

Origin Energy Resources NZ Limited
Drilling Waste Landfarms
Monitoring Programmes
2013-2014
Annual Report
Technical Report 14-63

ISSN: 0114-8184 (Print)
ISSN:1178-1467 (Online)
Document: 1430614 (Word)
Document: 1421730 (Pdf)

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November 2014

Executive summary

Origin Energy Resources NZ Limited (Origin Energy) took over the three drilling waste landfarming sites of Swift Energy NZ Ltd in 2008. The sites are located on Geary Road at Manutahi, in the Waikaikai catchment (Geary and Schrider sites); and on Spence Road, Kakaramea, in the Kaikura catchment. Disposals at the Geary and Schrider sites were completed in 2006 and 2011 respectively; the areas have since been reinstated to productive farmland. Disposals at the Spence site were completed in 2012. All three sites are continually monitored and reported on annually, as consents have not yet expired or been surrendered.

This report for the period July 2013-June 2014 describes the monitoring programmes implemented by the Taranaki Regional Council to assess Origin Energy's environmental performance during the period under review, and the results and environmental effects of Origin Energy's activities.

In the 2012-2013 year, Origin Energy Resources NZ Ltd achieved a high level of environmental performance in respect of these sites.

Origin Energy holds two resource consents, which include a total of 56 conditions setting out the requirements that the Company must satisfy. AR Geary holds one resource consent, which includes a total of 27 conditions setting out the requirements that the consent holder must satisfy. These consents allow for the discharge of drilling waste onto and into land via landfarming.

The Council's monitoring programme for the period under review included 11 inspections, 9 soil samples collected for analysis, and the review of records provided by Origin Energy.

Monitoring indicates that there are no adverse environmental effects occurring as a result of activities at the sites. Levels of contaminants in the surface soil meet the required consent conditions in most cases. Further monitoring of the sites will ensure that all criteria are complied with prior to surrender of the consents.

During the monitoring period, Origin Energy demonstrated a high level of both environmental and administrative performance and compliance with resource consents 6135-1 and 5325-1, and a good level of administrative compliance for consent 5935-1. There was one incident recorded by the Council in relation to the Company's landfarming operations at the Spence Road site under consent 5935-1. This incident was operational rather than environmental in nature, and has been dealt with effectively by the Company, but affects their overall compliance rating for that consent.

For reference, in the 2013-2014 year, 60% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance with their consents.

This report includes recommendations for the 2014-2015 year.

Table of contents

	Page
1. Introduction	1
1.1 Compliance monitoring programme reports and the Resource Management Act 1991	1
1.1.1 Introduction	1
1.1.2 Structure of this report	1
1.1.3 The Resource Management Act (1991) and monitoring	1
1.1.4 Evaluation of environmental performance	2
1.2 Process description	4
1.2.1 Drilling waste	4
1.2.2 Landfarming	5
1.3 Resource consents	6
1.4 Monitoring programme	7
1.4.1 Introduction	7
1.4.2 Programme liaison and management	7
1.4.3 Site inspections	7
1.4.4 Chemical sampling	8
1.4.5 Review of analytical results	8
2. Geary Landfarm	9
2.1 Site location	9
2.2 Resource consent	10
2.3 Results	11
2.3.1 Inspections	11
2.3.2 Results of receiving environment monitoring	12
2.3.2.1 Council soil results	12
2.3.2.2 Origin supplied soil results 2013-2014	12
2.4 Evaluation of performance	14
3. Schrider Landfarm	17
3.1 Site location	17
3.2 Resource consent	18
3.3 Results	19
3.3.1 Inspections	19
3.3.2 Results of receiving environment monitoring	20
3.3.2.1 Council soil results	20
3.3.2.2 Origin supplied soil results 2013-2014	21
3.4 Evaluation of performance	24
4. Spence Road Landfarm	26
4.1 Site location	26
4.2 Resource consent	27
4.3 Results	28
4.3.1 Inspections	28
4.3.2 Results of receiving environment monitoring	30
4.3.2.1 Council soil results	30
4.3.2.2 Origin supplied soil results 2011-2012	31
4.4 Evaluation of performance	32

5.	Discussion	35
5.1	Investigations, interventions, and incidents	35
5.2	Discussion of site performances	37
5.3	Environmental effects of exercise of consents	38
5.4	Evaluation of performance	38
5.5	Recommendations from the 2011-2013 Biennial Report	38
5.6	Alterations to monitoring programmes for 2014-2015	38
6.	Recommendations	40
	Glossary of common terms and abbreviations	41
	Bibliography and references	44
	Appendix I Resource consents held by Origin Energy Resources NZ Ltd & AR Geary	
	Appendix II Maps of Landfarmed Sites	

List of tables

Table 1	Summary of landfarming consents covered by this report	6
Table 2	Origin supplied soil results from the Geary site during the 2013 - 2014 monitoring period	12
Table 3	Origin supplied soil results from the Geary site during the 2013 - 2014 monitoring period	13
Table 4	Origin supplied soil results from the Geary site during the 2013 - 2014 monitoring period	14
Table 5	Summary of performance for Consent 5325-1 to discharge: drilling mud, fluids and cuttings from well drilling operations with water based muds; drilling cuttings from wells drilled with synthetic based muds; and oily waste material from hydrocarbon exploration and production activities; onto and into land	14
Table 6	Soil samples obtained from the Schrider Landfarm on 4 February 2014	20
Table 7	Origin supplied soil results from the Schrider site during the 2013 - 2014 monitoring period	21
Table 8	Origin supplied soil results from the Schrider site during the 2013 - 2014 monitoring period	21
Table 9	Origin supplied soil results from the Schrider site during the 2013 - 2014 monitoring period	22
Table 10	Origin supplied soil results from the Schrider site during the 2013 - 2014 monitoring period	23
Table 11	Origin supplied soil results from the Schrider site during the 2013 - 2014 monitoring period	23
Table 12	Summary of performance for Consent 6135-1 to discharge drilling cuttings and fluids from drilling operations with water based muds, drilling cuttings from wells drilled with synthetic based muds, drilling cuttings from wells drilled with oil based muds, and oily wastes, onto and into land via land farming	24
Table 13	Results of Council soil sampling at Spence landfarm during the 2013 - 2014 monitoring period	30
Table 14	Origin supplied soil results from the Spence Road site during the 2013 - 2014 monitoring period	31
Table 15	Origin supplied soil results from the Spence Road site during the 2013 - 2014 monitoring period	31
Table 16	Summary of performance for Consent 5935-1 To discharge waste drilling cuttings, muds and fluids from wells drilled with water based muds and waste drilling cuttings from wells drilled with synthetic based muds from hydrocarbon exploration and production operations onto and into land	32

List of figures

Figure 1	Aerial photograph of Geary Landfarm highlighting spreading areas and approximate regional location (inset)	10
Figure 2	Aerial photograph of Schrider Landfarm highlighting spreading areas and approximate regional location (inset)	18
Figure 3	Aerial photograph of Spence Road Landfarm highlighting spreading areas and approximate regional location (inset)	27

List of photos

Photo 1	Landfarming equipment at the Schrider site	6
Photo 2	View east from sand dunes across Geary site showing spreading area 39	11
Photo 3	Spreading area G38 showing successful pasture establishment following landfarming activities	12
Photo 4	View across spreading areas H65 and H66 from site visit on 4 February 2014	20
Photo 5	View across spreading area S19 from site visit on 6 January 2014	30
Photo 6	Incident 30711 - unauthorised discharge event into an abandoned pit at Origin's Spence Road Landfarm site, 13 May 2014	35
Photo 7	Incident 30711 - clean-up phase of the unauthorised discharge event at Origin's Spence Road Landfarm site	36
Photo 8	Incident 30711 - Origin's Spence Road Landfarm site with remediated pit containing ponded rain water, 28 May 2014	36

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the annual report for the period 1 July 2013 – 30 June 2014 by the Taranaki Regional Council describing the monitoring programmes associated with resource consents held by Origin Energy Resources NZ Limited (Origin Energy) and AR Geary. Origin Energy operates drilling waste landfarms situated on Geary Road at Manutahi (Schriber Landfarm), and Spence Road at Kakaramea. They also manage and monitor the Geary Landfarm site to ensure that consent conditions are met prior to surrender. The consent for this site is held by the landowner AR Geary.

This report covers the results and findings of the monitoring programmes implemented by the Council in respect of the consents held by Origin Energy and AR Geary, to discharge drilling waste onto and into land via landfarming. This is the 5th combined Technical Report and the 17th report across the three sites, to be prepared by the Taranaki Regional Council to cover the Company's discharges and their effects.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by Origin Energy and AR Geary, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted at the Company's sites.

Sections 2 - 4 each cover one of the three landfarming sites, setting out the site location, details of the resource consents, presenting the results of monitoring during the period under review (including scientific and technical data), and an evaluation of compliance with the resource consents.

Section 5 discusses the results, their interpretation, and their significance for the environment.

Section 6 presents recommendations to be implemented in the 2013-2014 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act (1991) and monitoring

The Resource Management Act primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- (a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;

- (b) physical effects on the locality, including landscape, amenity and visual effects;
- (c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- (d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
- (e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, (covering both activity and impact) monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, and considered responsible resource utilisation to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the consent holder/s during the period under review, this report also assigns a rating as to each Company's environmental and administrative performance.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year.

Administrative performance is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (i.e. a defence under the provisions of the *RMA* can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

- **High** No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

- **Good** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
 - Strong odour beyond boundary but no residential properties or other recipient nearby.
- **Improvement required** Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.
 - **Poor** Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative compliance

- **High** The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.
- **Good** Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.
- **Improvement required** Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

- **Poor** Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2013-2014 year, 60% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

1.2.1 Drilling waste

Waste drilling material is produced during well drilling for hydrocarbon exploration. The primary components of this waste are drilling fluids (muds) and rock cuttings. Drilling fluids are engineered to perform several crucial tasks in the drilling of a hydrocarbon well. These include: transporting cuttings from the drill bit to the well surface for disposal; controlling hydrostatic pressure in the well; supporting the sides of the hole and preventing the ingress of formation fluids; and lubricating and cooling the drill bit and drill pipe in the hole.

Drilling fluids

Oil and gas wells may be drilled with either synthetic based mud (SBM) or water based mud (WBM). As the names suggest, these are fluids with either water (fresh or saline) or synthetic oil as a base material, to which further compounds are added to modify the physical characteristics of the mud (for example mud weight or viscosity). More than one type of fluid may be used to drill an individual well. In the past, oil based muds (diesel/crude oil based) have also been used. Their use has declined since the 1980s due to their ecotoxicity; they have been replaced by SBM. SBM use olefins, paraffins or esters as a base material. While this is technically still a form of oil based fluid, these fluids have been engineered to remove polycyclic aromatic hydrocarbons, reduce the potential for bioaccumulation, and accelerate biodegradation compared with OBM.

Common constituents of WBM and SBM include weighting agents, viscosifiers, thinners, lost circulation materials (LCM), pH control additives, dispersants, corrosion inhibitors, bactericides, filtrate reducers, flocculants and lubricants. Of these, the naturally occurring clay mineral barite (barium sulphate) is generally the most common additive. It is added to most drilling muds as a wetting and weighting agent.

Drilling fluids may be intentionally discharged in bulk for changes to the drilling fluid programme or at the completion of drilling. Depending on operational requirements and fluid type and properties, fluids may be re-used in multiple wells.

Cuttings

Cuttings are produced as the drill bit penetrates the underlying geological formations. They are brought to the surface in the drilling fluid where they pass over a shaker screen that separates the cuttings and drilling fluids. The drilling fluids are recycled for reuse within the drilling process, but small quantities of drilling fluids remain adhered to the cuttings. The cuttings and smaller particle material from the

drill fluid treatment units drain into sumps. If sumps cannot be constructed, corrals or special bins are used. During drilling this material is the only continuous discharge.

1.2.2 Landfarming

The landfarming process as implemented in Taranaki has typically been shown to assist the conversion of sandy coastal sites prone to erosion into productive pasture. Results of an independent research project conducted by AgKnowledge Ltd (2013) have indicated that the re-contoured sand dunes, after the inclusion of the drilling wastes (as per the consents), and with the addition of appropriate fertilisers and water (irrigation) are capable of producing high quality clover-based pastures and thus increasing the value of the land from about \$3-4000/ha to \$30-40,000/ha (2013).

Landfarming uses natural and assisted bioremediation to reduce the concentration of petroleum compounds through degradation. Basic steps in the landfarming process include:

1. Drilling waste is transported from wellsites by truck (cuttings) or tanker (liquids). It may be discharged directly to land or placed in a dedicated storage pit.
2. The required area is prepared by scraping back and stockpiling existing pasture/topsoil and levelling out uneven ground.
3. Waste is transferred to the prepared area by excavator and truck and spread out with a bulldozer. Liquids may be discharged by tanker or a spray system.
4. Waste is allowed to dry sufficiently before being tilled into the soil to the required depth with a tractor and discs.
5. The disposal area is levelled with chains or harrows.
6. Stockpiled or brought in topsoil/clay is applied to aid stability and assist in grass establishment.
7. Fertiliser may be applied and the area is sown in crop or pasture at a suitable time of year.

The landfarming process utilized at the Geary, Schrider and Spence Road sites are on a single application basis. This means dedicated spreading areas each receive only a single application of waste.



Photo 1 Landfarming equipment at the Schrider site

1.3 Resource consents

Sections 15(1)(b) and (d) of the Resource Management Act stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Details of the consents covered by this report are summarised in Table 1.

Table 1 Summary of landfarming consents covered by this report

Site	Consent holder	Consent number	Purpose of consent	Issue date	Next review	Expiry
Geary	AR Geary	5325-1	Discharge drilling waste (SBM, WBM & OW)	28/5/1998	-	2016
Schrider	Origin	6135-1	Discharge drilling waste (SBM, WBM, OBM & OW)	6/3/2003	2016	2022
Spence Rd	Origin	5935-1	Discharge drilling waste (SBM, WBM & OW)	7/12/2001	-	2016

OBM = oil based mud
 OW = oily waste
 SBM = synthetic based mud
 WBM = water based mud

These permits are attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the Resource Management Act sets out obligation/s upon the Taranaki Regional Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region and report upon these.

The Taranaki Regional Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

The monitoring programme for the Origin Energy landfarms consisted of four primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans and;
- consultation on associated matters.

1.4.3 Site inspections

A total of eleven inspections were made of the landfarm sites during the monitoring period, with regard to the consents for the discharge of drilling waste. The main point of interest was to assess the ongoing effects upon soil quality of the land disposal process.

The inspections occurred as follows:

Geary Landfarm	25 June 2014
Schrider Landfarm	4 February 2014 9 April 2014 25 June 2014
Spence Road Landfarm	1 November 2013 6 January 2014 4 February 2014 9 April 2014 13 May 2014 28 May 2014 25 June 2014

1.4.4 Chemical sampling

During the monitoring period the Council collected six composite soil samples from the Spence Road site and another three composite soil samples from the Schrider site. For each sample, 12-15 cores were taken from a diagonal transect at 10 m intervals to a depth of 250mm, and composited in the field. The samples were analysed for chloride, conductivity, hydrocarbons, pH, sodium and total soluble salts.

1.4.5 Review of analytical results

The Council reviewed results provided by Origin Energy. Origin Energy are required by their consents to take predisposal and receiving environment samples and supply analyses results to the Council to ensure that waste application loading and surrender limits are met for the areas used for disposal.

2. Geary Landfarm

2.1 Site location

Swift Energy New Zealand Limited (Swift) operated a drilling waste landfarm off Geary Road, Manutahi which is shown in Figure 1. This site is located on marginal coastal farm land situated on reworked dune fields. The Waikaikai Stream flows approximately through the centre of the site. The proximity of the site to this recognised ecosystem has been taken into account in the setting of buffer distances and location of the stockpiling facilities. The site was active between 2000 and 2006, during which time 45 disposals of water based mud, synthetic based mud and oily waste were undertaken. Oil based cuttings and wastes from the Kauri-E wellsite, located in the southeast corner of the property, were landfarmed at the site in 2004 and 2005.

The predominant soil type has been identified as black loamy sand and vegetation growth is primarily pasture. Average annual rainfall for the site is 1043 mm (taken from the nearby 'Patea' monitoring station). As with the other South Taranaki coastal sites, the Geary site is subject to strong winds.

Site data

Location

Word descriptor:	Geary Road, Manutahi, Taranaki
Map reference: (NZTM)	E 1718754 N 5606372
Mean annual rainfall:	1043 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%
Elevation:	~40 m
Geomorphic position:	Cliffed coast / dune backslope
Erosion / deposition:	Erosion
Vegetation:	Pasture, dune grasses
Parent material:	Aeolian deposit
Drainage class:	Free / well draining

Disposals at the site were completed in March 2006 and the area has since been reinstated to productive farmland. Origin Energy took over Swift's operations in 2008; they now monitor the site to ensure that the conditions are met prior to surrender. The consent is held by AR Geary.

No disposals occurred during the period under review.

The site is adjacent to a remote cliffed coast with little to no public access.



Figure 1 Aerial photograph of Geary Landfarm highlighting spreading areas and approximate regional location (inset)

2.2 Resource consent

AR Geary holds discharge consent **5325-1**, to discharge: drilling mud, fluids and cuttings from well drilling operations with water based muds; drilling cuttings from wells drilled with synthetic based muds; and oily waste material from hydrocarbon exploration and production activities; onto and into land. This consent was issued by the Taranaki Regional Council on 28 May 1998 as a resource consent under Section 87(e) of the Resource Management Act. Changes to conditions were made on 2 July 2002, 18 September 2002 and 16 June 2003. It is due to expire on 1 June 2016.

Condition 1 relates to compliance with information supplied.

Condition 2 relates to best practicable option.

Conditions 3, 4, 5 and 7 relate to notification and supply of information to the Council.

Conditions 6 and 8-26 relate to operational and technical requirements.

Condition 27 is a review condition.

The permit is attached to this report in Appendix I.

2.3 Results

2.3.1 Inspections

One scheduled inspection of the Geary site was conducted during the monitoring period. A brief summary of the compliance inspection is provided below.

25 June 2014

No objectionable odours or visible emissions were detected at the time of inspection. No recent disposal activities had occurred and no storage pits were present. Observed pasture cover was complete across all spreading areas and appeared healthy.



Photo 2 View east from sand dunes across Geary site showing spreading area 39



Photo 3 Spreading area G38 showing successful pasture establishment following landfarming activities

2.3.2 Results of receiving environment monitoring

2.3.2.1 Council soil results

No samples were taken from the Geary site by the Council during the monitoring period under review, as the programme has been scaled back over time due to lack of recent activity, and assessment of previous soil results that demonstrate compliance with surrender requirements.

2.3.2.2 Origin supplied soil results 2013-2014

Origin provided the results to the Council from 18 soil samples obtained from the Geary landfarm during the 2013 – 2014 monitoring period. The results are shown below in Tables 2 to 4.

Table 2 Origin supplied soil results from the Geary site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			G5	G8	G9	G12	G13	G14
Benzene	mg/kg	1.1	<0.05	<0.2	<0.05	<0.04	<0.04	<0.05
Toluene	mg/kg	68	<0.05	<0.2	<0.05	<0.04	<0.04	<0.05
Ethylbenzene	mg/kg	53	<0.05	<0.2	<0.05	<0.04	<0.04	<0.05
m & p Xylene	mg/kg	48	<0.10	<0.2	<0.10	<0.08	<0.08	<0.1
o Xylene	mg/kg	48	<0.05	<0.2	<0.05	<0.04	<0.04	<0.05
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.02	<0.03	<0.02	<0.02	<0.02
Naphthalene	mg/kg	7.2	<0.13	<0.1	<0.12	<0.1	<0.1	<0.12
Pyrene	mg/kg	160	<0.03	<0.02	<0.03	<0.02	<0.02	<0.02
Hydrocarbon	mg/kg	-	<60	260	<50	<140	<210	170

Parameter	Unit	Consent Limit	Spreading areas sampled					
			G5	G8	G9	G12	G13	G14
C7-C9	mg/kg	120.0	<8	<8	<7	<7	<7	<7
C10-C14	mg/kg	58	<20	29	<10	<10	<10	<10
C15-C36	mg/kg	4000	<30	230	<30	140	200	170
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	16	19	14	16	15	16
Copper	mg/kg	100	18	27	12	17	19	19
Lead	mg/kg	300	1.50	2.2	1.2	2.4	3.5	3.50
Mercury	mg/kg	1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	10	7	8	7	8
Zinc	mg/kg	300	73	94	68	80	72	67
Barium*	mg/kg	10000	590	5400	284	588	2200	1090
Chloride	mg/kg	700	8	19	9	32	38	110
Conductivity	mSm-1	290	<10	<10	<10	<10	<10	<10
Sodium	mg/kg	460	89	440	420	84	380	410
Soluble salts	mg/kg	2500	<500	<500	<500	<500	<500	<500
Sodium absorption ratio	-	18	1.50	0.5	0.5	0.8	0.5	0.80

*Alberta agricultural limit for barium, not a consent condition.

Table 3 Origin supplied soil results from the Geary site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			G17	G18	G20	G23	G26	G27
Benzene	mg/kg	1.1	<0.03	<0.05	<0.05	<0.04	<0.02	<0.04
Toluene	mg/kg	68	<0.06	<0.05	<0.05	<0.04	<0.02	<0.04
Ethylbenzene	mg/kg	53	<0.03	<0.05	<0.05	<0.04	<0.02	<0.04
m & p Xylene	mg/kg	48	<0.03	<0.10	<0.10	<0.08	<0.02	<0.08
o Xylene	mg/kg	48	<0.03	<0.05	<0.05	<0.04	<0.02	<0.04
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.02	<0.03	<0.03	<0.03	<0.03	<0.02
Naphthalene	mg/kg	7.2	<0.1	<0.12	<0.12	<0.13	<0.13	<0.1
Pyrene	mg/kg	160	0.19	<0.03	<0.03	<0.03	<0.03	<0.02
Hydrocarbon	mg/kg	-	260	<60	430	<60	140	190
C7-C9	mg/kg	120.0	<7	<8	<4	<7	<7	<7
C10-C14	mg/kg	58	<10	<20	<8	<10	<10	<10
C15-C36	mg/kg	4000	260	<30	40	<30	140	180
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	18	18	20	13	13	8
Copper	mg/kg	100	14	13	20	12	21	10
Lead	mg/kg	300	1.2	1.10	1.90	3	2.70	1.8
Mercury	mg/kg	1	0.10	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	8	11	6	7	5
Zinc	mg/kg	300	85	76	80	58	59	38
Barium*	mg/kg	10000	640	461	173	436	159	149
Chloride	mg/kg	700	4	26	10	52	5	16
Conductivity	mSm-1	290	115	<10	<10	<10	<10	<10
Sodium	mg/kg	460	88	72	330	410	440	70
Soluble salts	mg/kg	2500	<500	<500	<500	<500	<500	<500
Sodium absorption ratio	-	18	0.60	0.80	1.10	1.7	0.90	1

*Alberta agricultural limit for barium, not a consent condition.

Table 4 Origin supplied soil results from the Geary site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			G30	G33	G37	G38	G39	G40
Benzene	mg/kg	1.1	<0.05	<0.02	<0.05	<0.04	<0.04	<0.04
Toluene	mg/kg	68	<0.05	<0.02	<0.05	<0.04	<0.04	<0.04
Ethylbenzene	mg/kg	53	<0.05	<0.02	<0.05	<0.04	<0.04	<0.04
m & p Xylene	mg/kg	48	<0.1	<0.02	<0.09	<0.08	<0.08	<0.08
o Xylene	mg/kg	48	<0.05	<0.02	<0.05	<0.04	0.13	<0.04
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.02	0.04	<0.03	<0.03	<0.03
Naphthalene	mg/kg	7.2	<0.13	<0.1	<0.1	<0.14	<0.1	<0.13
Pyrene	mg/kg	160	<0.03	0.05	0.09	<0.03	<0.03	<0.03
Hydrocarbon	mg/kg	-	<60	<50	80	1400	78	<60
C7-C9	mg/kg	120.0	<7	<7	<8	<8	<8	<8
C10-C14	mg/kg	58	<10	<10	<20	49	<20	<20
C15-C36	mg/kg	4000	40	<30	74	1400	78	<30
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	14	16	13	11	18	17
Copper	mg/kg	100	23	23	15	10	15	23
Lead	mg/kg	300	6.50	21.3	48.4	5.2	14.2	4
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	8	6	5	8	9
Zinc	mg/kg	300	53	80	50	46	67	66
Barium*	mg/kg	10000	1680	750	980	2800	2200	140
Chloride	mg/kg	700	165	4	356	7	27	22
Conductivity	mSm-1	290	<10	<10	<10	<10	<10	<10
Sodium	mg/kg	460	440	91	230	330	320	280
Soluble salts	g/100g	2500	<500	<500	<500	<500	<500	<500
Sodium absorption ratio	-	18	1.40	1.6	0.8	1.00	1.1	0.70

*Alberta agricultural limit for barium, not a consent condition

The results from these samples complied with the conditions set out in the consent; including polycyclic aromatic hydrocarbons (PAH's) and volatile aromatic compounds (BTEX) results, most of which were below the limited of detection.

2.4 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 5.

Table 5 Summary of performance for Consent **5325-1** to discharge: drilling mud, fluids and cuttings from well drilling operations with water based muds; drilling cuttings from wells drilled with synthetic based muds; and oily waste material from hydrocarbon exploration and production activities; onto and into land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Comply with documentation submitted for application	No disposals during monitoring period	N/A
2. Prevent or minimise any likely adverse effects on the environment	Inspection	Yes
3. Notify TRC in writing prior to waste disposal	No disposals during monitoring period	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Notify TRC prior to disposal of stockpiled waste	No disposals during monitoring period	N/A
5. Provide written notice and a chemical analysis for disposal of waste with greater than 5% hydrocarbon content	No disposals during monitoring period	N/A
6. Keep areas of disposal of water based drilling wastes separate from synthetic mud based drilling waste. Keep disposal areas for individual wells separate	No disposals during monitoring period	N/A
7. Maintain records of wastes for: a. each well b. stockpiling and disposal areas c. composition and volume of waste d. times of discharge e. treatments applied	No disposals during monitoring period	N/A
8. Limited to wastes generated within Taranaki	No disposals during monitoring period	N/A
9. No discharge within 25m of surface water or property boundaries, or within 6m of pipelines	No discharges during monitoring period	N/A
10. No destabilisation of neighbouring land	Site reinstated	Yes
11. Discharge depth limited to 150mm for waste with less than 5% hydrocarbons, or 50mm for waste with greater than 5% hydrocarbons	No discharges during monitoring period	N/A
12. If waste has greater than 5% hydrocarbons, incorporate waste into the soil so that the surface 250mm contains less than 5% hydrocarbons	No discharges during monitoring period	N/A
13. Electroconductivity must be less than 400 mSm ⁻¹ . If background soil has an electroconductivity of greater than 400 mSm ⁻¹ , then electroconductivity after disposal shall not exceed original electroconductivity by more than 100 mSm ⁻¹	Supplied soil samples show continued compliance	Yes
14. Sodium absorption ratio [SAR] must be less than 18.0. If background soil has an SAR of greater than 18.0, then SAR after disposal shall not exceed original SAR by more than 1.0	Supplied soil samples show continued compliance	Yes
15. Maximum rate of chloride application after discharge must not exceed 800 kgCl/ha/yr	No discharges during monitoring period	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
16. Maximum rate of nitrogen application after discharge must not exceed 200 kgN/ha/yr	No discharges during monitoring period	N/A
17. Prior to expiry/cancellation of consent soil hydrocarbon content must comply with Ministry for the Environment guidelines	Consent not surrendered or expired	N/A
18. Levels of metals must comply with Ministry of Health guidelines	Supplied soil samples show continued compliance	Yes
19. Total dissolved salts shall not exceed 2500 g/m ³	No soil samples obtained during monitoring period	N/A
20. Prior to expiry/cancellation of consent these levels must not be exceeded: a. conductivity, 290 mSm ⁻¹ b. dissolved salts, 2500 g/m ³ c. sodium, 460 g/m ³ d. chloride, 700 g/m ³	Consent not surrendered or expired	N/A
21. Discharge area shall be tilled and resown to pasture/crop as soon as possible after completion	No discharges during monitoring period. Pasture has been re-established.	N/A
22. Disposal of waste shall never lead to contamination of any surface water	Inspection - no effects noted	Yes
23. Disposal of waste shall never result in any adverse effects on ground or surface water	Inspection - no effects noted	Yes
24. Stockpiling limited to 5000 cubic metres and discharged within 2 months	No stockpiling or discharges during monitoring period	N/A
25. No offensive dust beyond the site boundary	Site reinstated	Yes
26. No offensive odour beyond the site boundary	Site reinstated	Yes
27. Optional review provision re environmental effects	No further options for review prior to expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

3. Schrider Landfarm

3.1 Site location

The Schrider Landfarm is located off Geary Road, Manutahi and adjoins the Geary Landfarm, as seen in Figure 2. Schrider landfarm is located on marginal coastal farm land situated on reworked dune fields and also consists predominately of black loamy sand, with vegetation growth primarily consisting of pasture. Average annual rainfall for the site is 1043 mm (taken from the nearby 'Patea' monitoring station). As with the other South Taranaki coastal sites, the Schrider site is subject to strong winds.

Site data

Location

Word descriptor:	Lower Manurau Road, Manutahi, Taranaki
Map reference: (NZTM)	E 1719054 N 5605073
Mean annual rainfall:	1043 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%
Elevation:	~30 m
Geomorphic position:	Cliffed coast / dune backslope
Erosion / deposition:	Erosion
Vegetation:	Pasture, dune grasses
Parent material:	Aeolian deposit
Drainage class:	Free / well draining

Previously part of the site was used to dispose of cuttings from the Kauri-F well. The site was initially used for the disposal of water based and synthetic based muds. Later, consent was granted for the disposal of oil based mud on a trial basis and then oily wastes were also included.

Disposals at the site were completed in March 2011 and the area has since been reinstated. No disposals occurred during the period under review.



Figure 2 Aerial photograph of Schriдер Landfarm highlighting spreading areas and approximate regional location (inset)

3.2 Resource consent

Origin Energy holds discharge consent 6135-1 to discharge drilling cuttings and fluids from drilling operations with water based muds, drilling cuttings from wells drilled with synthetic based muds, drilling cuttings from wells drilled with oil based muds, and oily wastes, onto and into land via land farming. This consent was issued by the Taranaki Regional Council on 6 March 2003 to Swift Energy NZ Ltd, as a resource consent under Section 87(e) of the Resource Management Act. Changes to conditions were made on 19 March 2004, 16 April 2004, 10 June 2004, 23 June 2004, 9 August 2006 and 10 February 2010. The consent was transferred to Origin Energy on 11 April 2008 and is due to expire on 1 June 2022.

Conditions 1 and 2 concern definitions and adoption of the best practical option.

Conditions 3 to 5 relate to notification and sampling requirements prior to discharge.

Conditions 6 to 18 relate to discharge limits and operational requirements.

Conditions 19 to 29 relate to receiving environment limits.

Conditions 30 and 31 concern monitoring and reporting.

Conditions 32 and 33 provide for optional review of the consent.

The consent is attached to this report in Appendix I.

3.3 Results

3.3.1 Inspections

There were a total of three inspections of the Schrider site during the monitoring period, two of which were scheduled and one was conducted in conjunction with sampling. Summaries of compliance inspections are provided below.

4 February 2014

Inspection was conducted in conjunction with soil sampling. No recent landfarming activities were observed or identified. The sampled areas appeared in good condition, minimal drilling mud was visible within the cores.

9 April 2014

No objectionable odours or visible emissions were detected at the time of inspection. No recent stockpiling or landfarming had occurred at the site. All areas where muds had previously been applied were inspected and found that pasture cover was satisfactory across all areas; the lowest site area had been sown into crop. However, areas of pasture where the irrigator was not reaching were brown due to a recent dry period, while the pasture within reach of the irrigator looked green and healthy. No muds were identified in the soil profile.

25 June 2014

No objectionable odours or visible emissions were detected at the time of inspection. No recent disposal activities had occurred and no pits were present at the site. Pasture cover was complete across all spreading areas and pasture appeared healthy. The lower spreading area across zones H1-6 had had crops sown and was being grazed at the time of inspection (all zones have been shown to meet surrender criteria). No muds were identified within the soil profile or in any test pits dug at the time of inspection by the inspecting officer.



Photo 4 View across spreading areas H65 and H66 from site visit on 4 February 2014

3.3.2 Results of receiving environment monitoring

3.3.2.1 Council soil results

Three composite soil samples were collected by sub-sampling to a depth of 250mm in landfarmed areas. The results of this sampling are presented in Table 6.

Table 6 Soil samples obtained from the Schrider Landfarm on 4 February 2014

Parameter	Unit	Consent Limit	Spreading Areas Sampled		
			H63	H64	H65 / H66
Calcium	mg/kg	-	38.7	13.9	37.5
Chloride	mg/kg	460	18.2	15.2	18.4
Conductivity	mS/m@20C	290	20.6	11.3	13.0
Hydrocarbon	mg/kg		22	21	30
Magnesium	mg/kg	-	9.2	6.73	9.4
Moisture factor	-	-	1.037	1.033	1.040
pH	pH	-	6.7	6.4	6.8
Sodium	mg/kg	460	37.4	34.4	32.0
Sodium absorption ratio	-	18	1.4	1.89	1.21
Total soluble salts	mg/kg	2500	161.2	88.4	101.7

The Council soil samples for landfarmed areas demonstrate compliance with all of the limits stipulated in the conditions of consent 6135-1.

3.3.2.2 Origin supplied soil results 2013-2014

Origin Energy collected 27 soil samples from the Schrider landfarm over the 2013 - 2014 monitoring period and provided the Council with the results of soil sampling. The results are shown below in Tables 7 to 10.

Table 7 Origin supplied soil results from the Schrider site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			H1	H2	H3	H4	H5	H6
Benzene	mg/kg	1.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03
Toluene	mg/kg	68	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06
Ethylbenzene	mg/kg	53	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03
m & p Xylene	mg/kg	48	<0.10	<0.10	<0.1	<0.1	<0.1	<0.03
o Xylene	mg/kg	48	<0.05	<0.05	<0.05	<0.05	<0.05	<0.03
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01
Naphthalene	mg/kg	7.2	<0.12	<0.12	<0.13	<0.13	<0.12	<0.07
Pyrene	mg/kg	160	<0.03	<0.03	<0.03	<0.03	<0.03	0.41
Hydrocarbon	mg/kg	-	350	290	320	<30	80	<50
C7-C9	mg/kg	120.0	<4	<7	<7	<4	<8	<7
C10-C14	mg/kg	58	<8	<10	<10	<8	<20	<10
C15-C36	mg/kg	4000	350	290	320	<20	80	<30
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	15	14	11	17	14	11
Copper	mg/kg	100	12	11	11	13	11	11
Lead	mg/kg	300	1.5	1.6	1.4	2.0	1.3	2.7
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	7	6	9	7	6
Zinc	mg/kg	300	74	68	57	81	66	62
Barium*	mg/kg	10000	190	133	171	319	116	78
Chloride	mg/kg	700	22	6	13	49	9	20
Conductivity	mSm-1	290	<10	<10	<10	<10	<10	<10
Sodium	mg/kg	460	29	26	16	24	12	57
Soluble Salts	mg/kg	2500	<500	<500	<500	<500	<500	<500
Sodium absorption ratio	-	18	1.3	1	0.6	0.9	0.8	1.7

*Alberta agricultural limit for barium, not a consent condition.

Table 8 Origin supplied soil results from the Schrider site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			H8	H20	H21	H22	H23	H24
Benzene	mg/kg	1.1	>0.05	<0.04	<0.04	<0.04	<0.04	<0.04
Toluene	mg/kg	68	<0.05	<0.04	<0.04	<0.04	<0.04	0.17
Ethylbenzene	mg/kg	53	<0.05	<0.04	<0.04	<0.04	<0.04	<0.04
m & p Xylene	mg/kg	48	<0.1	<0.08	<0.08	<0.08	<0.09	0.15
o Xylene	mg/kg	48	<0.05	<0.04	<0.04	<0.04	<0.04	0.07
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.027	<0.03	<0.03	<0.03	<0.03	<0.02
Naphthalene	mg/kg	7.2	<0.14	<0.12	<0.12	<0.12	<0.12	<0.1
Pyrene	mg/kg	160	<0.027	<0.03	<0.03	<0.03	<0.03	<0.02
Hydrocarbon	mg/kg	-	1230	<60	<60	<60	360	90
C7-C9	mg/kg	120.0	<7	<8	<7	<8	<7	<8
C10-C14	mg/kg	58	15	<20	<20	<20	21	<20

Parameter	Unit	Consent Limit	Spreading areas sampled					
			H8	H20	H21	H22	H23	H24
C15-C36	mg/kg	4000	1220	<30	<30	<30	340	87
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	22	17	14	9	18	22
Copper	mg/kg	100	14	12	12	9	11	21
Lead	mg/kg	300	1.8	1.10	1.30	1.2	2.5	22.9
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	10	8	7	5	8	11
Zinc	mg/kg	300	100	78	66	47	74	77
Barium*	mg/kg	10000	470	190	67	282	340	1660
Chloride	mg/kg	700	8	200	32	35	38	141
Conductivity	mSm-1	290	<10	<10	<10	<10	<10	100
Sodium	mg/kg	460	90	34	73	57	74	300
Soluble Salts	mg/kg	2500	<500	1000	<500	<500	<500	700
Sodium absorption ratio	-	18	0.80	0.50	0.70	0.70	0.5	0.4

*Alberta agricultural limit for barium, not a consent condition.

Table 9 Origin supplied soil results from the Schrider site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled					
			H28	H30	H31	H32	H35	H36
Benzene	mg/kg	1.1	0.06	<0.05	<0.05	<0.05	<0.03	<0.04
Toluene	mg/kg	68	0.39	<0.05	<0.05	<0.05	<0.03	<0.04
Ethylbenzene	mg/kg	53	0.16	<0.05	<0.05	<0.05	<0.03	<0.04
m & p Xylene	mg/kg	48	1	<0.1	<0.1	<0.1	<0.07	<0.08
o Xylene	mg/kg	48	0.35	<0.05	<0.05	<0.05	<0.03	<0.04
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.02	<0.02	<0.03	<0.02	<0.03
Naphthalene	mg/kg	7.2	<0.1	<0.13	<0.13	<0.12	<0.1	<0.1
Pyrene	mg/kg	160	<0.03	<0.02	<0.02	<0.03	<0.02	<0.03
Hydrocarbon	mg/kg	-	270	<60	<60	<60	<60	<60
C7-C9	mg/kg	120.0	<8	<8	<8	<8	<8	<8
C10-C14	mg/kg	58	37	<20	<20	<20	<20	<20
C15-C36	mg/kg	4000	230	50	<30	<30	<30	<30
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	10	12	13	19	16	14
Copper	mg/kg	100	10	11	11	14	12	12
Lead	mg/kg	300	4.3	1.2	1.6	3.1	1.3	1.3
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	6	7	7	10	7	7
Zinc	mg/kg	300	46	57	61	80	66	63
Barium*	mg/kg	10000	2500	514	444	194	286	82
Chloride	mg/kg	700	350	38	11	79	54	32
Conductivity	mSm-1	290	26	<10	<10	100	<10	<10
Sodium	mg/kg	460	310	106	135	55	80	104
Soluble Salts	mg/kg	2500	900	<500	<500	700	<500	<500
Sodium absorption ratio	-	18	0.7	0.6	0.7	0.7	0.6	0.4

*Alberta agricultural limit for barium, not a consent condition.

Table 10 Origin supplied soil results from the Schrider site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled			
			H41	H44	H45	H46
Benzene	mg/kg	1.1	<0.05	<0.05	<0.05	<0.1
Toluene	mg/kg	68	<0.05	<0.05	<0.05	0.20
Ethylbenzene	mg/kg	53	<0.05	<0.05	<0.05	<0.1
m & p Xylene	mg/kg	48	<0.10	<0.09	<0.09	<0.2
o Xylene	mg/kg	48	<0.05	<0.05	<0.05	0.10
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.023	<0.023	0.03
Naphthalene	mg/kg	7.2	<0.13	<0.12	<0.12	0.13
Pyrene	mg/kg	160	<0.03	<0.023	0.054	0.09
Hydrocarbon	mg/kg	-	<60	150	<60	520
C7-C9	mg/kg	120.0	<8	<8	<7	<9
C10-C14	mg/kg	58	<20	<20	<10	40
C15-C36	mg/kg	4000	<30	150	<30	480
Arsenic	mg/kg	20	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	17	15	16	17
Copper	mg/kg	100	12	12	13	18
Lead	mg/kg	300	1.10	2.20	1.3	4.3
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	7	8	9
Zinc	mg/kg	300	73	71	78	62
Barium*	mg/kg	10000	150	1630	51	230
Chloride	mg/kg	700	78	462	18	213
Conductivity	mSm-1	290	<10	<10	<10	145
Sodium	mg/kg	460	102	340	75	202
Soluble Salts	mg/kg	2500	<500	<500	<500	1000
Sodium absorption ratio	-	18	1.3	1.0	1.2	2.0

*Alberta agricultural limit for barium, not a consent condition.

Table 11 Origin supplied soil results from the Schrider site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled		
			H47	H48	H60
Benzene	mg/kg	1.1	<0.08	<0.23	<0.050
Toluene	mg/kg	68	0.12	<0.23	0.094
Ethylbenzene	mg/kg	53	<0.08	<0.23	0.097
m & p Xylene	mg/kg	48	0.2	<0.23	3
o Xylene	mg/kg	48	0.09	<0.45	0.88
Benzo(a)pyrene (BAP)	mg/kg	0.027	<0.03	<0.024	<0.03
Naphthalene	mg/kg	7.2	<0.14	<0.12	<0.13
Pyrene	mg/kg	160	<0.03	<0.024	<0.03
Hydrocarbon	mg/kg	-	79	<60	270
C7-C9	mg/kg	120.0	<8	<8	<8
C10-C14	mg/kg	58	20	<20	<20
C15-C36	mg/kg	4000	59	<30	270
Arsenic	mg/kg	20	<2	<2	2.5
Cadmium	mg/kg	1	<0.1	<0.1	0.17
Chromium	mg/kg	600	16	19	18
Copper	mg/kg	100	16	15	54
Lead	mg/kg	300	2.7	1.1	11.0

Parameter	Unit	Consent Limit	Spreading areas sampled		
			H47	H48	H60
Mercury	mg/kg	7	<0.1	<0.1	<0.10
Nickel	mg/kg	60	8	9	10
Zinc	mg/kg	300	86	86	82
Barium*	mg/kg	10000	511	23	450
Chloride	mg/kg	700	182	20	32
Conductivity	mSm-1	290	<10	<10	<100
Sodium	mg/kg	460	82	73	400
Soluble Salts	mg/kg	2500	<500	<500	<500
Sodium absorption ratio	-	18	1.7	1.7	0.5

*Alberta agricultural limit for barium, not a consent condition.

The results detailed in tables 7 to 11 complied with the conditions set out in the consent.

3.4 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 12.

Table 12 Summary of performance for Consent **6135-1** to discharge drilling cuttings and fluids from drilling operations with water based muds, drilling cuttings from wells drilled with synthetic based muds, drilling cuttings from wells drilled with oil based muds, and oily wastes, onto and into land via land farming

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Definitions	Not applicable	N/A
2. Adoption of best practicable option	Inspection and sampling	Yes
3. Notify TRC 48 hrs prior stockpiling	No stockpiling at site during monitoring period	N/A
4. Notify TRC 48 hrs prior to landfarming	No disposals during monitoring period	N/A
5. Provide specified data for OBM disposals	Provision of data - no OBM disposals	N/A
6. Rate of discharge/application depths	Inspection, sampling and Company records	Yes
7. Incorporate wastes ASAP so that hydrocarbon content in top 250mm is: a) < 5 % for WBM & SBM b) < 1.5 % for oily wastes & OBM	Sampling	Yes
8. Resow into pasture ASAP	Inspection	Yes
9. Wastes from individual wells to be kept separate & distinct	No stockpiling at site during monitoring period	N/A
10. Oily waste & OBM's to be kept separate & distinct	No stockpiling at site during monitoring period	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. No discharge near surface water, boundaries or pipelines	Inspection	Yes
12. Wastes restricted to Taranaki Region	Inspection and Company records	Yes
13. Max stockpiled volume of 2,000 m ³ & must be discharged within 8 mths	No stockpiling at site during monitoring period	N/A
14. No stockpiling of oily wastes or OBM's	No stockpiling at site during monitoring period	N/A
15. OBM only from certain wells	No OBM disposals	N/A
16. Limited area for disposal of OBM	No OBM disposals	N/A
17. Limit on nitrogen application rates	No disposals during monitoring period	N/A
18. No destabilisation of neighbouring land	Inspection	Yes
19. Electroconductivity limits	Sampling	Yes
20. Sodium absorption ratio limits	Sampling	Yes
21. Limits on concentration of metals	Sampling	Yes
22. Hydrocarbon levels prior to expiry	Sampling	N/A
23. Conductivity, TDS, sodium and chloride limits prior to expiry	Sampling	N/A
24. Level of total dissolved salts in surface and groundwater	Sampling – surface water not sampled, groundwater not assessed.	Not tested during period under review
25. No contamination of surface water bodies	No surface water	N/A
26. No impacts upon groundwater or surface water	Sampling	Not tested during period under review
27. No effects on surface water	No surface water	N/A
28. Limits on dust generation	Inspection	Yes
29. No offensive or objectionable odour	Inspection and complaint register	Yes
30. Monitoring requirements	Provision of data	Yes
31. Post application analysis for OBM's	Provision of results – no OBM disposals	N/A
32. Consent review	Next option for review in June 2016	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

4. Spence Road Landfarm

4.1 Site location

The Spence Road (Kauri-C) Landfarm is located on Spence Road, Kakaramea and is shown in Figure 3. As with other South Taranaki coastal sites, Spence Road landfarm is located on marginal coastal farm land amongst reworked dune fields. The soil type has been identified as predominately of black loamy sand. Average annual rainfall for this site is 1043 mm (taken from the nearby 'Patea' monitoring station) and is subject to strong winds.

Site data

Location

Word descriptor:	Spence Road, Kakaramea, Taranaki
Map reference:	E 1722014
(NZTM)	N 5601830
Mean annual rainfall:	1043 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%
Elevation:	~40 m
Geomorphic position:	Backslope
Erosion / deposition:	Erosion
Vegetation:	Pasture, dune grasses
Parent material:	Aeolian deposit
Drainage class:	Free / well draining

The site was active between 2004 and 2012 when 31 disposals of water based and synthetic based muds and cuttings, and smaller quantities of oily waste were undertaken.

In 2012 Origin Energy staff were informed that they would be required to line all storage pits with high grade synthetic liners or equivalent prior to any further activity being undertaken at the site.



Figure 3 Aerial photograph of Spence Road Landfarm highlighting spreading areas and approximate regional location (inset)

4.2 Resource consent

Origin Energy holds discharge permit **5935-1**, to discharge waste drilling cuttings, muds and fluids from wells drilled with water based muds, waste drilling cuttings from wells drilled with synthetic based muds and oily wastes, from hydrocarbon exploration and production operations onto and into land. This permit was issued to Swift Energy NZ Ltd by the Taranaki Regional Council on 7 December 2001, as a resource consent under Section 87(e) of the Resource Management Act. It was varied on 16 April 2004, 30 September 2008 and 10 February 2010. It was transferred to Origin Energy on 11 April 2008 and is due to expire on 1 June 2016.

Resource consent 5935-1 provides for an optional review of the consent in June 2012. A recommendation was made in the 2010-11 Annual Report that this option would not be exercised on the grounds that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of the consents.

Origin Energy applied to vary the consent on 3 February 2012. The variation requested that condition 12 be deleted. This condition required that oily wastes are kept separate from other waste types (SBM and WBM). As volumes of oily waste are typically small (less than 10m³) Origin Energy considered it uneconomic to landfarm such small volumes and requested that the condition be removed. The variation also requested that condition 13 be amended to allow for the time period for stock piling wastes on site to be extended from eight months to twelve months. The consent was varied on 7 March 2012.

Conditions 1 and 2 set out definitions and a requirement for adoption of the best practicable option.

Conditions 3 to 6 set out the requirements for a management plan, notifications, monitoring and reporting.

Conditions 7 and 8 specify discharge limits.

Conditions 9 to 13 are operational requirements.

Conditions 14 to 17 relate to effects on groundwater and surface water.

Conditions 18 to 22 set limits on certain parameters in the soil.

Condition 23 allows for an optional review.

The permit is attached to this report in Appendix I.

4.3 Results

4.3.1 Inspections

There were a total of three scheduled inspections, two inspections conducted in conjunction with sampling and another two inspections conducted in response to an incident at the Spence Road site during the monitoring period. Summaries of inspections are provided below.

1 November 2013

No objectionable odours or visible emissions were detected at the time of inspection. All unlined pits contained only water and vegetation surrounding the pits appeared healthy. The oily waste bins had plenty of freeboard available. The areas where muds had been applied were inspected and pasture cover appeared good and healthy throughout. No muds were identified within the soil profile and no incidents or issues were reported by the landowner.

6 January 2014

Inspection was conducted in conjunction with soil sampling. The storage pits appeared in good order and the steel oily waste bins had secure caging / fencing attached. Pasture in the sampled spreading areas appeared healthy.

4 February 2014

Inspection was conducted in conjunction with soil sampling. No recent landfarming activities were identified. Sampled areas appeared in good condition. No visible drilling mud was observed within cores and pasture cover was well established in all sampled areas.

9 April 2014

No objectionable odours or visible emissions were detected at the time of inspection. No recent stockpiling or landfarming activities were identified at site. All unlined pits were empty of muds and re-vegetating. The oily waste bin had approximately one metre of freeboard available. Areas of pasture where drilling waste was

historically applied appeared healthy and the cover was good. No muds were identifiable within the soil profile.

13 May 2014

Origin Energy's Spence Road landfarm was inspected following self-notification of an unauthorised discharge incident. Origin Energy environmental staff were present during the inspection. Origin Energy had contacted the Council the previous afternoon to inform that they had observed some oily waste in one of the former mud pits. The site is no longer actively used for disposal, and the pits are not set up to receive waste for stockpiling. Inspection of the site confirmed that a relatively small quantity (approximately 80 litres) of oily liquid waste was present in the base of the pit, intermixed with a small quantity of natural stormwater held in the pit base. A discussion was held on-site with Origin Energy staff about the source of the material, and the required remedial action. Origin informed the Council that contractors would be removing the fluids and solids and potentially hot water cleaning the pit, and that they were conducting an internal investigation. Origin Energy were informed that the incident would be referred to management and enforcement would potentially follow.

28 May 2014

A follow up inspection of Origin Energy's Spence Road landfarm was conducted relating to incident 30711. Origin Energy staff had advised the Council that contractors had been returning daily to the site as part of the clean up of the former storage pit. Origin Energy staff were not satisfied with the initial sucker truck clean up, and have had contractors dig out the pit floor and walls to remove more material. During the follow up inspection it was observed that the pit had had some material removed from the walls and the oily waste had been removed. The excavated material had been mixed with imported clay and stockpiled next to the pit for landfarming. The pit base still contained rain / groundwater which was turbid brown in appearance. Solid hydrocarbons had been removed but there was a slight sheen on parts of the pooled rain / groundwater. The stockpiled material looked secure. The rest of the site looked tidy and no other issues were noted.

25 June 2014

No objectionable odours or visible emissions were detected at the time of inspection, however a noticeable but localised hydrocarbon odour was noted down wind of the oily waste tank. The well head was being cleaned during the inspection; hot water was being used and only liquid was recovered via sucker truck. The oily waste bin was also being emptied using a sucker truck, the material was reportedly destined for disposal at another consented off-site facility. All historical mud pits were found to contain ponded water. Two piles of stockpiled gravel and dirt were present adjacent to the pits. No further incidents were reported. Mud application areas were inspected and pasture cover appeared complete and healthy across all areas. Test pits were dug and drilling mud was observed below 100 mm, which appeared well weathered and dispersed with no apparent hydrocarbon odours. Worm populations were found in all test pits.



Photo 5 View across spreading area S19 from site visit on 6 January 2014

4.3.2 Results of receiving environment monitoring

4.3.2.1 Council soil results

Six composite soil samples were collected on two separate occasions by sub-sampling to a depth of 250mm in landfarmed areas. The results of this sampling are presented in Table 13.

Table 13 Results of Council soil sampling at Spence landfarm during the 2013 - 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading Areas Sampled					
			6 Jan 14 <i>S19</i>	6 Jan 14 <i>S21</i>	6 Jan 14 <i>S23</i>	4 Feb 14 <i>S3</i>	4 Feb 14 <i>S4</i>	4 Feb 14 <i>S6</i>
Calcium	mg/kg	-	148	17.6	15.0	35.6	25.2	15.3
Chloride	mg/kg	460	39.5	71.4	56.5	78.6	17.9	35.3
Conductivity	mS/m@20C	290	76.6	40.7	29.1	58.2	26.4	22.4
Hydrocarbons	mg/kg		20	19	82	46	29	27
Magnesium	mg/kg	-	19.5	6.1	5.4	12.6	8.9	7.6
Moisture factor	-	-	1.014	1.013	1.009	1.043	1.038	1.018
pH	pH	-	7.3	6.4	6.4	6.9	6.6	6.8
Sodium	mg/kg	460	43.4	43.4	30.2	72.8	39.9	39.4
Sodium absorption ratio	-	18	0.89	2.27	1.7	2.67	1.74	2.05
Total soluble salts	mg/kg	2500	599.5	318.5	227.7	455.5	206.6	175.3

The Council soil samples for landfarmed areas demonstrate compliance with all of the limits stipulated in the conditions of consent 5935-1.

4.3.2.2 Origin supplied soil results 2011-2012

Origin Energy collected 14 soil samples from the Spence landfarm over the 2013 - 2014 monitoring period and provided the Council with the results of soil sampling. The results are shown below in Tables 14 and 15.

Table 14 Origin supplied soil results from the Spence Road site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled						
			S2	S3	S4	S5	S6	S8/10	S11
Benzene	mg/kg	1.1	<0.02	<0.05	<0.02	<0.02	<0.02	<0.04	<0.04
Toluene	mg/kg	68	<0.02	<0.05	<0.02	<0.02	<0.02	<0.04	<0.04
Ethylbenzene	mg/kg	53	<0.02	<0.05	<0.02	<0.02	<0.02	<0.04	<0.04
m & p Xylene	mg/kg	48	<0.02	<0.10	<0.02	<0.02	<0.02	<0.08	<0.08
o Xylene	mg/kg	48	<0.02	<0.05	<0.02	<0.02	<0.02	<0.04	<0.04
Benzo(a)pyrene (BAP)	mg/kg	0.027	0.03	0.03	0.03	0.03	0.03	<0.03	<0.03
Naphthalene	mg/kg	7.2	0.13	0.13	0.13	0.13	0.13	<0.1	<0.13
Pyrene	mg/kg	160	0.03	0.03	0.03	0.03	0.03	0.13	<0.03
Hydrocarbons	mg/kg	-	<60	<50	<50	<50	<50	96	1100
C7-C9	mg/kg	120.0	<8	<7	<7	<7	<7	<8	<8
C10-C14	mg/kg	58	<20	<10	<10	<10	<10	<20	30
C15-C36	mg/kg	4000	<30	<30	<30	40	70	93	1070
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	10	13	13	14	13	11	25
Copper	mg/kg	100	10	10	17	18	23	17	21
Lead	mg/kg	300	1.30	0.8	2.2	2.7	3.3	71.5	31.4
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	7	6	7	8	8	7	12
Zinc	mg/kg	300	49	58	61	65	64	46	108
Barium*	mg/kg	10000	240	63	48	276	122	1650	2700
Chloride	mg/kg	700	71	8	323	80	10	2	35
Conductivity	mSm-1	290	<100	<10	<10	<10	<10	<10	<10
Sodium	mg/kg	460	90	82	94	170	98	14	350
Soluble salts	mg/kg	2500	<500	<500	<500	<500	<500	<500	<500
Sodium absorption ratio	-	18	0.90	1.5	0.7	2.1	1.3	0.9	0.8

*Alberta agricultural limit for barium, not a consent condition.

Table 15 Origin supplied soil results from the Spence Road site during the 2013 – 2014 monitoring period

Parameter	Unit	Consent Limit	Spreading areas sampled						
			S14	S15	S17/19	S18	S20	S21	S22
Benzene	mg/kg	1.1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05
Toluene	mg/kg	68	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05
Ethylbenzene	mg/kg	53	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05
m & p Xylene	mg/kg	48	<0.07	<0.08	<0.07	<0.07	0.15	<0.08	<0.10
o Xylene	mg/kg	48	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	<0.05
Benzo(a)pyrene (BAP)	mg/kg	0.027	0.03	<0.02	<0.02	<0.03	<0.02	0.03	<0.03
Naphthalene	mg/kg	7.2	0.12	<0.1	<0.1	<0.14	<0.1	0.14	<0.12
Pyrene	mg/kg	160	0.03	0.05	<0.02	<0.03	0.06	0.03	<0.03
Hydrocarbons	mg/kg	-	<60	110	220	<60	<60	50	<60
C7-C9	mg/kg	120.0	<8	<8	<8	<8	<8	<7	<8
C10-C14	mg/kg	58	<20	<20	<20	<20	<20	<10	<20

Parameter	Unit	Consent Limit	Spreading areas sampled						
			S14	S15	S17/19	S18	S20	S21	S22
C15-C36	mg/kg	4000	43	110	210	<30	<30	40	<30
Arsenic	mg/kg	20	<2	<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	mg/kg	600	15	11	19	16	19	15	20
Copper	mg/kg	100	19	15	15	25	19	11	18
Lead	mg/kg	300	6.5	13.6	2.1	4.20	20.1	1.7	2.1
Mercury	mg/kg	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	60	8	8	9	9	10	7	10
Zinc	mg/kg	300	61	47	81	66	78	59	80
Barium*	mg/kg	10000	430	1830	248	920	1170	245	2200
Chloride	mg/kg	700	24	10	37	81	18	127	9
Conductivity	mSm-1	290	<10	<10	<10	100	<10	<10	<100
Sodium	mg/kg	460	103	400	113	260	410	145	410
Soluble salts	g/100g	2500	<500	<500	<500	700	<500	<500	<500
Sodium absorption ratio	-	18	1.10	0.6	0.8	1.00	2	1.9	2.5

*Alberta agricultural limit for barium, not a consent condition.

The results detailed in tables 14 and 15 complied with the conditions set out in the consent. Heavy metal concentrations were typically well within MfE guidelines, and hydrocarbon contaminants were generally below the limit of detection.

4.4 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 16.

Table 16 Summary of performance for Consent 5935-1 To discharge waste drilling cuttings, muds and fluids from wells drilled with water based muds and waste drilling cuttings from wells drilled with synthetic based muds from hydrocarbon exploration and production operations onto and into land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Definitions	Not applicable	N/A
2. Best practicable option to be adopted	Inspections and liaison with consent holder	Yes
3. Management plan	Site management information provided	Yes
4. Notification of Council prior to any discharge	Notification received	Yes
5. Notification of Council prior to discharging stockpiled material	Notification received	Retrospectively (Incident 30711)
6. Records to be kept and made available to Council	Consent holder's records	Yes
7. Limit on application depth of waste	Inspection and consent holder's records	Yes
8. Incorporation of wastes	Inspection and sampling	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Buffer distances	Inspection	Yes
10. Only wastes generated in Taranaki to be disposed of	Consent holder's records	Yes
11. Discharge not to cause destabilisation of neighbouring land	Inspection	Yes
12. Stockpiling and disposal areas for oily wastes to be kept separate	Inspection and consent holder's records	Yes
13. Material to be incorporated within 8 months	Inspection and consent holder's records	Yes
14. Discharge area to be tilled and resown as soon as practicable after discharge	Inspection	Yes
15. No contaminants to enter a surface water body	Inspection	Yes
16. There are to be no adverse effects on groundwater or surface water	Inspection - no surface water, groundwater not assessed	Yes
17. Discharge not to give rise to certain effects in receiving waters	Inspection	Yes
18. Limit on level of total dissolved salts in surface or groundwater	Not assessed	N/A
19. Limit on electroconductivity of soil/waste layer post application	Sampling	Yes
20. Limit on sodium absorption ratio of soil/waste layer post application	Sampling	Yes
21. Limits on levels of metals in soil	Sampling	Yes
22. Limits on levels of certain parameters in soil prior to expiry/surrender	Not applicable	N/A
23. Limit on levels of hydrocarbons in soil prior to expiry/surrender	Not applicable	N/A
24. Provision for review	Not exercised	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		Good

The Company demonstrated a 'high' level of environmental performance and a 'good' level of administrative compliance for the Spence landfarm site during the monitoring period. The site is no longer active, and the Company complied with all

consent conditions, but there was one unauthorised incident recorded against the consent during the monitoring period. This incident was quickly resolved by the Company, and had not led to any adverse environmental effects, but could have been avoided if the Company had taken proactive measures to ensure the stockpiling area was clearly identified as closed with fencing or signage, or reinstated the former pits. The Company have undertaken this work as part of their incident investigation and response.

The Company were professional in all interactions with the Council.

5. Discussion

5.1 Investigations, interventions, and incidents

The monitoring programme for the period was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During each year matters may arise which require additional activity by the Council e.g. provision of advice and information, or investigation of potential or actual courses of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Taranaki Regional Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The Unauthorised Incident Register (UIR) includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

In the 2013-2014 monitoring period, there was one incident recorded by the Council that was associated with the Origin Energy Spence Road landfarm.

Incident 30711

On 12 May 2014 the Company notified the Council of the discovery of a small quantity of liquid oily waste in the bottom of one of the unlined storage pits, formerly used for the storage of water based muds. On 13 May Council staff inspected the site with Origin Energy environmental staff and confirmed that a relatively small quantity (approximately 80 litres) of oily waste was present in the base of the pit, intermixed with site stormwater (Photograph 6). The Company sent through a written notification to the Council, and outlined to Council staff the intended clean-up procedures.



Photo 6 Incident 30711 - unauthorised discharge event into an abandoned pit at Origin's Spence Road Landfarm site, 13 May 2014

The site is currently unused, but there are steel 'D-bins' in place to receive oily waste from production sites for temporary stockpiling. The Council has previously informed Origin Energy that all earthen pits would require lining prior to resumption of any discharge activities at the site, to which the Company had agreed.

Clean up of the pit commenced on 15 May, with the oily waste removed via vacuum truck. A digger was then used to remove approximately 30 m³ of oil contaminated soil from the pit walls and base. Clean up was completed by 21st May (Photographs 7 and 8). A follow up inspection was conducted to confirm the work undertaken was to the satisfaction of the Council. The pit clean up had been performed to a high standard.



Photo 7 Incident 30711 – clean-up phase of the unauthorised discharge event at Origin's Spence Road Landfarm site

A 14 day 'please explain' letter was issued to the Company, who responded promptly to the satisfaction of the Council.



Photo 8 Incident 30711 - Origin's Spence Road Landfarm site with remediated pit containing ponded rain water, 28 May 2014

Origin Energy conducted their own comprehensive investigation into the incident. It appeared that a transport contractor had erroneously discharged the material into the pit, but this could not be confirmed. The material was possibly sourced from Manutahi D wellsite shutdown and mistakenly unloaded to the unlined pit rather than the steel storage bin on site.

Following clean up operations, samples were taken from each of the four banks of the pit, and two samples from the base of the pit. A composite sample of the material removed from the pit was also taken as a comparison against the last product that had been stored in the pit.

The Council undertook a follow-up inspection on 28 May 2014 and found the remediation work to be satisfactory.

The Company also took several measures immediately after the physical clean-up to ensure there could be no similar incidents at the site. The following was actioned to address the investigation findings:

- The Kauri C wellsite entrance gates are to be locked and a permit will have to be issued by Rimu Production Station before entrance to the site.
- All work on site will be conducted under the permit to work system, which will also allow supervision, and ensure correct procedures are communicated.
- An updated map has been provided to the contractor showing that no dumping is to occur into pits.
- “NO DUMPING” signage has been ordered and will be installed in front of each of the five unused pits.

Overall, the impacts of this incident were negligible, but the incident could have been avoided if the above measures had been completed earlier as a preventative measure. This incident was not directly the fault of Origin Energy, and was unintentional in nature. The Company acted quickly and comprehensively to inform the Council, resolve the incident, clean up the site and conduct an investigation, the key findings of which have been used to improve the site and general operations. The Company has also been advised that they should consider options for reinstating the storage area if the intention is to no longer use the site for disposal. They have suggested that they are still in talks with the landowner about what reinstatement option is preferable.

5.2 Discussion of site performances

Disposals at the Geary and Schrider sites were completed in 2006 and 2011 respectively; the areas have since been reinstated to productive farmland. Disposals at the Spence site were completed in 2012. Aside from the incident detailed in section 5.1, inspections did not identify any issues of concern and the sites were well managed. Notifications were made to the Council regarding the transfer of wastes to site and landfarming activities. The Company continued to collect soil samples from disposal areas and provide the results to Council.

5.3 Environmental effects of exercise of consents

Disposal area soil sampling conducted by both the Company and the Council indicates compliance with the consent conditions. There have been no disposals at the sites in recent years, and the results of sampling indicate salt and hydrocarbon contaminant levels in the areas previously spread are reducing, with most areas having reached surrender criteria. There are no surface water bodies in the immediate vicinity of disposal areas at the sites. Due to the location of the sites and the significant distance to any neighbours no air monitoring was undertaken as effects are known to be minimal.

5.4 Evaluation of performance

Tabular summaries of the consent holder's compliance record for the period under review are set out in the relevant section for each site.

During the period, the Company demonstrated a good level of administrative performance and a high level of environmental performance and compliance with the resource consents.

5.5 Recommendations from the 2011-2013 Biennial Report

In the 2011-2013 Biennial Report, it was recommended:

1. It is proposed that for 2013-2014, the monitoring programme for the Geary site remains unchanged from that for 2011-2013.
2. It is proposed that the monitoring programme for the Schrider site is modified to include the resumption of standard soil sampling of spreading areas.
3. It is proposed that, should activity resume at the Spence site, the monitoring programme be modified to include a groundwater component.

Recommendations 1 and 2 were implemented, but the Company did not resume activity at the Spence site, so recommendation 3 will be repeated in the 2014-2015 recommendations.

5.6 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki discharging to the environment.

It is proposed that for 2014-2015, the monitoring programme for the Geary site remains unchanged from that for 2013-2014.

It is proposed that the monitoring programme for the Schrider site remains unchanged from that for 2013-2014.

It is proposed that, should activity resume at the Spence site, the monitoring programme be modified to include a groundwater component.

Recommendations to this effect are included in this report.

6. Recommendations

1. THAT the monitoring programme for consented activities at the Geary Landfarm in 2014-2015, remain unchanged from that for 2013-2014.
2. THAT the monitoring programme for consented activities at the Schrider Landfarm in 2014-2015, remain unchanged from that for 2013-2014.
3. THAT the monitoring programme for consented activities at the Spence Road Landfarm in the 2014-2015, remain unchanged from that for 2013-2014, unless activity resumes at the site, at which time groundwater sampling should be implemented.
4. THAT, if the intention is to permanently discontinue use of the Spence facilities, the Company investigates options for storage area reinstatement.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Al*	Aluminium.
As*	Arsenic.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
BTEX	MAH's benzene, toluene, ethylbenzene and xylene.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate .
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m ³ s ⁻¹).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus
<i>E.coli</i>	<i>escherichia coli</i> , an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m ³	grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.

Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
l/s	Litres per second.
MAHs	Monocyclic aromatic hydrocarbons, molecules consist of a single six-sided hydrocarbon ring.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
OW	Oily waste.
PAHs	Polycyclic aromatic hydrocarbons, molecules consist of more than two six-sided hydrocarbon rings.
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	Resource Management Act 1991 and including all subsequent amendments.
SBM	Synthetic based mud.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
TPH	Total petroleum hydrocarbons
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual

environmental consequences that may represent a breach of a consent or provision in a Regional Plan.

WBM

Water based mud.

Zn*

Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact the Council's laboratory.

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Appendix I

**Resource consents held by
Origin Energy Resources NZ Ltd & AR Geary**



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Please quote our file number
on all correspondence

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Origin Energy Resources NZ [Rimu] Limited
Private Bag 2022
NEW PLYMOUTH 4342

Decision Date (Change): 7 March 2012

Commencement Date (Change): 7 March 2012 (Granted: 7 December 2001)

Conditions of Consent

Consent Granted: To discharge waste drilling cuttings, muds and fluids from wells drilled with water based muds, waste drilling cuttings from wells drilled with synthetic based muds and oily wastes, from hydrocarbon exploration and production operations onto and into land at or about (NZTM) 1722014E-5601830N

Expiry Date: 1 June 2016

Review Date(s): June 2012

Site Location: Kauri-C wellsite, Spence Road, Kakaramea
(Property owner: G & W Vanner)

Legal Description: Sec 486 Pt Sec 461 Sbdn 4 of Sec 637 Blk II Carlyle SD
(Discharge site)

Catchment: Kaikura

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*
www.trc.govt.nz

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. For the purposes of this consent the following definitions shall apply:
 - a) stockpiling means a discharge of drilling wastes from vehicles, tanks, or other containers onto land, but without subsequently spreading, or incorporating the discharged material into the soil within 24 hours; and
 - b) landfarming means the discharge of drilling waste onto land, subsequent spreading and incorporation into the soil, and includes any stripping and relaying of topsoil.
2. The consent holder shall adopt the best practicable option [as defined section 2 of the Resource Management Act 1991] to prevent or minimise any actual or potential effects on the environment arising from the discharge.

Management plan, notification, monitoring and reporting

3. The consent holder shall maintain, to the written satisfaction of the Chief Executive, Taranaki Regional Council, a management plan to confirm that the activity will be conducted to comply with all of the conditions of this consent. The management plan shall include as a minimum:
 - a) procedures for notification to Council of disposal activities;
 - b) procedures for the receipt and stockpiling of drilling wastes onto the site;
 - c) methods used for the mixing and testing of different waste types;
 - d) procedures for landfarming drilling wastes [including means of transfer from stockpiling area, means of spreading, and incorporation into the soil];
 - e) procedures for sowing landfarmed areas;
 - f) contingency procedures;
 - g) sampling regime and methodology;
 - h) post-landfarming management, monitoring and site reinstatement; and
 - i) control of site access.
4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, [by emailing worknotification@trc.govt.nz] at least 48 hours prior to permitting drilling wastes onto the site for stockpiling, from each well drilled. Notification shall include the following information:
 - a) the consent number;
 - b) the name of the well[s] from which the waste was generated;
 - c) the type of waste to be stockpiled;
 - d) the volume of waste to be stockpiled; and
 - e) for oily wastes the concentration of total petroleum hydrocarbons [C₆-C₉, C₁₀-C₁₄, and C₁₅-C₃₆], polycyclic aromatic hydrocarbons [PAH], and benzene, toluene, ethylbenzene and xylenes [BTEX].

5. The consent holder shall notify the Chief Executive, Taranaki Regional Council, [by emailing worknotification@trc.govt.nz.] at least 48 hours prior to landfarming stockpiled material. Notification shall include the following information:
 - a) the consent number;
 - b) the name of the well[s] from which the waste was generated;
 - c) the type of waste to be landfarmed;
 - d) the volume and weight of the waste to be landfarmed;
 - e) the concentration of chlorides, nitrogen and total petroleum hydrocarbons hydrocarbons in the waste; and
 - f) the specific location and area over which the waste will be landfarmed.

6. The consent holder shall keep records of the following:
 - a) wastes from each individual well [including records of all additives used at the wellsite during the drilling process];
 - b) composition of wastes [including concentrations of chloride, nitrogen and total petroleum hydrocarbons];
 - c) stockpiling area[s];
 - d) volumes of material stockpiled
 - e) landfarming area[s], including a map showing individual disposal areas with GPS co-ordinates;
 - f) volumes and weights of wastes landfarmed;
 - g) dates of commencement and completion of stockpiling and landfarming events;
 - h) dates of sowing landfarmed areas;
 - i) treatments applied;
 - j) details of monitoring, including sampling locations, sampling methods and the results of analysis;

and shall make the records available to the Chief Executive, Taranaki Regional Council.

Discharge limits

7. For the purposes of landfarming, drilling wastes shall be applied to land in a layer not exceeding:
 - a) 100 mm thick for wastes with a hydrocarbon concentration less than 50,000 mg/kg dry weight; or
 - b) 50 mm thick for wastes with a hydrocarbon concentration equal to or greater than 50,000 mg/kg dry weight; and
 - c) in a rate and manner such that no ponded liquids remain after one hour, for all wastes;

prior to incorporation into the soil.

8. As soon as practicable following the application of drilling wastes to land in accordance with condition 7 of this consent, the consent holder shall incorporate the wastes into the soil to a depth of at least 250 mm, so that the hydrocarbon concentration in the soil/waste mix is less than:
- a) 50,000 mg/kg dry weight, anywhere in the 250 mm layer below the topsoil layer, for water based drilling wastes and drilling cuttings from wells drilled with synthetic based muds; or
 - b) 15,000 mg/kg dry weight, anywhere in the 250 mm layer below the topsoil layer, for oily wastes, or drilling cuttings from wells drilled with oil based muds.

Operational requirements

9. No discharge shall take place within 25 metres of surface water or property boundaries, or within 6 horizontal metres of the existing gas pipelines.
10. The exercise of this consent is limited to wastes generated within the Taranaki region.
11. The exercise of this consent shall not result in the destabilisation of neighbouring land.
12. All material must be landfarmed as soon as practicable, but no later than twelve months after being brought onto the site.
13. As soon as practicable following landfarming, areas shall be sown into pasture [or into crop]. The consent holder shall monitor revegetation and if adequate establishment is not achieved within two months of sowing, shall undertake appropriate land stabilisation measures to minimise wind and stormwater erosion.

Receiving environment limits - water

14. The exercise of this consent, including the design, management and implementation of the discharge, shall not lead or be liable to lead to contaminants entering a surface water body.
15. The exercise of the resource consent shall not result in any adverse impacts to groundwater as a result of leaching, and surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.
16. The discharge shall not give rise to any of the following effects in the adjacent surface water body of the Kaikura Stream:
- a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.

17. The exercise of this consent shall not result in a level of total dissolved salts within any surface or groundwater of more than 2500 gm⁻³.

Receiving environment limits - soil

18. The conductivity of the soil/waste layer after application shall be less than 400 mSm⁻¹, or alternatively, if the background soil conductivity exceeds 400 mSm⁻¹, the application of waste shall not increase the soil conductivity within the upper 20 cm by more than 100 mSm⁻¹.
19. The sodium absorption ratio [SAR] of the soil/waste layer after application shall be less than 18.0, or alternatively if the background soil SAR exceeds 18.0, the application of waste shall not increase the SAR by more than 1.0.
20. At any time the levels of metals in the soil shall comply with the guidelines for heavy metals in soil set out in Table 7.1, Section 7 of the Ministry for the Environment and New Zealand Water & Wastes Association's Guidelines for the safe application of biosolids to land in New Zealand [2003].
21. At the time of expiry, cancellation, or surrender of this consent soil levels shall not exceed the following limits: conductivity, 290 mSm⁻¹; total soluble salts, 2500 mg/kg; sodium, 460 mg/kg; and chloride, 700 mg/kg.
22. At the time of expiry, cancellation, or surrender of this consent the levels of hydrocarbons in the soil shall comply with the guideline values for sandy soil in the surface layer [less than 1 metre depth] set out in Tables 4.12 and 4.15 of the Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand [Ministry for the Environment, 1999].

Review

23. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2012, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 March 2012

For and on behalf of
Taranaki Regional Council



Director-Resource Management



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Please quote our file number
on all correspondence

**Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

Name of Consent Holder: Origin Energy Resources NZ [Rimu] Limited
Private Bag 2022
NEW PLYMOUTH 4342

Change To Conditions Date: 10 February 2010 [Granted: 6 March 2003]

Conditions of Consent

Consent Granted: To discharge drilling cuttings and fluids from drilling operations with water based muds, drilling cuttings from wells drilled with synthetic based muds, drilling cuttings from wells drilled with oil based muds, and oily wastes, onto and into land via land farming at or about (NZTM) 1719054E-5605073N

Expiry Date: 1 June 2022

Review Date(s): June 2010, June 2012, June 2016

Site Location: Kauri-F wellsite, Corner of Lower Manutahi Road and Lower Taumaha Road [both unformed], Manutahi [Property owners: N Schrider & P Campbell]

Legal Description: Road Reserve & Lot 3 DP 14551 & Lot 8 DP 14552 Blk I Carlyle SD

Catchment: Waikaikai

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

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Doc# 720652-v1

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. For the purposes of this consent the following definitions shall apply:
 - a) stockpiling means a discharge of drilling wastes from vehicles, tanks, or other containers onto land, but without subsequently spreading, or incorporating the discharged material into the soil within 24 hours; and
 - b) landfarming means the discharge of drilling waste onto land, subsequent spreading and incorporation into the soil, and includes any stripping and relaying of topsoil.
2. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

Notification and sampling requirements prior to discharge

3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, [by emailing worknotification@trc.govt.nz.] at least 48 hours prior to permitting drilling wastes onto the site for stockpiling, from each well drilled. Notification shall include the following information:
 - a) the consent number;
 - b) the name of the well[s] from which the waste was generated;
 - c) the type of waste to be stockpiled; and
 - d) the volume of waste to be stockpiled.
4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, [by emailing worknotification@trc.govt.nz.] at least 48 hours prior to landfarming stockpiled material. Notification shall include the following information:
 - a) the consent number;
 - b) the name of the well[s] from which the waste was generated;
 - c) the type of waste to be landfarmed;
 - d) the volume and weight of the waste to be landfarmed;
 - e) the concentration of chlorides, nitrogen and total petroleum hydrocarbons hydrocarbons in the waste;
 - f) for oily wastes the concentration of total petroleum hydrocarbons [C6-C9, C10-C14, and C15-C36], polycyclic aromatic hydrocarbons [PAH], and benzene, toluene, ethylbenzene and xylenes [BTEX]; and
 - g) the specific location and area over which the waste will be landfarmed.

Consent 6135-1

5. Prior to discharge/disposal of drilling cuttings from wells drilled with oil based muds from any well, the consent holder shall provide the Chief Executive, Taranaki Regional Council:
- a) information on location of discharge area;
 - b) records of all additives used during the drilling process;
 - c) a representative chemical analysis of the material to be discharged from each well [from a composite sample, including: concentrations of nitrogen, chloride, pH, K, Ca, Mg, Na, total petroleum hydrocarbon [TPH] composition in the ranges C₆-C₉, C₁₀-C₁₄ and C₁₅-C₃₆, polynuclear aromatic hydrocarbon [PAH] composition, density, and BTEX]; and
 - d) results of leachate testing.

Discharge Limits

6. For the purposes of landfarming, drilling wastes shall be applied to land in a layer not exceeding:
- a) 100 mm thick for wastes with a hydrocarbon concentration less than 50,000 mg/kg dry weight; or
 - b) 50 mm thick for wastes with a hydrocarbon concentration equal to or greater than 50,000 mg/kg dry weight;
 - c) 20 mm thick for drilling cuttings from wells drilled with oil based muds [once mixed 1:1 with an absorbent material such as sawdust] regardless of the hydrocarbon concentration; and
 - d) in a rate and manner such that no ponded liquids remain after one hour, for all wastes;
- prior to incorporation into the soil.
7. As soon as practicable following the application of drilling wastes to land in accordance with condition 6 of this consent, the consent holder shall incorporate the wastes into the soil to a depth of at least 250 mm, so that the hydrocarbon concentration in the soil/waste mix is less than:
- a) 50,000 mg/kg dry weight, anywhere in the 250 mm layer below the topsoil layer, for water based drilling wastes and drilling cuttings from wells drilled with synthetic based muds; or
 - b) 15,000 mg/kg dry weight, anywhere in the 250 mm layer below the topsoil layer, for oily wastes, or drilling cuttings from wells drilled with oil based muds.

Operational requirements

8. As soon as practicable following landfarming, areas shall be sown into pasture [or into crop]. The consent holder shall monitor revegetation and if adequate establishment is not achieved within two months of sowing, shall undertake appropriate land stabilisation measures to minimise wind and stormwater erosion.

Consent 6135-1

9. The consent holder shall ensure that areas used for the stockpiling and disposal of water based drilling wastes are kept separate and distinct from areas utilised for the stockpiling and disposal of cuttings from wells drilled with synthetic based muds. Further, stockpile and disposal areas for individual wells shall also be kept separate and distinct. For the purpose of this consent condition 'disposal' means spreading, tilling or layering.
10. The consent holder shall ensure that areas for the disposal of oily wastes and drilling cuttings from wells drilled with oil based muds are kept separate and distinct, with either a buffer or bunding, from areas utilised for the stockpiling and disposal of wastes from wells drilled with water based mud and/or cuttings from wells drilled with synthetic based muds.
11. No discharge shall take place within 25 metres of surface water or property boundaries [with the exception of the northwest property boundary where discharge may take place right up to that boundary], or within 6 horizontal metres of the existing gas pipelines.
12. The exercise of this consent is limited to wastes generated within the Taranaki region.
13. The stockpiling of material authorised by this consent shall be limited to a maximum volume of 2000 cubic metres at any one time on the property. In any case all stockpiled material must be landfarmed within eight months of being brought onto the site.
14. There shall be no stockpiling of oily wastes, or drilling cuttings from wells drilled with oil based muds.
15. The discharge of drilling cuttings from wells drilled with oil based muds, is limited, in the first instance, to wastes generated at the Manutahi-A, Manutahi-B, Manutahi-C, Manutahi-D, Manutahi-G, and Kauri-C wellsites. The discharge of wastes from other wells drilled with oil based muds shall not be allowed until such time that the Chief Executive, Taranaki Regional Council, has received all information required under special conditions 5 and 30, and considered the need for a review under special condition 31.
16. The area used for disposal of drilling cuttings from wells drilled with oil based muds is limited to 10,000 square metres per well.
17. The maximum rate of nitrogen application [excluding stockpiling] shall not exceed 200 kg/ha.
18. The exercise of this consent shall not result in the destabilisation of neighbouring land.

Receiving environment limits - soil

19. The conductivity of the soil/waste layer after landfarming shall be less than 400 mSm⁻¹, or alternatively, if the background soil conductivity exceeds 400 mSm⁻¹, the application of waste shall not increase the soil conductivity by more than 100 mSm⁻¹.
20. The sodium absorption ratio [SAR] of the soil/waste layer containing the discharge shall be less than 18.0, or alternatively if the background soil SAR exceeds 18.0, the application of waste shall not increase the SAR by more than 1.0.

Consent 6135-1

21. At any time the levels of metals in the soil shall comply with the guidelines for heavy metals in soil set out in Table 7.1, Section 7 of the Ministry for the Environment and New Zealand Water & Wastes Association's Guidelines for the Disposal for the safe application of biosolids to land in New Zealand [2003].
22. At the time of expiry, cancellation, or surrender of this consent the levels of hydrocarbons in the soil shall comply with the guideline values for sandy soil in the surface layer [less than 1 metre depth] set out in Tables 4.12 and 4.15 of the Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand [Ministry for the Environment, 1999].
23. At the time of expiry, cancellation, or surrender of this consent soil levels shall not exceed the following limits: conductivity, 290 mSm⁻¹; total soluble salts, 2500 mg/kg; sodium, 460 mg/kg; and chloride, mg/kg.

Receiving environment limits - water

24. The exercise of this consent shall not result in a level of total dissolved salts within any surface water or groundwater of more than 2500 gm⁻³.
25. The exercise of this consent, including the design, management and implementation of the discharge [including but not limited to stockpiling on land and/or discharge onto and into land], shall not lead or be liable to lead to contaminants entering a surface water body by direct surface overland flow.
26. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or on surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.
27. The exercise of this consent shall not result in any of the following effects on surface water:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.

Receiving environment limits - air

28. The discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:
 - a) dust deposition rate 0.13 g/m²/day; and/or
 - b) suspended dust level 0.15 mg/m³.

29. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.

Monitoring and reporting

30. The consent holder shall keep records of the following:
- a) wastes from each individual well [including records of all additives used at the wellsite during the drilling process]. For oily wastes, records shall include source, date collected, waste description and volume;
 - b) stockpiling area[s];
 - c) landfarming area[s], including a map showing individual disposal areas with GPS co-ordinates;
 - d) composition of material [including concentrations of nitrogen, chloride and total hydrocarbons];
 - e) PAH composition of oily wastes, and drilling cuttings from each well drilled with oil based muds;
 - f) volumes of material stockpiled;
 - g) volumes and weights of material landfarmed;
 - h) dates of commencement and completion of stockpiling and landfarming;
 - i) dates of sowing landfarmed areas;
 - j) treatments applied;
 - k) details of monitoring, including sampling locations, sampling methods and the results of analysis;

and shall make the records available to the Chief Executive, Taranaki Regional Council, upon request.

31. The consent holder shall collect and analyse a composite representative sample of the surface soil-waste layer [to a depth of 250 mm] on three occasions after the application drilling cuttings from wells drilled with oil based muds to land. The analysis shall include the analyses listed in condition 6. The three occasions shall be:
- a) within one month of the discharge;
 - b) after three months, but before four months of the discharge; and
 - c) after six months but before eight months of the discharge.

The results of these analyses shall be provided to the Council within nine months of the exercise of this consent in respect of the disposal of oil based muds, cuttings and wastes from any one well.

Review

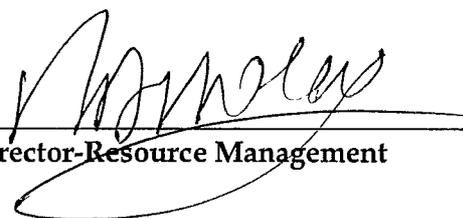
32. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this consent, including the exclusion of drilling cuttings from wells drilled with oil based muds, by giving notice of review within three months of the receipt of any information required under condition 30.

Consent 6135-1

33. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2012 and/or June 2016, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 10 February 2010

For and on behalf of
Taranaki Regional Council



Director-Resource Management



Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

Name of
Consent Holder: A R Geary
Geary Road
R D 2
PATEA

Change To
Conditions Date:  2 July 2002 [Granted: 28 May 1998]

Conditions of Consent

Consent Granted: To discharge drilling mud, fluids and cuttings from well drilling operations with water based muds, and to discharge drilling cuttings from wells drilled with synthetic based muds onto and into land at or about GR: Q21:288-681 

Expiry Date: 1 June 2016

Review Date(s): June 2004, June 2010

Site Location: Geary Road, Manutahi, Patea

Legal Description: Road Reserve, Lot 2 DP 5346 Pt Sec 485 Lots 1, 9, 10, 13
DP 14551 Patea Dist Blk I Carlyle SD

Catchment: Waikaikai

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.



Special conditions

1. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of the application and to ensure that the conditions of this consent are met at all times.
2. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
3. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to commencement of each discharge operation at the site.
4. The consent holder shall ensure that areas for the disposal of water based drilling wastes are kept separate and distinct from areas utilised for the disposal of cuttings from wells drilled with synthetic based muds. Further, disposal areas for individual wells shall also be kept separate and distinct.
5. The consent holder shall keep records of the wastes from each individual well [including records of all additives used at the wellsite during the drilling process], the disposal area[s], composition [including concentrations of nitrogen, chloride and hydrocarbons] and volumes of material discharged, times of discharge events, and treatments applied, and shall make the records available to the Chief Executive, Taranaki Regional Council upon request.
6. The exercise of this consent is limited to wastes generated within the Taranaki region.
7. No discharge shall take place within 25 metres of surface water or property boundaries.
8. The exercise of this consent shall not result in the destabilisation of neighbouring land.
9. The rate of discharge shall be limited to an application depth of 150 mm of waste solids.
10. The hydrocarbon content in the waste prior to discharge at the site, including discharge into the treatment rows prior to final land application/incorporation shall be less than 5%.
11. The electroconductivity of the soil/waste layer after application shall be less than 400 mSm^{-1} , or alternatively, if the background soil electroconductivity exceeds 400 mSm^{-1} , the application of waste shall not increase the soil electroconductivity within the upper 20 cm by more than 100 mSm^{-1} .

Consent 5325-1

12. The sodium absorption ratio [SAR] of the soil/waste layer after application shall be less than 18.0, or alternatively if the background soil SAR exceeds 18.0, the application of waste shall not increase the SAR by more than 1.0.
13. The maximum rate of chloride application after discharge into the soil shall not exceed 800 kg Cl/ha/year.
14. The maximum rate of nitrogen application after discharge to the soil shall not exceed 200 kgN/ha/year.
15. Prior to the expiry, cancellation, or surrender of this consent the levels of hydrocarbons in the soil shall comply with the guideline values for sandy soil in the surface layer [less than 1 metre depth] set out in Tables 4.12 and 4.15 of the Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand [Ministry for the Environment, 1997].
16. The levels of metals in the soil shall comply with the guidelines for heavy metals in soil set out in the Department of Health's Guidelines for the Disposal of Sewerage Sludge to Land [1992].
17. The exercise of this consent shall not result in a level of total dissolved salts within any surface or groundwater of more than 2500 gm⁻³.
18. Prior to the expiry, cancellation, or surrender of this consent soil levels will not exceed the following limits: conductivity, 290 mSm⁻¹; total dissolved salts, 2500 gm⁻³; sodium, 460 gm⁻³; and chloride, 700 gm⁻³.
19. The discharge area shall be tilled and resown to pasture [or into crop] as soon as practicable following completion of the discharge.
20. The exercise of this consent, including the design, management and implementation of the discharge, shall not lead or be liable to lead to contaminants entering a surface waterbody.
21. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or on surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.
22. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 2 July 2002

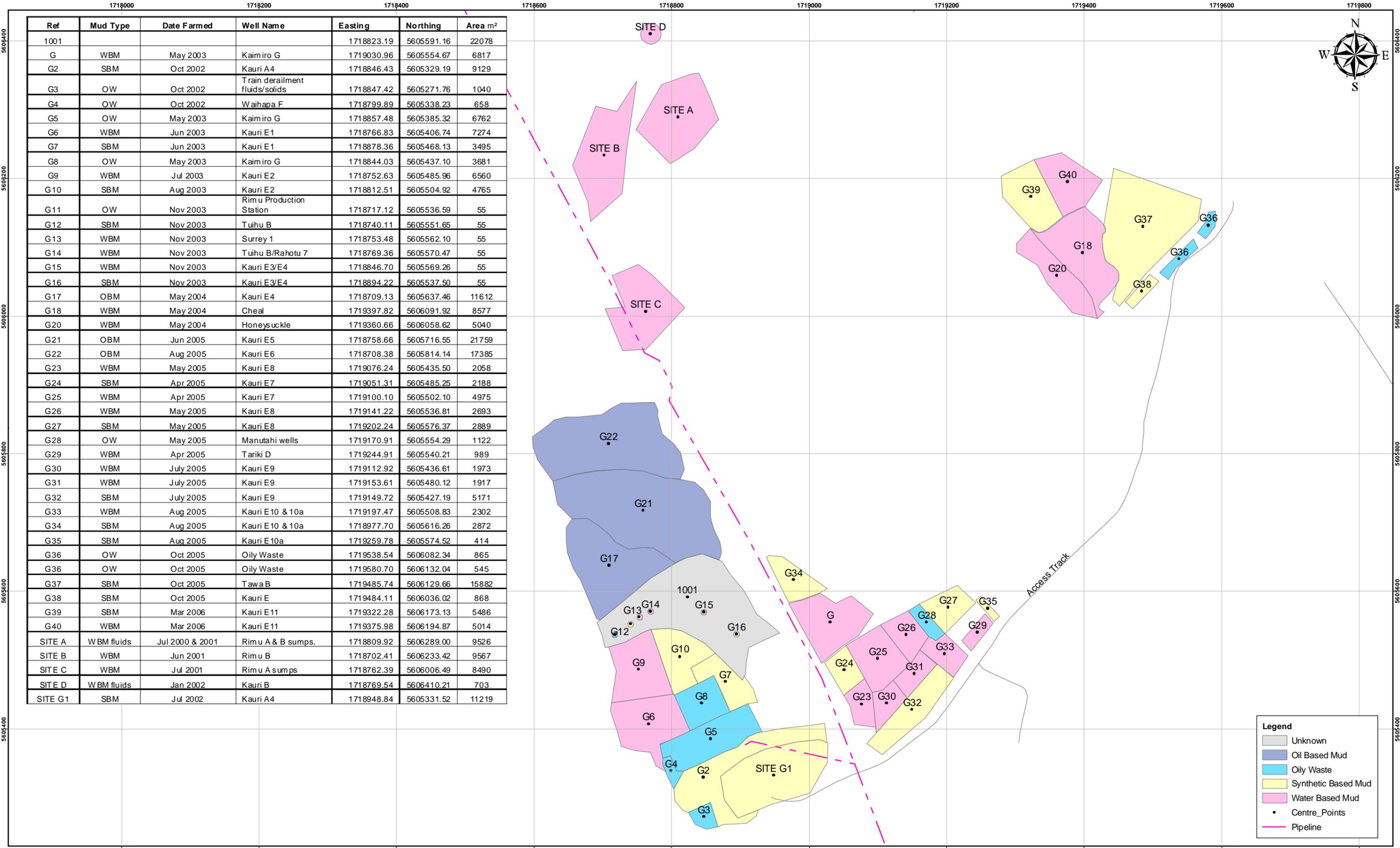
For and on behalf of
Taranaki Regional Council



Director-Resource Management

Appendix II

Maps of Landfarmed Sites



Ref	Mud Type	Date Farmed	Well Name	Easting	Northing	Area m ²
1001				1718823.19	5605591.16	22078
G	WBM	May 2003	Kaimiro G	1719030.96	5605554.67	6817
G2	SBM	Oct 2002	Kauri A4	1718846.43	5605329.19	9129
G3	OW	Oct 2002	Train derailment fluids/solids	1718847.42	5605271.76	1040
G4	OW	Oct 2002	Waihapa F	1718799.89	5605338.23	658
G5	OW	May 2003	Kaimiro G	1718857.48	5605385.32	6762
G6	WBM	Jun 2003	Kauri E1	1718766.83	5605406.74	7274
G7	SBM	Jun 2003	Kauri E1	1718878.36	5605468.13	3495
G8	OW	May 2003	Kaimiro G	1718844.03	5605437.10	3681
G9	WBM	Jul 2003	Kauri E2	1718752.63	5605485.96	6560
G10	SBM	Aug 2003	Kauri E2	1718812.51	5605504.92	4765
G11	OW	Nov 2003	Rimu Production Station	1718717.12	5605536.59	55
G12	SBM	Nov 2003	Tuihu B	1718740.11	5605551.65	55
G13	WBM	Nov 2003	Surrey 1	1718753.48	5605562.10	55
G14	WBM	Nov 2003	Tuihu B/Rahotu 7	1718769.36	5605570.47	55
G15	WBM	Nov 2003	Kauri E3/E4	1718846.70	5605569.26	55
G16	SBM	Nov 2003	Kauri E3/E4	1718894.22	5605537.50	55
G17	OBM	May 2004	Kauri E4	1718709.13	5605637.46	11612
G18	WBM	May 2004	Cheal	1719397.82	5606091.92	8577
G20	WBM	May 2004	Honeysuckle	1719360.66	5606058.62	5040
G21	OBM	Jun 2005	Kauri E5	1718758.66	5605716.55	21759
G22	OBM	Aug 2005	Kauri E6	1718708.38	5605814.14	17385
G23	WBM	May 2005	Kauri E8	1719076.24	5605435.50	2058
G24	SBM	Apr 2005	Kauri E7	1719051.31	5605485.25	2188
G25	WBM	Apr 2005	Kauri E7	1719100.10	5605502.10	4975
G26	WBM	May 2005	Kauri E8	1719141.22	5605536.81	2693
G27	SBM	May 2005	Kauri E8	1719202.24	5605576.37	2889
G28	OW	May 2005	Manutahi wells	1719170.91	5605554.29	1122
G29	WBM	Apr 2005	Tariki D	1719244.91	5605540.21	989
G30	WBM	July 2005	Kauri E9	1719112.92	5605436.61	1973
G31	WBM	July 2005	Kauri E9	1719153.61	5605480.12	1917
G32	SBM	July 2005	Kauri E9	1719149.72	5605427.19	5171
G33	WBM	Aug 2005	Kauri E10 & 10a	1719197.47	5605508.83	2302
G34	SBM	Aug 2005	Kauri E10 & 10a	1718977.70	5605616.26	2872
G35	SBM	Aug 2005	Kauri E10a	1719259.78	5605574.52	414
G36	OW	Oct 2005	Oily Waste	1719538.54	5606082.34	865
G36	OW	Oct 2005	Oily Waste	1719580.70	5606132.04	545
G37	SBM	Oct 2005	Tawa B	1719485.74	5606129.66	15882
G38	SBM	Oct 2005	Kauri E	1719484.11	5606036.02	868
G39	SBM	Mar 2006	Kauri E11	1719322.28	5606173.13	5486
G40	WBM	Mar 2006	Kauri E11	1719375.98	5606194.87	5014
SITE A	WBM fluids	Jul 2000 & 2001	Rimu A & B sumps.	1718809.92	5606289.00	9526
SITE B	WBM	Jun 2001	Rimu B	1718702.41	5606233.42	9567
SITE C	WBM	Jul 2001	Rimu A sumps	1718762.39	5606006.49	8490
SITE D	WBM fluids	Jan 2002	Kauri B	1718769.54	5606410.21	703
SITE G1	SBM	Jul 2002	Kauri A4	1718948.84	5605331.52	11219

Legend	
[Grey Box]	Unknown
[Blue Box]	Oil Based Mud
[Light Blue Box]	Oily Waste
[Yellow Box]	Synthetic Based Mud
[Pink Box]	Water Based Mud
[Black Dot]	Centre Points
[Pink Line]	Pipeline

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Nb	DATE	BY	CH	AP	OP	DESCRIPTION

DRAWN	THOMPSON	14/11/08
CHECKED	JOINES	DATE
PROJECT Nb.	02234	
LOCATION	MANUTAHU	
ORIGINAL SIZE	A3	
SCALE	1:5,000	

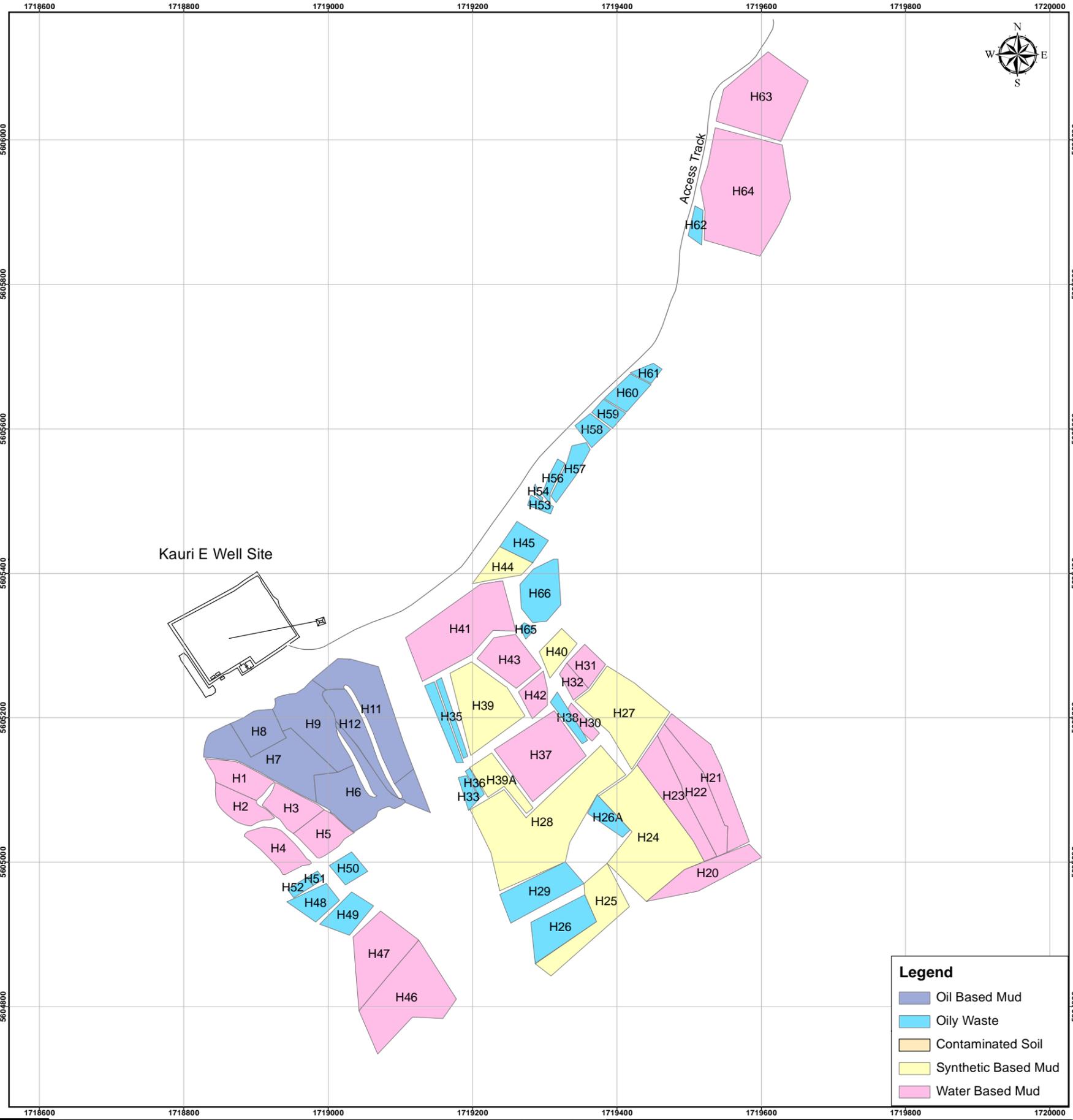
GEARY ROAD DISPOSAL SITE

0 40 80 160 240 320
Meters

Origin energy

DRAWING Nb: **02234-02-GIS** REVISION: **0**

Ref.	Mud Type	Date Farmed	Well Name	Easting	Northing	Area m ²	Volume m ³
H1	WBM	Jun 2004	Manutahi B	1718877	5605117	2890	
H2	WBM	Jun 2004	Manutahi A	1718878	5605077	2488	
H3	WBM	Jul 2004	Manutahi D	1718949	5605075	2996	
H4	WBM	Jun 2004	Kauri E5	1718931	5605019	2984	
H5	WBM	Jul 2004	Manutahi C	1718993	5605039	2917	
H6	OBM	Jul 2004	Manutahi D	1719035	5605098	6943	
H7	OBM	Jun 2004	Manutahi A	1718924	5605143	7965	
H8	OBM	Aug 2004	Kauri C	1718904	5605182	3031	
H9	OBM	Jun 2004	Manutahi B	1718979	5605192	6570	
H11	OBM	Jul 2004	Manutahi G	1719060	5605212	7922	
H12	OBM	Jul 2004	Manutahi C	1719030	5605192	4838	
H20	WBM	Jan 2006	Pohutukawa A	1719526	5604985	4087	
H21	WBM	Mar 2006	Goss A	1719531	5605115	5357	
H22	WBM	Mar 2006	Kauri E12	1719510	5605098	5518	
H23	WBM	Feb 2006	Trapper A	1719479	5605093	5059	
H24	SBM	Feb 2006	Trapper A	1719444	5605035	13480	
H25	SBM	Mar 2006	Kauri E12	1719385	5604947	5323	
H26	OW	Feb 2006	Oily Waste	1719322	5604911	4289	
H26A	OW	Mar 2006	Oily Waste	1719387	5605063	1338	
H27	SBM	Apr 2006	Kauri E12	1719410	5605207	8636	
H28	SBM	Mar 2006	Goss A	1719296	5605056	17012	
H29	OW	Jun 2006	Oily Waste	1719293	5604960	4402	
H30	WBM	Aug 2006	Waihapa C MBC sump	1719350	5605194	925	
H31	WBM	Sept 2006	Waihapa C	1719358	5605273	1645	
H32	WBM	Sept 2006	Waihapa H	1719339	5605249	936	
H33	OW	Oct 2006	Oily Waste	1719194	5605098	662	
H34	OW	Oct 2006	Waihapa C Oily waste	1719160	5605197	1416	
H35	OW	Feb 2007	Rimu PS Glycol OW	1719171	5605202	892	
H36	OW	Dec 2006	Oily Waste	1719203	5605110	308	
H37	WBM	Feb 2007	Trapper A sump	1719295	5605149	8138	
H38	OW	Feb 2007	Oily Waste	1719332	5605201	960	
H39	SBM	Feb 2007	Kauri E12 tank waste	1719215	5605217	7310	
H39A	SBM	Feb 2007	Kauri E12 tank waste	1719235	5605114	2491	
H40	SBM	Feb 2007	Trapper A	1719317	5605292	1709	
H41	WBM	Feb 2007	Goss A sump	1719183	5605323	10487	
H42	WBM	May 2007	Waihapa C Sump	1719287	5605231	1529	
H43	WBM	May 2007	Waihapa H Sump	1719251	5605280	3666	
H44	SBM	Aug 2007	Goss A SBM	1719242	5605410	2061	
H45	OW	Aug 2007	RPS Oily Waste	1719271	5605443	2037	
H46	WBM	Aug 2007	Piakau A	1719109	5604813	9840	
H47	WBM	Aug 2007	Ahuroa B	1719070	5604874	6339	
H48	OW	Sept 2007	WPS Oily Waste	1718982	5604945	1919	
H49	OW	Oct 2007	Oily Waste	1719027	5604928	2187	
H50	OW	May 2008	RPS Oily Waste	1719028	5604992	1255	
H51	OW	July 2008	RPS Glycol Waste	1718982	5604978	237	
H52	OW	July 2008	Oily Waste	1718961	5604965	452	
H53	OW	Sept 2008	Tariki A contaminated metal	1719294	5605495	437	
H54	OW	Sept 2008	Kauri F contaminated metal	1719291	5605507	45	
H55	OW	Sept 2008	Manutahi D contaminated metal	1719287	5605518	24	
H56	OW	Sept 2008	Waihapa Production Station Cleanings	1719311	5605530	648	
H57	OW	Sept 2008	Rimu Production Station	1719336	5605544	1565	
H58	OW	June 2009	Rimu A Contaminated Soil	1719365	5605599	1179	40
H59	OW	June 2009	Rimu A Oily Waste	1719388	5605621	933	20
H60	OW	June 2009	Rimu A Oily Waste	1719415	5605650	1675	100
H61	OW	June 2009	Waihapa Production Station	1719445	5605677	608	30
H62	OW	June 2010	Oily waste from cleaning (various sources)	1719274	5605322	250	3.5
H63	WBM	June 2010	Ahuroa B3	1719600	5606060	9496	768
H64	WBM	June 2010	Kauri F	1719575	5605929	16571	1406
H65	OW	Aug 2009	Oily waste from cleaning old waste pits	1719274	5605322	250	10
H66	OW	March 2011	Kauri E	1719293	5605372	3707	



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No	DATE	BY	CH	DESCRIPTION
7	23/08/11	BO	GA	Add H66.
6	11/08/10	PT	DF	Add a volume to H65 in the table.
5	28/06/10	PT	PS	Adjust H64 & H62.
4	25/06/10	PT	PS	Add H62 & H65 and amend areas.
3	23/06/10	PT	PS	Add disposal areas H63 & H64
2	10/07/09	PT	GA	Add disposal areas H62
1	10/07/09	PT	GA	Add disposal areas H58, H59, H60, H61

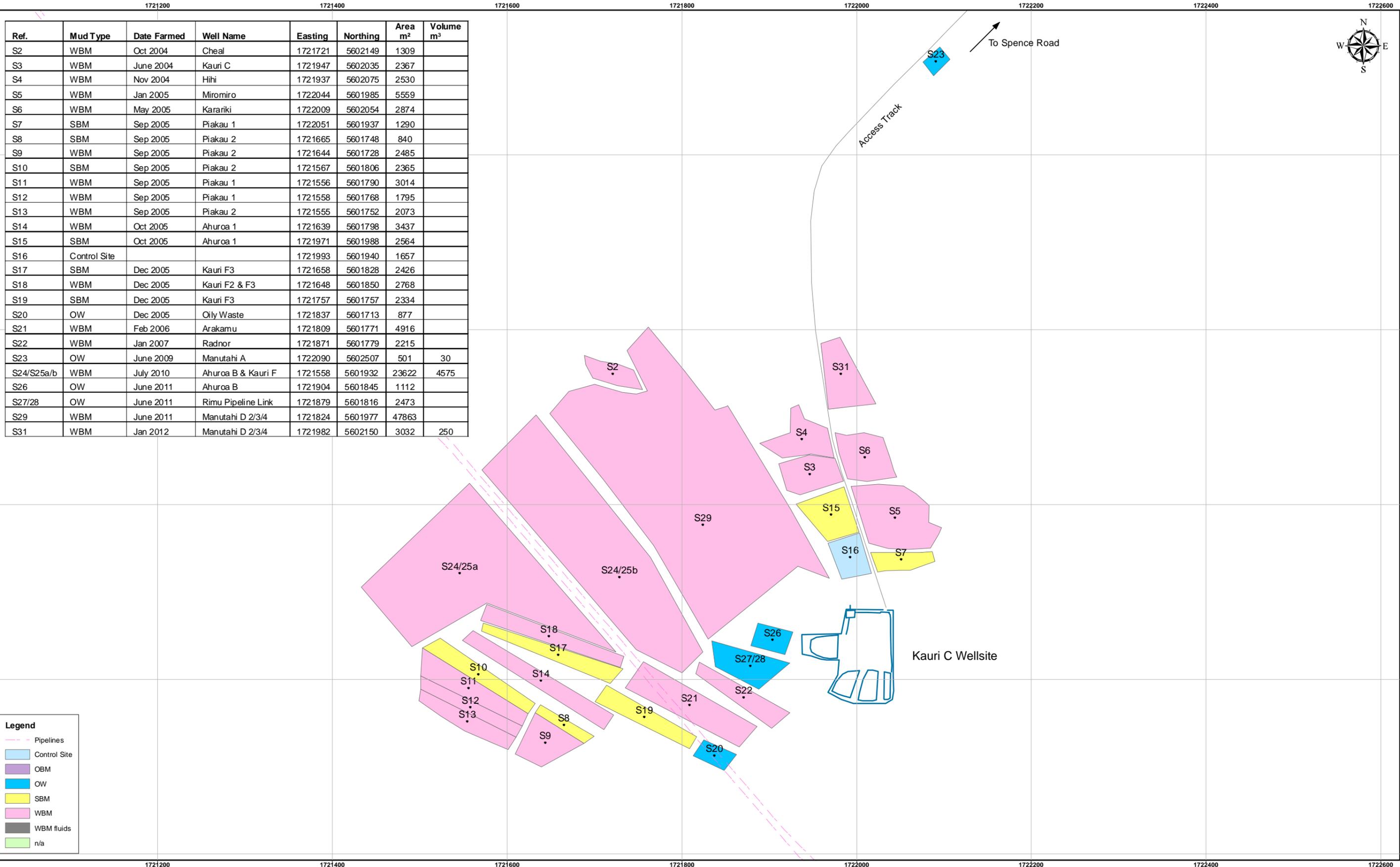
DRAWN	THOMPSON	04/11/08
CHECKED	JOINES	04/11/08
PROJECT No.	05342	
LOCATION	MANUTAH	
ORIGINAL SIZE	A3	
SCALE	1:6,000	

SCHRIDER DISPOSAL SITE

0 50 100 200 300 400
Meters

Origin energy

DRAWING No. **05342-06-GIS** REVISION **7**



Ref.	Mud Type	Date Farmed	Well Name	Easting	Northing	Area m ²	Volume m ³
S2	WBM	Oct 2004	Cheal	1721721	5602149	1309	
S3	WBM	June 2004	Kauri C	1721947	5602035	2367	
S4	WBM	Nov 2004	Hihī	1721937	5602075	2530	
S5	WBM	Jan 2005	Miromiro	1722044	5601985	5559	
S6	WBM	May 2005	Karariki	1722009	5602054	2874	
S7	SBM	Sep 2005	Piakau 1	1722051	5601937	1290	
S8	SBM	Sep 2005	Piakau 2	1721665	5601748	840	
S9	WBM	Sep 2005	Piakau 2	1721644	5601728	2485	
S10	SBM	Sep 2005	Piakau 2	1721567	5601806	2365	
S11	WBM	Sep 2005	Piakau 1	1721556	5601790	3014	
S12	WBM	Sep 2005	Piakau 1	1721558	5601768	1795	
S13	WBM	Sep 2005	Piakau 2	1721555	5601752	2073	
S14	WBM	Oct 2005	Ahuroa 1	1721639	5601798	3437	
S15	SBM	Oct 2005	Ahuroa 1	1721971	5601988	2564	
S16	Control Site			1721993	5601940	1657	
S17	SBM	Dec 2005	Kauri F3	1721658	5601828	2426	
S18	WBM	Dec 2005	Kauri F2 & F3	1721648	5601850	2768	
S19	SBM	Dec 2005	Kauri F3	1721757	5601757	2334	
S20	OW	Dec 2005	Oily Waste	1721837	5601713	877	
S21	WBM	Feb 2006	Arakamu	1721809	5601771	4916	
S22	WBM	Jan 2007	Radnor	1721871	5601779	2215	
S23	OW	June 2009	Manutahi A	1722090	5602507	501	30
S24/S25a/b	WBM	July 2010	Ahuroa B & Kauri F	1721558	5601932	23622	4575
S26	OW	June 2011	Ahuroa B	1721904	5601845	1112	
S27/28	OW	June 2011	Rimu Pipeline Link	1721879	5601816	2473	
S29	WBM	June 2011	Manutahi D 2/3/4	1721824	5601977	47863	
S31	WBM	Jan 2012	Manutahi D 2/3/4	1721982	5602150	3032	250

Legend	
	Pipelines
	Control Site
	OBM
	OW
	SBM
	WBM
	WBM fluids
	n/a

btw company
 . surveyors
 . planners
 . engineers
 . land & g+s services

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No	DATE	BY	CH	AP	OP	DESCRIPTION
7	16/01/12	JH	DR			Add disposal site S31
6	28/07/11	JH	GJ			Add disposal sites S26, S27/28, S29
5	07/02/11	JH	GJ			Merge disposal areas S24/S25a,b
4	06/10/10	PT	GJ			Adjust disposal area S24/S25a
3	16/09/10	PT	GJ			Add disposal area S24/S25a & S24/S25b
2	10/07/09	PT	GA			Add disposal area S23
1	10/07/09	PT	AJ			Add disposal area

DRAWN	THOMPSON	04/11/08
CHECKED	JOINES	04/11/08
PROJECT No.	08327	
LOCATION	MANUTAHĪ	
ORIGINAL SIZE	A3	
SCALE	1:4,000	

**SPENCE ROAD
 DISPOSAL SITE PLAN
 EXTENTS AS AT JANUARY 2011**

0 50 100 200 300
 Meters

Origin energy

DRAWING No. **08327-02-GIS** REVISION **7**