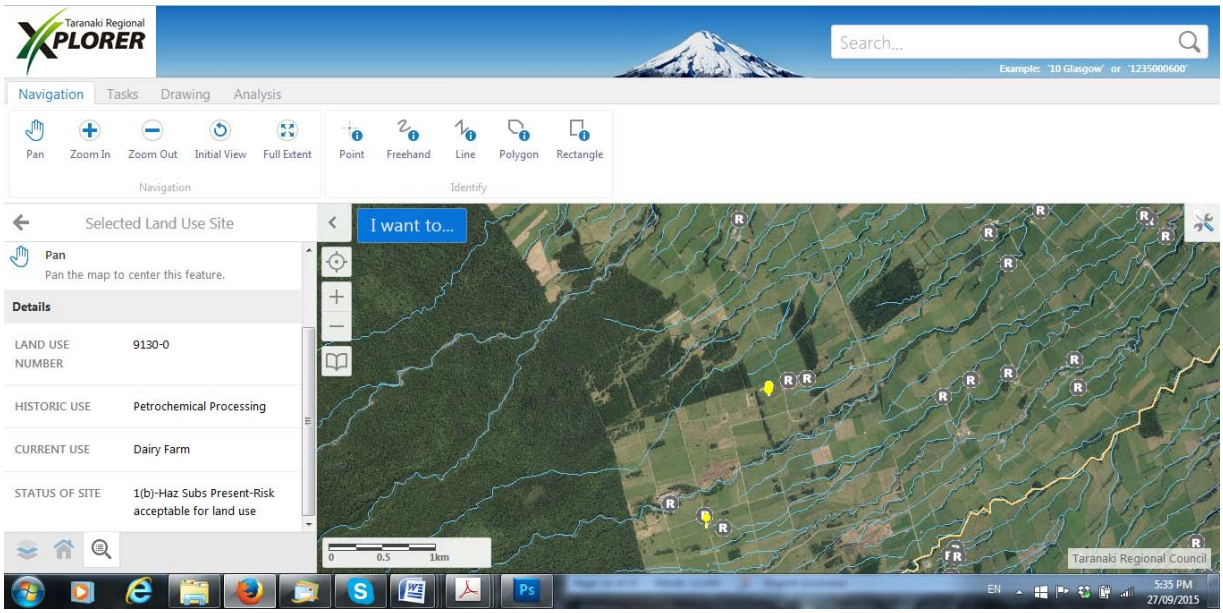
Figure 3. Aerial schematic of Derby Road North stockpiling facilities within C Boyd landfarm, showing locations of storage pits, cells and sampling sites



Source: Taranaki Regional Council, Nov 2014. C Boyd – Drilling Waste Disposal Monitoring Programme Biennial Report 2011-2013. Technical Report 2013 – Report No 63. http://www.trc.govt.nz/assets/Publications/technical-reports/oil-and-gas-compliance-monitoring-reports/1431016w2.pdf

Figure 4. Taranaki Regional Xplorer views on BTW landfarm (top), C Boyd landfarm (centre) and KA5/10 wellsite (bottom)





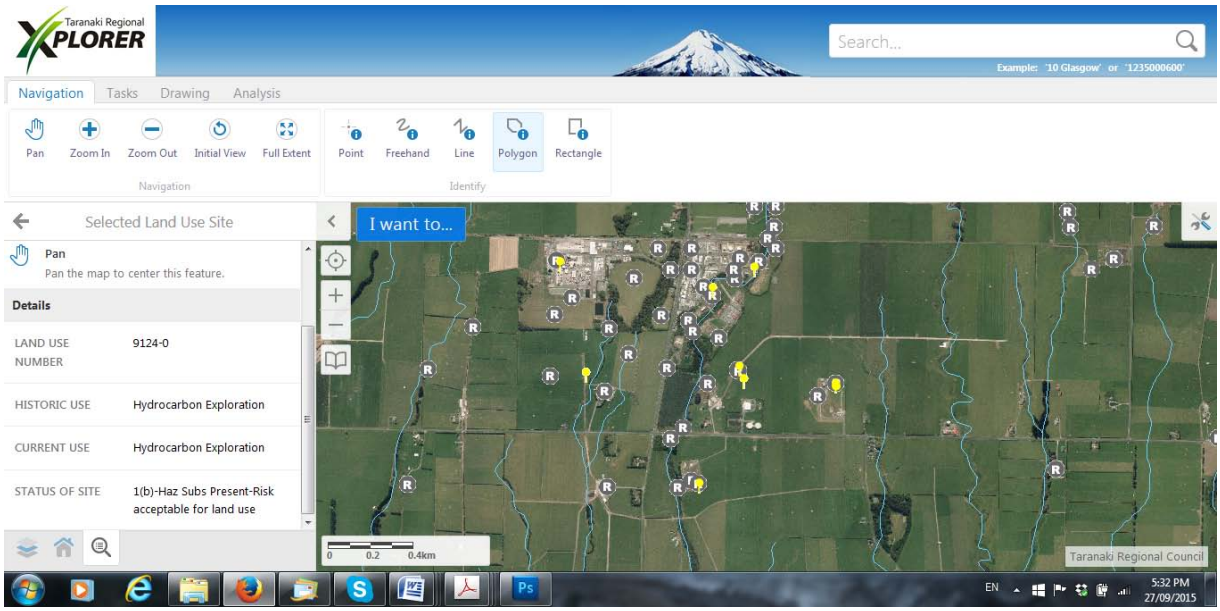


Figure 5. Pump Jacks at Copper Moki Wellsite

Source: Taranaki Regional Council, Nov 2014. Taranaki Ventures Limited Copper Moki Production Station Monitoring Programme Biennial Report 2012-2014. Technical Report 2014-65. http://www.trc.govt.nz/assets/Publications/technical-reports/oil-and-gas-compliance-monitoring-reports/1430570w2.pdf

Figure 6. Copper Moki wellsite during rainstorm

Photo by Sarah Roberts, 19 June 2015

Figure 7. Smoky flare at Todd Energy Mangahewa-D Wellsite on 18 June 2014, Tikorangi

Figure 8. Smoky flare at Todd Energy Mangahewa-E Wellsite on 29 December 2014, Tikorangi

Both photos by Fiona Clark

Appendix 1.

Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

SUMMARY TABLES

Update 7.0
September 2007

Table 1. Canadian Soil Quality Guidelines (mg·kg^{-1}).

Substance[y]	Year revised/ released[a]	Land Use and Soil Texture							
		Agricultural*		Residential/ parkland*		Commercial*		Industrial*	
		Coarse	Fine	Coarse	Fine	Coarse	Fine	Coarse	Fine
Arsenic (inorganic)	1997	12[b]		12[b]		12[b]		12[b]	
Barium	2003	750[c]		500[c]		2000[c]		2000[c]	
Benzene									
Surface[w]	2004	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]
Subsoil[w]	2004	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]
Surface[x]	2004	0.0095[t,u]	0.0068[t,u]	0.0095[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]
Subsoil[x]	2004	0.011[t,u]	0.0068[t,u]	0.011[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]	0.030[t,u]	0.0068[t,u]
Benzo*(a)*pyrene	1997	0.1[e]		0.7[f]		0.7[f]		0.7[f]	
Cadmium	1999	1.4[b]		10[g]		22[b]		22[b]	
Chromium									
Total chromium	1997	64[b]		64[b]		87[b]		87[b]	
Hexavalent chromium (VI)	1999	0.4[h]		0.4[h]		1.4[h]		1.4[h]	
Copper	1999	63[b]		63[b]		91[b]		91[b]	
Cyanide (free)	1997	0.9[b]		0.9[b]		8.0[b]		8.0[b]	
DDT (total)	1999	0.7[i]		0.7[i]		12[i, j]		12[i, j]	
Diisopropanolamine (DIPA)[z]	2006	180[b]		180[b]		180[b]		180[b]	
Ethylbenzene									
Surface	2004	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]
Subsoil	2004	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]	0.082[t]	0.018[t,u]
Ethylene glycol	1999	960[k]		960[k]		960[k]		960[k]	
Lead	1999	70[b]		140[b]		260[b]		600[b]	
Mercury (inorganic)	1999	6.6[b]		6.6[b]		24[b]		50[b]	
Naphthalene	1997	0.1[d]		0.6[h]		22[h]		22[h]	
Nickel	1999	50[l]		50[l]		50[l]		50[l]	
Nonylphenol (and its ethyloxylates)	2002	5.7[p]		5.7[p]		14[p]		14[p]	
Pentachlorophenol	1997	7.6[b]		7.6[b]		7.6[b]		7.6[b]	
Phenol	1997	3.8[b]		3.8[b]		3.8[b]		3.8[b]	
Polychlorinated biphenyls (PCBs)	1999	0.5[m]		1.3[l]		33[j,l]		33[j,l]	
Polychlorinated dibenzo-*p*-dioxins/ dibenzofurans (PCDD/Fs)	2002	4 ng TEQ·kg^{-1} [q]		4 ng TEQ·kg^{-1} [q]		4 ng TEQ·kg^{-1} [r]		4 ng TEQ·kg^{-1} [s]	
Propylene glycol	2006	Insufficient information[v]		Insufficient information[v]		Insufficient information[v]		Insufficient information[v]	
Selenium	2007	1[b]		1[b]		2.9[b]		2.9[b]	

Continued

Canadian Environmental Quality Guidelines
Canadian Council of Ministers of the Environment, 1999, updated 2001, 2002, 2004, 2006, and 2007

Appendix 1. … continued

Substance	Year revised/ released[a]	Land Use and Soil Texture							
		Agricultural*		Residential/ parkland*		Commercial*		Industrial*	
		Coarse	Fine	Coarse	Fine	Coarse	Fine	Coarse	Fine
Sulfolane[z]	2006	0.8[b]		0.8[b]		0.8[b]		0.8[b]	
Tetrachloroethylene	1997	0.1[e]		0.2[f]		0.5[f]		0.6[f]	
Thallium	1999	1[n]		1[o]		1[o]		1[o]	
Toluene									
Surface	2004	0.37[t]	0.08[t]	0.37[t]	0.08[t]	0.37[t]	0.08[t]	0.37[t]	0.08[t]
Subsoil	2004	0.37[t]	0.08[t]	0.37[t]	0.08[t]	0.37[t]	0.08[t]	0.37[t]	0.08[t]
Trichloroethylene	2006	0.01[b,u]		0.01[b,u]		0.01[b,u]		0.01[b,u]	
Uranium[z]	2007	23[t]		23[t]		33[t]		300[t]	
Vanadium	1997	130[l]		130[l]		130[i]		130[i]	
Xylenes									
Surface	2004	11[t]	2.4[t]	11[t]	2.4[t]	11[t]	2.4[t]	11[t]	2.4[t]
Subsoil	2004	11[t]	2.4[t]	11[t]	2.4[t]	11[t]	2.4[t]	11[t]	2.4[t]
Zinc	1999	200[l]		200[l]		360[l]		360[l]	

Notes: SQG_E = soil quality guideline for environmental health; SQG_{HH} = soil quality guideline for human health.

*For guidelines derived prior to 2004, differentiation between soil texture (coarse/fine) is not applicable.

[a]Guidelines released in 1997 were originally published in the working document entitled "Recommended Canadian Soil Quality Guidelines" (CCME 1997) and have been revised, edited, and reprinted here. Guidelines revised/released in 1999 are published here for the first time (see Table 2).

[b]Data are sufficient and adequate to calculate an SQG_{HH} and an SQG_E. Therefore the soil quality guideline is the lower of the two and represents a fully integrated *de novo* guideline for this land use, derived in accordance with the soil protocol (CCME 1996; 2006). The corresponding interim soil quality criterion (CCME 1991) is superseded by the soil quality guideline.

[c]Data are insufficient/inadequate to calculate an SQG_{HH}, a provisional SQG_{HH}, an SQG_E, or a provisional SQG_E. Therefore the interim soil quality criterion (CCME 1991) is retained as the soil quality guideline for this land use (see table 2).

[d]Data are sufficient and adequate to calculate only a provisional SQG_E. It is greater than the corresponding interim soil quality criterion (CCME 1991). Therefore, in consideration of receptors and/or pathways not examined, the interim soil quality criterion is retained as the soil quality guideline for this land use.

[e]Data are sufficient and adequate to calculate an SQG_{HH} and a provisional SQG_E. Both are greater than the corresponding interim soil quality criterion (CCME 1991). Therefore, in consideration of receptors and/or pathways not examined, the interim soil quality criterion is retained as the soil quality guideline for this land use.

[f]Data are sufficient and adequate to calculate an SQG_{HH} and a provisional SQG_E. Both are less than corresponding interim soil quality criterion (CCME 1991). Therefore the soil quality guideline supersedes the interim soil quality criterion for this land use.

[g]The soil–plant–human pathway was not considered in the guideline derivation. If produce gardens are present or planned, a site-specific objective must be derived to take into account the bioaccumulation potential (e.g., adopt the agricultural guideline as objective). The off-site migration check should be recalculated accordingly.

[h]Data are sufficient and adequate to calculate only a provisional SQG_E, which is less than the existing interim soil quality criterion (CCME 1991). Therefore the provisional soil quality guideline supersedes the interim soil quality criterion for this land use.

[i]Data are sufficient and adequate to calculate only an SQG_E. An interim soil quality criterion (CCME 1991) was not established for this land use, therefore the SQG_E becomes the soil quality guideline.

[j]In site-specific situations where the size and/or the location of commercial and industrial land uses may impact primary, secondary, or tertiary consumers, the soil and food ingestion guideline is recommended as the SQG_E.

[K]Data are sufficient and adequate to calculate only a provisional SQG_E.

[l]Data are sufficient and adequate to calculate only an SQG_E, which is less than the interim soil quality criterion (CCME 1991) for this land use. Therefore the SQG_E becomes the soil quality guideline, which supersedes the interim soil quality criterion for this land use.

[m]Data are sufficient and adequate to calculate only an SQG_E, which is greater than the interim soil quality criterion (CCME 1991) for this land use. Therefore the interim soil quality criterion (CCME 1991) is retained as the soil quality guideline for this land use.

[n]Data are sufficient and adequate to calculate a provisional SQG_{HH} and an SQG_E. The provisional SQG_{HH} is equal to the SQG_E and to the existing interim soil quality criterion (CCME 1991) and thus becomes the soil quality guideline, which supersedes the interim soil quality criterion for this land use.

Appendix 1. … continued

[o]Data are sufficient and adequate to calculate a provisional SQG_{HH} and an SQG_E. The provisional SQG_{HH} is less than the SQG_E and thus becomes the soil quality guideline for this land use.

[p]Data are sufficient and adequate to calculate only an SQG_E. An interim soil quality criterion (CCME 1991) was not established for these substances, therefore, the SQG_E becomes the soil quality guideline.

[q]Data are sufficient and adequate to calculate only a provisional SQG_{HH}, which is less than the existing interim soil quality criterion (CCME 1991). Thus the provisional SQG_{HH} becomes the soil quality guideline, which supersedes the interim soil quality criterion for this land use.

[r]Data are sufficient and adequate to calculate only a provisional SQG_{HH}. An interim soil quality criterion (CCME 1991) was not established for this land use, therefore the provisional SQG_{HH} becomes the soil quality guideline.

[s]Data are sufficient and adequate to calculate only an SQG_{HH}. An interim soil quality criterion (CCME 1991) was not established for this land use, therefore the SQG_{HH} becomes the soil quality guideline.

[t]Data are sufficient and adequate to calculate an SQG_{HH} and an SQG_E. Therefore the soil quality guideline is the lower of the two and represents a fully integrated *de novo* guideline for this land use.

[u]This guideline value may be less than the common limit of detection in some jurisdictions. Contact jurisdictions for guidance.

[v]Data are sufficient and adequate to calculate only a preliminary SQG_{FWAL} (Soil Quality Guideline for freshwater aquatic life). This value is 6,210 $mg \cdot kg^{-1}$. See accompanying factsheet for further information.

[w]10^{-5} Incremental Risk

[x]10^{-6} Incremental Risk

[y]Unless otherwise indicated, supporting documents are available from the National Guidelines and Standards Office, Environment Canada.

[z]Supporting documents are available from the Canadian Council of Ministers of the Environment at http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=125

References

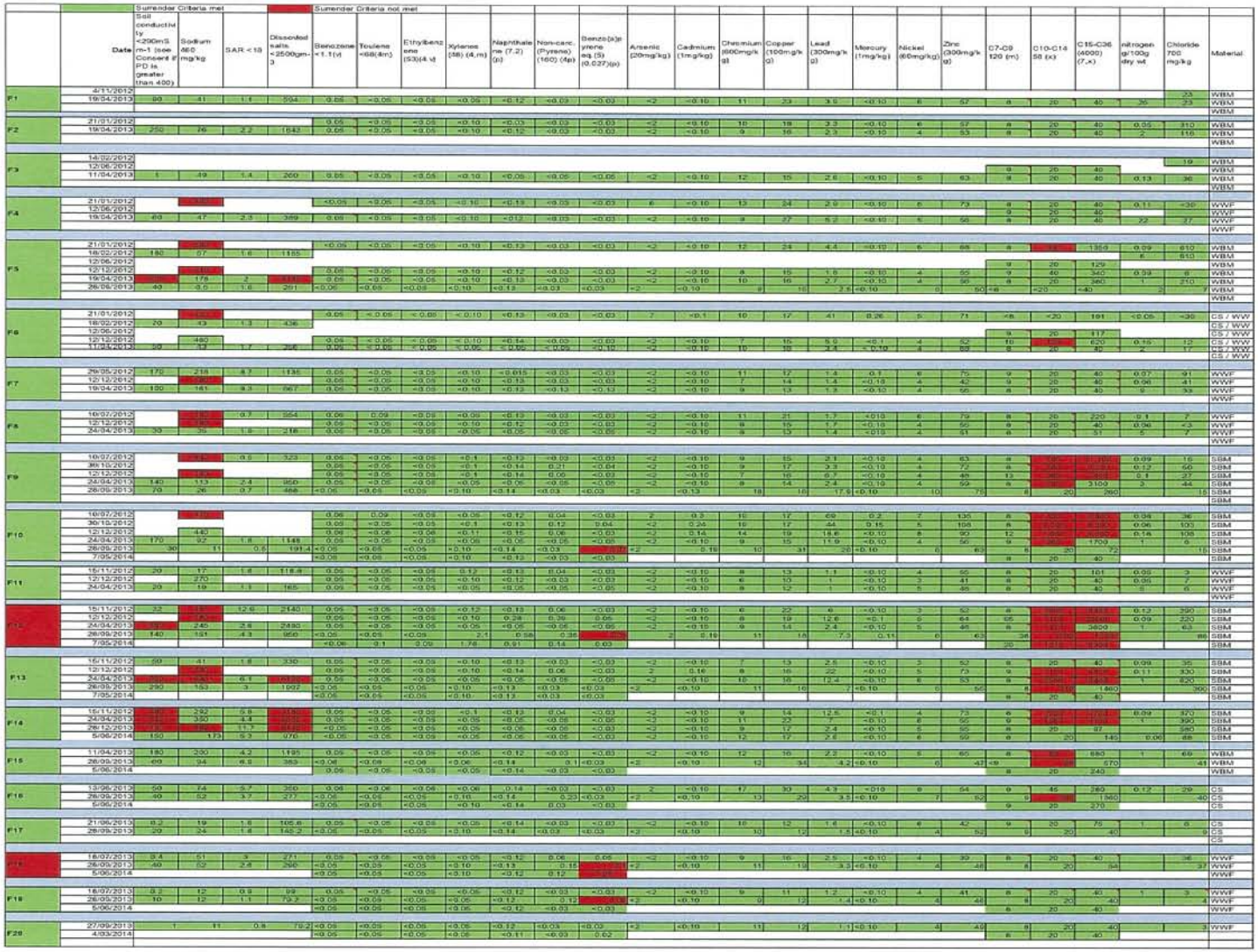
CCME (Canadian Council of Ministers of the Environment). 1991. Interim Canadian environmental quality criteria for contaminated sites. CCME, Winnipeg.

———. 1996. A protocol for the derivation of environmental and human health soil quality guidelines. CCME, Winnipeg. [A summary of the protocol appears in Canadian environmental quality guidelines, Chapter 7, Canadian Council of Ministers of the Environment, 1999, Winnipeg.]

———. 1997. Recommended Canadian soil quality guidelines. CCME, Winnipeg.

———. 2006. A protocol for the derivation of environmental and human health soil quality guidelines. CCME, Winnipeg. [The protocol is available online through the CCME website at http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=125]

Table 4.1: Monitoring results from Wellington Landfarm



Appendix 2. Monitoring results from Wellington Landfarm

Source: BTW, Aug 2014. *Wellington Land Farm Annual Report – Consent 7884*. In Taranaki Regional Council, Feb 2015. *BTW Company Ltd Brown-Road-Wellington Landfarm monitoring programme. 2013-2014. Technical Report 2014-66.* http://www.trc.govt.nz/assets/Publications/technical-reports/oil-and-gas-compliance-monitoring-reports/1413791w2.pdf

Appendix 3.

Table 5.11 Tier 1 Groundwater acceptance criteria (mg/L) [1]

Contaminant	Tier 1 Groundwater Acceptance Criteria			Aquatic ecosystem guidelines (ANZECC, 1992)
	Potable	Irrigation [2]	Stock water [2]	
MAHs				
Benzene	0.01	0.8	4	0.3
Toluene	0.8	39	8	0.3
Ethylbenzene	0.3	18	4	0.14
Xylenes	0.6	13	8	-
PAHs				
Naphthalene	-	0.8	0.16	-
Non-carc.(Pyrene)	-	2	1.2	-
Benzo(a)pyrene	0.0007	0.001	0.001	-
Total PAH	NAD [3]			0.003

NOTE:
1. Refer to Tables 5.9 and 5.10 for Tier 1 groundwater acceptance criteria based on volatilisation and impact on surface users of the site.
2. Values uncertain, based on cross media transfer estimates. Refer Sections 5.4 and 5.5.
3. NAD denotes Not Adequate Data (MoH, 1995)

Table 5.12 Tier 1 Groundwater acceptance criteria for TPH (mg/L) [1]

Contaminant	Tier 1 Groundwater Acceptance Criteria			Aquatic ecosystem guidelines (ANZECC, 1992)
	Potable	Irrigation [3]	Stock water [3]	
C_7 - C_9	18 [4]	> S [2]	> S [2]	-
C_{10} - C_{14}	> S [2]	> S [2]	> S [2]	-
C_{15} - C_{36}	> S [2]	> S [2]	> S [2]	-

NOTE:
1. Refer to Tables 5.9 and 5.10 for Tier 1 groundwater acceptance criteria based on volatilisation.
2. > S denotes calculated limit exceeds solubility limit given TPH criteria based on aliphatic component only. Separate consideration is given to the aromatic component.
3. Values uncertain, based on cross media transfer estimates.
4. Exceeds solubility limit for aliphatic components; aromatic components will be limited by criteria for BTEX compounds. Therefore, comparison of measured concentrations with criteria for BTEX, will also be protective against adverse effects associated with aliphatic component.

Source: Ministry for the Environment, 1999 (revised 2011). *Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Revised in 2011). Module 5: Tier 1 groundwater acceptance criteria*. http://www.mfe.govt.nz/sites/default/files/publications/hazards/oil-guide-jun99/module-5.pdf

Appendix 4. South Taranaki Proposed District Plan

Submission by Catherine Cheung, 27 Sept 2015

1. Scope of Submission

My submission concerns all aspects of petroleum activities and hazardous substances in the proposed district plan, and more specifically the following provisions: Rural Zone Rules 3. 2.2 on minimum setbacks; Hazardous Substances Rules 12.2.4 on discretionary activities and 12.3.2-12.3.3 on performance standards and 12.3.4 on natural hazards; and Energy Rule 13.1.1.

2. Submission

I oppose the specific provisions identified above because of these reasons:

a) The Rural Zone Rules **provision 3.2.2** permits petroleum exploration and production activities only 150m from homes, schools, hospitals, cafes and other sensitive activities, and hazardous facilities only 200m from the same sensitive activities. The same provision also permits sensitive activities just 300m from a Rural Industrial Zone (e.g. STOS Maui Oaonui Production Station, Ballance Agri-Nutrients Ammonia Urea Plant).

b) These **setback distances are far too small** to offer adequate protection to people's health and safety. For contrast, EPA West Australia stipulates a separation distance of 2000m between oil or gas extraction/production and sensitive land uses. Medical studies from USA have illustrated links between distances from well sites and the rates of cancer and birth defects far beyond 200m.

c) To protect local communities, this provision should be amended with much increased setback distances determined by science and thorough analyses.

d) In the Rural Zone, **petroleum activities and hazardous facilities should be Prohibited within the setback distances** and Discretionary beyond the setback.

e) The Hazardous Substances **Rule 12.2.4** permits the increase in use, storage and handling of hazardous substances by 20% in the Rural Industrial Zone. This is not acceptable where homes and other sensitive activities already exist within 200-300m from such hazardous facilities. All increase or expansion of hazardous facilities within the Rural Industrial Zone should be Discretionary.

f) **Provision 12.3.4** on natural hazards has removed the restriction (limited discretionary) on all developments within **100m of a geological fault line** stated in the 2004 operative district plan. This needs to be reinstated, and with a larger separation distance, given the increasing number of peer-reviewed scientific studies showing the links between increased earthquake events, deepwell injection and fracking.

g) **Provisions 12.3.2-12.3.3** do not stipulate a setback distance between Hazardous Facilities and **Significant Waterbodies, Regionally Significant Wetlands or Significant Natural Areas**, unless a Significant Waterbody is identified with natural hazards (12.3.4). These provisions should be amended to include an adequate setback distance for all significant waterbodies, wetlands and natural areas, whether or not they are prone to natural hazards.

h) Energy Rules **provision 13.1.1** classifies petroleum prospecting, including seismic exploration, as Permitted in the Rural Zone, and stipulates no performance standards or setback distance. Seismic surveys were exempted from the provisions following PEPANZ's feedback (section 32 Evaluation report on hazardous substances), as was the exclusion of oil and gas activities from the definition of Major Hazardous Facilities subject to Health and Safety Regulation. This is suggestive of regulatory capture.

3. I seek the following decision from the South Taranaki District Council:

Accept the Proposed Plan with the following amendments:

a) Address all the issues raised above in the previously listed provisions.

b) Include an in-depth section on **cumulative effects**, with additional provisions based on the precautionary principle, to address them. The plan in its current form does not adequately address cumulative effects. This is especially important in terms of the heightened risks on sensitive landuse as the number and range of hazardous facilities, oil/gas installations and number of wells within each wellsite increase over time. E.g. Provisions are needed to take into account the different risk levels from installations of different sizes and intensity of activities.

c) **Deepwell injection and fracking sites** are especially prone to cumulative effects, as underground pressure builds up and changes, causing unpredictable, potentially devastating outcomes, from earthquakes to groundwater contamination. Setback distances are also needed between hazardous facilities to address cumulative effects.

d) Introduce specific provisions on **landfarming, mix-bury-cover and other petroleum waste facilities**. At least two landfarms are located within Coastal Protection Area (Rural maps 14 and 10). These facilities should be prohibited from Coastal Protection Area and with adequate setback from Outstanding Natural Features / Landscapes and Significant Waterbodies and Wetlands.

e) It is good to see the range of **renewable energy** sources mentioned in section 2.9, notably policies 2.9.15 "*Recognise and provide for the potential for biogas and biomass energy and electricity generation*…" (Especially from organic wastes) and 2.9.16 "*Recognise and provide for the benefits of small or community-scale renewable electricity generation activities*…" These could be more explicit and elaborated in the Energy Rules (section 13), especially energy and electricity generation from farm wastes.

f) Council also pointed out the impacts of **climate change and associated sea level rise**, coastal erosion and storm surges in section 2.19. The removal of the entire section 12 on **Natural Hazards** in the 2004 district plan from the proposed plan appears at odds with its policy. This section needs to be reinstated and expanded to take into account the full implications of climate change and associated hazards, for the protection of people, sensitive activities and essential utilities, and to facilitate adaptation.

4. I wish to be heard in support of my submission.

5. I could not gain an advantage in trade competition through this submission.

Appendix 5. Non-exhaustive List of Taranaki Regional Council (TRC) Consents issued for Discharge of Oil and Gas Wastes into Water from Jan 2014 to 20 August 2015

Excerpts from TRC website: http://www.trc.govt.nz/resource-consents-issued/

R2/4067-2.1 Commencement Date: 15 Jan 2014
Greymouth Petroleum Acquisition Company Limited
Expiry Date: 01 Jun 2015
PO Box 3394, NEW PLYMOUTH 4341 **Review Dates:**
Location: Ngatoro-E wellsite, 615 Dudley Road, Inglewood
Activity Class: Discretionary
To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-E wellsite onto land and into the Ngatoroiti Stream

Non-notified authorisations issued between 24 Jan 2014 and 06 Mar 2014

R2/9674-1.1 Commencement Date: 13 Feb 2014
Greymouth Petroleum Limited **Expiry Date:** 01 Jun 2027
PO Box 3394, NEW PLYMOUTH 4341 **Review Dates:** June 2015, June 2021
Activity Class: Discretionary
Location: Turangi Production Station, Turangi Road, Motunui
Application Purpose: Change
To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Turangi Production Station, onto land where it may enter an unnamed tributary of the Parahaki Stream

R2/6403-1.2 Commencement Date: 07 Feb 2014
Cheal Petroleum Limited **Expiry Date:** 01 Jun 2023
PO Box 402, NEW PLYMOUTH 4340 **Review Dates:** June 2017
Activity Class: Discretionary
Location: Cheal-C wellsite, Brookes Road, Stratford
Application Purpose: Change
To discharge treated stormwater, treated produced water and treated wastewater at the Cheal-C wellsite onto and into land in the vicinity of an unnamed tributary of the Mangawharawhara Stream in the Waingongoro catchment

Non-notified authorisations issued between 07 Mar 2014 and 23 Apr 2014

R2/1334-3.2 Commencement Date: 08 Apr 2014
Greymouth Petroleum Acquisition Company Limited
Expiry Date: 01 Jun 2020
PO Box 3394, NEW PLYMOUTH 4341 **Review Dates:** June 2014
Activity Class: Discretionary
Location: Kaimiro Production Station, Upland Road, Inglewood
Application Purpose: Change
To discharge treated stormwater from the Kaimiro Production Station site into an unnamed tributary of the Mangaoraka Stream in the Waiongana catchment

Non-notified authorisations between 30 May 2014 and 10 Jul 2014

R2/4820-2.0
Greymouth Petroleum Acquisition Company Limited
PO Box 3394, NEW PLYMOUTH 4341

Commencement Date: 13 Jun 2014
Expiry Date: 01 Jun 2032

Review Dates: June 2020, June 2026
Activity Class: Discretionary

Location: Kaimiro-K wellsite, 441 Junction Road, Inglewood (Property owner: J & Y Drinkwater)
To discharge treated stormwater and treated produced water from hydrocarbon exploration and production operations at the Kaimiro-K wellsite, into an unnamed tributary of the Manganaeia Stream

R2/9453-1.2
Todd Energy Limited

Commencement Date: 19 Jun 2014
Expiry Date: 01 Jun 2027

PO Box 802, NEW PLYMOUTH 4340 **Review Dates:** June 2015, June 2021
Activity Class: Discretionary
Location: Mangahewa-E wellsite, Tikorangi Road East, Waitara (Property owner: KA & LE Sarten)
Change to consent conditions to stormwater discharge location to reflect land and water as receiving environment
To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Mangahewa-E wellsite, onto land and into an unnamed tributary of the Waiau Stream

R2/9941-1.0 **Commencement Date:** 24 Jun 2014
TAG Oil (NZ) Limited **Expiry Date:** 01 Jun 2019
PO Box 402, New Plymouth 4340 **Review Dates: Activity Class:** Controlled
Location: Sidewinder-B wellsite, 35 Norfolk Road Upper, Norfolk (Property owner: KA & JM Wisnewski)

To discharge stormwater and sediment, deriving from soil disturbance undertaken for the purpose of constructing the Sidewinder-B wellsite, onto land and into the Maketehinu Stream

R2/9939-1.0 **Commencement Date:** 27 Jun 2014
TAG Oil (NZ) Limited **Expiry Date:** 01 Jun 2033
PO Box 402, New Plymouth 4340 **Review Dates:** June 2021, June 2027
Activity Class: Discretionary
Location: Sidewinder-B wellsite, 35 Norfolk Road Upper, Norfolk (Property owner: KA & JM Wisnewski)
To discharge treated stormwater from hydrocarbon exploration and production operations at the Sidewinder-B wellsite, onto land and into the Maketehinu Stream

Non-notified authorisations between 11 Jul 2014 and 21 Aug 2014

R2/9868-1.1 **Commencement Date:** 01 Aug 2014
Greymouth Facilities Limited **Expiry Date:** 01 Jun 2032
PO Box 3394, Fitzroy, New Plymouth 4341 **Review Dates:** June 2017, June 2020, June 2023, June 2026, June 2029
Activity Class: Discretionary
Location: 58 Corbett Road, Bell Block **Application Purpose:** Change
Change to conditions to use an interceptor instead of skimmer pits for treatment
To discharge untreated stormwater from a yard used for storage and maintenance of hydrocarbon exploration drilling equipment directly onto and into land, and to discharge treated stormwater into the Waitaha Stream via the New Plymouth District Council reticulated stormwater system, from an interceptor

R2/4812-2.1 **Commencement Date:** 05 Aug 2014
Tasman Oil Tools Limited **Expiry Date:** 01 Jun 2020
PO Box 3140, NEW PLYMOUTH 4312 **Review Dates:**
Activity Class: Discretionary
Location: 13 De Havilland Drive, Bell Block **Application Purpose:** Review
Review of conditions to ensure the conditions are adequate to deal with adverse effects on the environment
To discharge up to 112 litres/second of stormwater including washdown water from a storage and maintenance yard for oil field drilling equipment into an unnamed tributary of the Mangati Stream

R2/7934-1.2 **Commencement Date:** 05 Aug 2014
Greymouth Petroleum Limited **Expiry Date:** 01 Jun 2027
PO Box 3394, New Plymouth 4341 **Review Dates:** June 2015, June 2021
Activity Class: Discretionary
Location: Ngatoro-G wellsite, Bedford Road, Inglewood (Property owner: RJ & GW Moffitt)
Application Purpose: Change
Change to consent conditions to:
• increase the catchment area contributing to the stormwater discharge;
• change the discharge point; and
• change the chloride concentration standard

To discharge treated stormwater and produced water onto land and into an unnamed tributary of the Ngatoronui Stream from hydrocarbon exploration and production operations at the Ngatoro-G wellsite

R2/7595-1.3
TAG Oil (NZ) Limited
PO Box 402, New Plymouth 4340

Commencement Date: 05 Aug 2014
Expiry Date: 01 Jun 2027
Review Dates: June 2015, June 2021
Activity Class: Discretionary

Location: Sidewinder wellsite, 323 Upper Durham Road, Inglewood
Application Purpose: Change
Change to conditions to reflect the proposal to discharge directly to water
To discharge treated stormwater and production water from hydrocarbon exploration and production operations at the Sidewinder wellsite into the Piakau Stream

Non-notified authorisations between 22 Aug 2014 and 02 Oct 2014

R2/6342-1.3
Commencement Date: 26 Aug 2014
Origin Energy Resources NZ (Rimu) Limited, Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi-H wellsite, Lower Ball Road, Kakaramea (Property owners: RJ Dwyer)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions, and change of purpose
To discharge treated stormwater from hydrocarbon exploration and production operations at the Manutahi -H wellsite, onto land where it may enter the Mangaroa Stream and Lake Kaikoura

R2/6330-1.3
Commencement Date: 28 Aug 2014
Origin Energy Resources NZ (Rimu) Limited
Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi-F wellsite, 124 Lower Ball Road, Kakaramea (Property owner: Waiwira Holdings Limited)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions, and change of Purpose
To discharge treated stormwater from hydrocarbon exploration and production operations at the Manutahi-F wellsite, onto land where it may enter the Mangaroa Stream and Lake Kaikoura

R2/6325-1.3
Commencement Date: 28 Aug 2014
Origin Energy Resources NZ (Rimu) Limited
Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi -E wellsite, 124 Lower Ball Road, Kakaramea (Property owner: Waiwira Holdings Limited)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions
To discharge stormwater and sediment from earthworks during construction of the Manutahi-E wellsite onto and into land in the vicinity of the Mangaroa Stream and Lake Kaikoura

R2/6324-1.3
Commencement Date: 28 Aug 2014
Origin Energy Resources NZ (Rimu) Limited, Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi-E wellsite, 124 Lower Ball Road, Kakaramea
(Property owner: Waiwira Holdings Limited)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions, and change of purpose

To discharge treated stormwater from hydrocarbon exploration and production operations at the Manutahi-E wellsite, onto land

R2/6331-1.3
Commencement Date: 28 Aug 2014
Origin Energy Resources NZ (Rimu) Limited, Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi-F wellsite, 124 Lower Ball Road, Kakaramea (Property owner: Waiwira Holdings Limited)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions
To discharge stormwater and sediment from earthworks during construction of the Manutahi-F wellsite onto and into land in the vicinity of the Mangaroa Stream and Lake Kaikoura

R2/6343-1.3
Commencement Date: 28 Aug 2014
Origin Energy Resources NZ (Rimu) Limited, Sustainability Manager, Private Bag 2022, New Plymouth 4342
Expiry Date: 01 Jun 2022
Review Dates: June 2016
Activity Class: Discretionary
Location: Manutahi-H wellsite, 74 Lower Ball Road, Kakaramea
(Property owners: RJ Dwyer)
Application Purpose: Change
Change of conditions to reflect updated and standardised conditions
To discharge stormwater and sediment from earthworks during construction of the Manutahi-H wellsite onto and into land in the vicinity of an unnamed tributary of the Mangaroa Stream

R2/9966-1.0
Commencement Date: 01 Sep 2014
Greymouth Petroleum Limited, PO Box 3394, New Plymouth 4341
Expiry Date: 01 Jun 2028
Review Dates: June 2016, June 2022
Activity Class: Discretionary
Location: Radnor-B wellsite, 15 Radnor Road, Midhirst (Property owner: AB & LH Crofskey)
Application Purpose: New
To discharge treated stormwater from hydrocarbon exploration and production operations at the Radnor-B wellsite through a roadside drain into an unnamed tributary of the Piakau Stream

Non-notified authorisations between 03 Oct 2014 and 13 Nov 2014

R2/9991-1.0 **Commencement Date:** 03 Oct 2014
Greymouth Petroleum Limited **Expiry Date:** 01 Jun 2019
PO Box 3394, New Plymouth 4341 **Review Dates:**
Activity Class: Controlled
Location: Turangi-D wellsite, 180 Waiau Road, Urenui (Property owner: J Topless & K Topless)
Application Purpose: New
To discharge stormwater and sediment, deriving from soil disturbance undertaken for the purpose of constructing the Turangi-D wellsite, onto land and into an unnamed tributary of the Waiau Stream

R2/9989-1.0 **Commencement Date:** 16 Oct 2014
Greymouth Petroleum Limited **Expiry Date:** 01 Jun 2033
PO Box 3394, New Plymouth 4341 **Review Dates:** June 2021, June 2027
Activity Class: Discretionary
Location: Turangi-D wellsite, 180 Waiau Road, Urenui (Property owner: J Topless & K Topless)
Application Purpose: New
To discharge treated stormwater from hydrocarbon exploration and production operations at the Turangi-D wellsite, onto land and into an unnamed tributary of the Waiau Stream

R2/9961-1.0 **Commencement Date:** 24 Oct 2014
Todd Energy Limited **Expiry Date:** 01 Jun 2019
PO Box 802, New Plymouth 4340 **Review Dates:**
Activity Class: Discretionary
Location: 1334 Otaraoa Road, Tikorangi (Property owner: DG Jupp)

Application Purpose: New
To discharge stormwater and sediment from earthworks during construction of the Mangahewa Expansion Compression Project into an unnamed tributary of the Mangahewa Stream

R2/10003-1.0 **Commencement Date:** 04 Nov 2014
BP Oil New Zealand Limited **Expiry Date:** 01 Jun 2019
PO Box 99873, Auckland 1149 **Review Dates:**
Activity Class: Discretionary
Location: 71 Powderham Street, New Plymouth
Application Purpose: New
To discharge treated water from dewatering activities, associated with the placement of an underground petroleum storage tank, into the Huatoki Stream, via the New Plymouth District Council stormwater network

Non-notified authorisations issued between 14 Nov 2014 and 22 Jan 2015

R2/5997-1.2 **Commencement Date:** 20 Nov 2014
Shell Exploration NZ Limited **Expiry Date:** 01 Jun 2033
Shell (Petroleum Mining) Co Ltd, Pohokura Operations, Private Bag 2035, New Plymouth 4342
Review Dates: June 2015, June 2021, June 2027
Activity Class: Discretionary
Location: Pohokura Production Station, Lower Otaraoa Road, Motunui, Waitara
Application Purpose: Change
To discharge treated stormwater from an Onshore Production Station to an existing stormwater control system, being a body of water commonly known as 'The Duck Pond' within the Manu Stream catchment

R2/6269-1.1 **Commencement Date:** 20 Nov 2014
Shell Exploration NZ Limited **Expiry Date:** 01 Jun 2033
Shell (Petroleum Mining) Co Ltd, Pohokura Operations, Private Bag 2035, New Plymouth 4342
Review Dates: June 2015, June 2021, June 2027
Activity Class: Discretionary
Location: Lower Otaraoa Road wellsite, Lower Otaraoa Road, Motunui, Waitara
Application Purpose: Change
To discharge treated stormwater from hydrocarbon exploration and production operations at the Lower Otaraoa Road Wellsite to an existing stormwater control system, being a body of water commonly known as 'The Duck Pond' within the Manu Stream

R2/9335-1.3 C **Commencement Date:** 21 Nov 2014
Todd Energy Limited **Expiry Date:** 01 Jun 2027
PO Box 802, Taranaki Mail Centre, New Plymouth 4340
Review Dates: June 2015, June 2021
Activity Class: Discretionary
Location: Mangahewa-D wellsite, Rimutauteka Road, Inglewood (Property owner: KV & SJ Collins)
Application Purpose: Change
To discharge stormwater from skimmer pits at the Mangahewa-D wellsite onto and into land and into an unnamed tributary of the Manganui River

R2/10024-1.0 **Commencement Date:** 05 Dec 2014
Todd Energy Limited **Expiry Date:** 01 Jun 2019
PO Box 802, Taranaki Mail Centre, New Plymouth 4340
Review Dates:
Activity Class: Controlled
Location: Mangahewa-G wellsite, Otaraoa Road, Tikorangi (Property owner: FD & KS Wyatt)
Application Purpose: New
To discharge stormwater and sediment, deriving from soil disturbance undertaken for the purpose of constructing the Mangahewa-G wellsite, onto land where it may enter an unnamed tributary of the Mangahewa Stream

R2/9961-1.1 **Commencement Date:** 17 Dec 2014
Todd Energy Limited **Expiry Date:** 01 Jun 2019
PO Box 802, New Plymouth 4340 **Review Dates:**
Activity Class: Discretionary
Location: 1334 Otaraoa Road, Tikorangi (Property owner: DG Jupp)
Application Purpose: Change
To discharge stormwater and sediment from earthworks during construction of the Mangahewa Expansion Compression Project into an unnamed tributary of the Mangahewa Stream

R2/10022-1.0 **Commencement Date:** 08 Jan 2015
Todd Energy Limited **Expiry Date:** 01 Jun 2033
PO Box 802, Taranaki Mail Centre, New Plymouth 4340
Review Dates: June 2021, June 2027
Activity Class: Controlled
Location: Mangahewa-G wellsite, Otaraoa Road, Tikorangi
(Property owner: FD & KS Wyatt)
Application Purpose: New
To discharge treated stormwater from hydrocarbon exploration and production operations at the Mangahewa-G wellsite, into an unnamed tributary of the Mangahewa Stream

Consents Issued between 23 Jan 2015 and 05 Mar 2015

R2/10051-1.0 **Commencement Date:** 28 Jan 2015
Todd Energy Limited **Expiry Date:** 01 Jun 2020
PO Box 802, Taranaki Mail Centre, New Plymouth 4340
Review Dates:
Activity Class: Controlled
Location: Between the Waitara River and McKee Production Station
Application Purpose: New
To discharge stormwater and sediment from earthworks associated with the construction and installation of a multiphase pipeline conveying hydrocarbons between the Waitara River and the McKee Production Station, onto and into land in circumstances where it may enter surface water

R2/10081-1.0 **Commencement Date:** 26 Feb 2015
TAG Oil (NZ) Limited **Expiry Date:** 01 Jun 2020
PO Box 402, New Plymouth 4340 **Review Dates:**
Activity Class: Controlled
Location: Cheal-E to Cheal-A pipeline, Cheal Road, Ngaere
Application Purpose: New
To discharge stormwater and sediment from earthworks associated with the construction and installation of a pipeline for conveying hydrocarbons between the Cheal-E wellsite and Cheal-A wellsite, onto and into land in circumstances where it may enter surface water

R2/10050-1.0 **Commencement Date:** 05 Mar 2015
Todd Energy Limited **Expiry Date:** 01 Jun 2020
PO Box 802, Taranaki Mail Centre, New Plymouth 4340
Review Dates:
Activity Class: Controlled
Location: Between Mangahewa-D wellsite and the Waitara River
Application Purpose: New
To discharge stormwater and sediment from earthworks during construction of the Mangahewa-D to McKee Production Station multiphase pipeline, between the Mangahewa-D wellsite and the Waitara River, onto and into land in circumstances where it may enter surface water

Consents issued between 06 Mar 2015 and 16 Apr 2015

R2/10063-1.0 **Commencement Date:** 09 Mar 2015
Remediation New Zealand **Expiry Date:** 01 Jun 2033
107 Corbett Road, Bell Block 4373 **Review Dates:** June 2021, June 2027
Activity Class: Discretionary
Location: 1460 Mokau Road, Uruti **Application Purpose:** New
To discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream

R2/4070-3.0 **Commencement Date:** 11 Mar 2015
Greymouth Petroleum Acquisition Company Limited
Expiry Date: 01 Jun 2032
PO Box 3394, New Plymouth 4341 **Review Dates:** June 2020, June 2026
Activity Class: Discretionary

Location: Ngatoro-D wellsite, 246 Dudley Road North, Inglewood (Property owner: J & SP Van Burgsteden)
Application Purpose: Replace
To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-D wellsite, onto land where it may enter an unnamed tributary of the Waionganaiti Stream

Consents issued between 17 Apr 2015 and 28 May 2015

R2/5046-2.1 **Commencement Date:** 19 May 2015
Contact Energy Limited **Expiry Date:** 01 Jun 2033
PO Box 10742, Wellington 6143 **Review Dates:** June 2021, June 2027
Activity Class: Discretionary
Location: Piakau-A wellsite, Stanley Road, Wharehuia (Property owner: N & C Walsh)
Application Purpose: Replace
To discharge treated stormwater and treated wellsite water from hydrocarbon exploration and production operations at the Piakau-A wellsite into an unnamed tributary of the Makara Stream

Consents issued between 29 May 2015 and 09 Jul 2015

R2/10118-1.0 **Commencement Date:** 10 Jun 2015
Roma Petroleum Limited **Expiry Date:** 01 Jun 2017
18 Wairau Road, Oakura 4314 **Review Dates:**
Activity Class: Discretionary
Location: 7 Breakwater Road, Moturoa
Application Purpose: New
To discharge treated water from dewatering activities, associated with the placement of an underground petroleum storage tank, onto and into land in circumstances where it may enter water, via the New Plymouth District Council stormwater network

R2/3668-2.3 **Commencement Date:** 24 Jun 2015
Todd Energy Limited **Expiry Date:** 01 Jun 2033
PO Box 802, New Plymouth 4340 **Review Dates:** Jun 2015, Jun 2021, Jun 2027
Activity Class: Discretionary
Location: McKee-C wellsite, 1334 Otaraoa Road, Tikorangi
Application Purpose: Change
To discharge treated stormwater, uncontaminated treated site water and uncontaminated treated production water from hydrocarbon exploration and production operations and electricity generation operations and associated activities at the McKee-C wellsite and the Mangahewa Expansion Compression facility onto and into land and into an unnamed tributaries of the Mangahewa Stream
Change of consent conditions to include reference to the Mangahewa Expansion Compression (MEC) facility

Non-notified authorisations issued between 10 Jul 2015 and 20 Aug 2015

R2/4015-3.0 Commencement Date: 14 Jul 2015
Greymouth Petroleum Acquisition Company Limited
Expiry Date: 01 Jun 2033
PO Box 3394, New Plymouth 4341 **Review Dates:** June 2021, June 2027
Activity Class: Discretionary
Location: Ngatoro-C wellsite, 260 Dudley Road, Inglewood (Property owner: J Eden, B Giddy & K Sole)
Application Purpose: Replace
To discharge treated stormwater from hydrocarbon exploration and production operations at the Ngatoro-C wellsite, into an unnamed tributary of the Kurapete Stream

R2/9453-1.3 Commencement Date: 18 Aug 2015
Todd Energy Limited **Expiry Date:** 01 Jun 2027
PO Box 802, New Plymouth 4340 **Review Dates:** June 2021
Activity Class: Discretionary
Location: Mangahewa-E wellsite, Tikorangi Road East, Waitara (Property owner: KA & LE Sarten)
Application Purpose: Change
To discharge treated stormwater and produced water from hydrocarbon exploration and production operations at the Mangahewa-E wellsite, onto land and into an unnamed tributary of the Waiau Stream

Change of conditions to allow for an increase in chloride concentration in the discharge of 230 g/m^3

R2/5838-2.2 Commencement Date: 20 Aug 2015
Remediation (NZ) Limited **Expiry Date:** 01 Jun 2018
PO Box 8045, New Plymouth 4342 **Review Dates:** June 2016, June 2017
Activity Class: Discretionary
Location: 1450 Mokau Road, Uruti **Application Purpose:** Change
To discharge:
a) waste material to land for composting; and
b) treated stormwater and leachate from composting operations;
onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream. Change of consent conditions to permit irrigation to two new areas