

Waste Remediation Services Ltd
Manawapou (Symes) Landfarm
Monitoring Programme
Annual Report
2018-2019

Technical Report 2019-68

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Executive summary

Waste Remediation Services Ltd (the Company) operates a landfarm (Symes Manawapou) located on Manawapou Road, near Manutahi, in the Manawapou catchment, South Taranaki. The original consent was granted in 2012 and was then transferred to the Company in June 2014. This report marks the fifth year that the Company have been in charge of the landfarm and it is the seventh report by the Council for this facility.

This report for the period July 2018 to June 2019 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds one resource consent, which includes 27 conditions setting out the requirements that the Company must satisfy. The consent permits the discharge of drilling wastes (consisting of drilling cuttings and drilling fluids from water based and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land in the practice known as landfarming.

During the monitoring period, the Company demonstrated an overall good level of environmental performance.

The Council's monitoring programme for the year under review included seven inspections, 17 water samples and six soil samples collected for physicochemical analysis.

The monitoring showed that saline impacts to groundwater (above the consent defined limit) were observed in one monitoring well on three of four occasions, and briefly in another well, on one occasion of four. The most recently landfarmed area of M1810 was required to be re-sown due to the occurrence of yellow bristle grass. Thus two seeding exercises were undertaken by the consent holder in this monitoring period.

A review of consent holder provided information indicated that no new material was brought onto the site in this monitoring period.

Soil sampling was also undertaken on the recently landfarmed area of M1810. Six soil samples were collected from this area. The analysis indicated that only one sample of six, marginally exceeded the limit of surrender for mid-range petroleum hydrocarbons. The remaining analytes, as defined in the sample analysis were within surrender and consent defined limits.

There were one unauthorised incident recording non-compliance in respect of this consent holder during the period under review. This was specifically related to the elevated salinity observed in the groundwater.

During the year, the Company demonstrated a good level of environmental and a high level of administrative performance with the resource consent.

For reference, in the 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a good level in the year under review.

This report includes recommendations for the 2019-2020 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2018 to June 2019 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Waste Remediation Services Ltd (the Company). The Company operates a landfarm, (Symes Manawapou Landfarm), situated at 156 Manawapou Road, Manutahi, in the Manawapou catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consent held by the Company, that relate to discharges to land within the Manawapou catchment.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of land and is the seventh combined annual report by the Council for this landfarm.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the Company in the Manawapou catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in the Company's site/catchment.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2019-2020 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 RMA 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 an activity, and may include cultural and social-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 (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, 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 and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

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 (that is 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 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 during investigations of incidents reported to the Council by a third party 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 during investigations of incidents reported to the Council by a third party. 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 during investigations of incidents reported to the Council by a third party. 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 performance

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 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% of the consents, a good level of environmental performance and compliance was achieved.¹

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; 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

¹ The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

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, paraffin 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 has typically been used in the Taranaki region 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 \$3-4,000/ha to \$30-40,000/ha (2013).

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

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 leveling 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 leveled 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.

Photos 1 and 2 depict different stages in the landfarming process at the Manawapou Landfarm. The landfarming process utilised at the site is on a single application basis. This means dedicated spreading

areas each receive only a single application of waste. When disposal is complete, the area will be reinstated and monitored until consent surrender criteria have been met.



Photo 1 WRS Manawapou (Symes) Landfarm post discharge and reinstatement pre-seeding 2014



Photo 2 WRS Manawapou (Symes) Landfarm post surrender 2018

1.3 Site location and description

The site is located on Manawapou Road, Manutahi, South Taranaki. This site is positioned on marginal coastal farm land situated on reworked dune fields. An extensive (100-250 m) foredune is located seaward of the consented site, and will remain undisturbed by site activities. The foredune provides a considerable natural buffer from prevailing onshore winds. A natural gas pipeline runs adjacent to the length of the site on the seaward side, marking the seaward extent of the disposal site. In addition, a QE II covenant is located in the north western end of the site, and Lake Taumaha (which is a QE II covenant and a Key Native Ecosystem) is located east of the site. The proximity of the site to these recognised ecosystems has been taken into account in the setting of buffer distances and location of the stockpiling facilities.

The predominant soil type has been identified as black loamy sand and vegetation growth is primarily a mixture of pasture and dune grasses. Test pitting and the logging of boreholes on site indicated a relatively shallow water table. Test bores were augured to 10 m in the pit area, revealing extensive compacted, low permeable clays underlying coastal dune sands. Pit construction revealed mostly tightly packed sand at the pit bases (approximately 4-5 m below surface). Average annual rainfall for the site is 1,023 mm (taken from the nearby 'Duffy' monitoring station). As with the other South Taranaki coastal sites, this site is subject to strong winds.



Site data

Location

Word descriptor:	Manawapou Road, Manutahi, Taranaki
Map reference:	E 1717244
(NZTM)	N 5608736
Mean annual rainfall:	1,023 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%

Elevation:	~40 m
Geomorphic position:	Dune backslope
Erosion / deposition:	Erosion
Vegetation:	Pasture, dune grasses
Parent material:	Aeolian deposit
Drainage class:	Free / well draining

1.4 Resource consents

The Company holds one resource consent, the details of which are summarised in the table below. Summaries of the conditions attached to the permit are set out in Section 3 of this report.

A summary of the various consent types issued by the Council is included Appendix I, as is a copy of the permit held by the Company during the period under review.

Table 1 Consent held by Company

Consent number	Purpose	Granted	Review	Expires
Discharge of wastes to land				
7795-1	To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.	May 2012	June 2022	June 2028

1.5 Monitoring programme

1.5.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

The 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 Company's site consisted of three primary components.

1.5.2 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;
- discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.5.3 Site inspections

The Manawapou Landfarm was visited on seven occasions during the monitoring period. Further visits were also undertaken during soil and groundwater sampling occasions. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.5.4 Chemical sampling

Soil and groundwater monitoring forms part of the annual compliance monitoring programme for the Manawapou Landfarm.

Groundwater monitoring

The facility, as part of its consented obligations contains an active groundwater monitoring network which is comprised of four active groundwater monitoring wells. These wells were sampled four times per annum to ascertain for seasonal fluctuation. Their aim was to assess for any potential adverse effects which may have occurred through the exercise of the consent. The sampling was conducted through a peristaltic pump. Field parameters were captured via a Yellow Springs Instrument (YSI) multi parameter probe. The samples were collected once field parameters had been stable for three consecutive readings.

Groundwater analysis parameters

- Barium (dissolved and acid soluble), chloride, conductivity (@ 25°C), sodium, total dissolved salts (TDS), pH;
- Benzene, ethylbenzene, total petroleum hydrocarbons (speciated), toluene, meta-xylene, ortho-xylene, and
- In-situ readings: pH, conductivity, dissolved oxygen (DO), oxidation and reduction potential (ORP) and temperature.

Soil monitoring

The rationale for soil sampling is primarily to assess the concentration of target contaminants within the soil, within a landfarmed area. The methodology utilised by the Council for the collection of soil samples was adapted from the Guidelines for the Safe Application of Biosolids to land in New Zealand (2003). Whereby a soil corer was inserted to a depth of 400 mm +/- to encompass the zone of application. Ten soil cores are collected, these are generally spaced 10 meters apart. These ten soil cores are then composited to gain one representative soil sample of a landfarm application area. In this monitoring period six soil samples were collected. The soil samples were subjected to the following analysis.

Soil analysis parameters

- Total heavy metals (arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc);
- Chloride, conductivity, sodium, sodium adsorption ratio (SAR) and soluble salts;
- Total petroleum hydrocarbons; poly-cyclic aromatic hydrocarbons and mono-cyclic aromatic hydrocarbons; and
- Moisture factor.

2 Results

2.1 Inspections

06 July 2018

During the inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. Pit 1 had been emptied of all muds, the muds had been spread across the area of exposed land directly west of the storage pit. The material was drying and was yet to be incorporated into the soil profile. The exposed area north of the current discharge location had been worked and the muds had been incorporated. The area was yet to have topsoil reapplied and pasture sown. On observation, pit 2 was found to be full of liquid which had a red appearance. Pit 4 contained brown stormwater. Due to the contouring of the land from the spreading area access ramp, and around the south of pit 1, stormwater discharges into pit 1. The historic spreading areas were also inspected. Pasture cover, on observation, appeared healthy and no drilling mud was identified at the soil surface.

13 August 2018

During an inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. No recent deliveries had occurred, and no further spreading had occurred either. Of the previous spread area which had muds drying out at the surface, the northern end of the spreading area had been worked and partially incorporated, while the southern end had been bunded. This will likely prevent stormwater run-off as it will discharge into pit 1. The stockpiled topsoil remained stable on inspection and was revegetating. The pit liners appeared in good repair and all pits were well below capacity.

22 November 2018

During an inspection the following was observed. No objectionable odour or visible emissions were found beyond the boundary of the site. Pit 1 and 2 both contained red liquid with essentially no surface hydrocarbons, pit 4 appeared to contain stormwater only. The balance pipe between pits 1 and 2 was blocked. The level of fluid within pit 2 was high. The outlet pipe into pit 4 was above the liquid level however. The recent spreading areas had been worked and the topsoil had been reinstated across these areas. Pasture had been sown and the strike looked good across all areas. On observation some mud had migrated to the surface in places, the mud broke apart easily on handling. The shoreline was also inspected, no adverse effects were found at the time of inspection.

26 February 2019

During an inspection the following was observed. The inspection found the recent spreading area had been sown in chicory and red clover and the strike was good across the majority of the area. A few bare patches were noted, within these areas some muds had migrated to the surface. On handling, the mud broke apart easily. Contractors whom brought equipment onto the site for landfarming had introduced yellow bristle grass onto the property and the recently sown crop will allow easier eradication of the pest plant.

The storage pits were found to contain residual product, the storage liners appeared in good repair and storage capacity was available within the pits. No drilling mud was present at the surface in the historic spreading areas and the pasture appeared healthy.

8 April 2019

During an inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. No recent land farming activities had occurred. The recent spreading areas had good chicory crop cover. There were some muds visible at the surface where the crop had not taken. The historic spreading areas had complete pasture cover which appeared healthy. No muds were identified at the

surface in these historic areas. On observation storage pit liners appeared in good state of repair, with plenty of capacity available to cope with stormwater inputs.

6 May 2019

During an inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. No recent mud deliveries had occurred. All lined pits had available stormwater capacity. No recent spreading activities had occurred. The most recent spreading area had been sprayed out and all vegetation was dead. Some muds had migrated to the surface, a typical mud odour was present and the muds broke apart easily on handling. The historic spreading areas were found to hold good pasture cover which appeared healthy, no muds were identified at the surface in those areas.

14 June 2019

During the inspection the following was observed. No objectionable odours or visible emissions were found during the inspection. No recent mud deliveries or spreading activities had occurred. The pit liners appeared in good state of repair and the pits appeared to contain stormwater only. All spreading areas had good pasture cover which appeared healthy.

2.1.1 Results of receiving environment monitoring

2.1.2 Groundwater monitoring results

Groundwater monitoring was undertaken on four occasions this monitoring period. The Manawapou Landfarm has four groundwater monitoring wells (piezometers) (Figure 1).

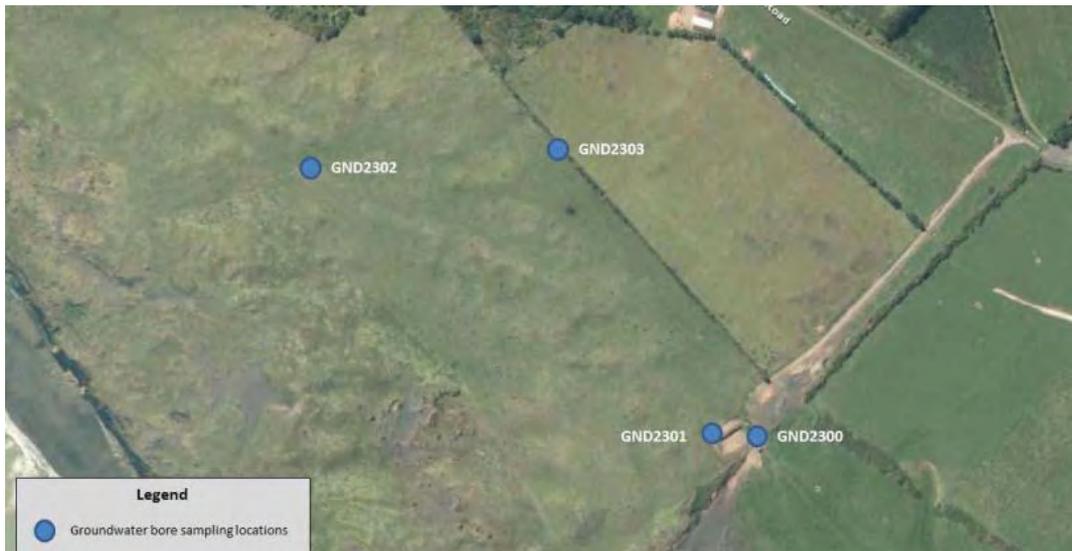


Figure 1 Groundwater monitoring well locations WRS Manawapou Landfarm

The aim of this monitoring is to assess the quality of the groundwater in both the storage cell area and also the wider landfarm area. Wells are situated in close proximity to the storage cells (GND2300 and 2301) to monitor the integrity of these storage locations and on the northern edges of the landfarm, to assess for effects of the landfarming operation (GND2302 and 2303).

The wells are monitored quarterly to account for seasonal variation. This quarterly monitoring also assesses for any potential adverse effects which may be a result of the exercise of this consent, within the Manawapou catchment.

The analysis of the four rounds of groundwater monitoring is presented in the following Tables 2-5.

Table 2 GND2300 2018-2019 monitoring period

Site		GND2300	GND2300	GND2300	GND2300
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
Temperature	°C	16.6	15.2	17.4	14.9
Electrical Conductivity (EC) 25°C	mS/m	147	339	341	350
pH	pH Units	6	6.1	6.3	6.1
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11
Dissolved Barium	g/m ³	0.058	0.101	0.088	0.079
Chloride	g/m ³	390	970	1,080	1,390
Total Sodium	g/m ³	119	260	220	183
Total Dissolved Solids (TDS)	g/m ³	950	2,400	2,200	2,600
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06	< 0.06
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7

Table 3 GND2301 2018-2019 monitoring period

Site		GND2301	GND2301	GND2301	GND2301
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
Temperature	°C	17.8	16.1	17.9	15.1
Electrical Conductivity (EC) 25°C	mS/m	75.1	124.8	114.2	97.5
pH	pH Units	6.3	6.9	7.1	6.9
Acid Soluble Barium	g/m ³	0.33	0.29	0.5	0.16
Dissolved Barium	g/m ³	0.33	0.27	0.169	0.136
Chloride	g/m ³	69	132	116	94
Total Sodium	g/m ³	82	110	97	74
Total Dissolved Solids (TDS)	g/m ³	460	750	690	590
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06	< 0.06

Site		GND2301	GND2301	GND2301	GND2301
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7

Table 4 GND2302 2018-2019 monitoring period

Site		GND2302	GND2302	GND2302	GND2302
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
Temperature	°C	15.3	15.8	17.3	14.3
Electrical Conductivity (EC) 25°C	mS/m	82.3	91.3	112.1	158
pH	pH Units	6.4	6.6	6.5	6.4
Acid Soluble Barium	g/m ³	< 0.11	< 0.11	< 0.11	< 0.11
Dissolved Barium	g/m ³	0.032	0.04	0.049	0.071
Chloride	g/m ³	163	185	260	400
Total Sodium	g/m ³	63	75	80	88
Total Dissolved Solids (TDS)	g/m ³	530	660	750	1,470
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06	< 0.06
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7

Table 5 GND2303 2018-2019 monitoring period

Site		GND2303	GND2303	GND2303	GND2303
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
Temperature	°C	14.9	15	17.9	14
Electrical Conductivity (EC) 25°C	mS/m	239	390	420	524
pH	pH Units	6.1	6.3	6.2	6.1
Acid Soluble Barium	g/m ³	0.14	0.25	0.25	0.39
Dissolved Barium	g/m ³	0.142	0.26	0.26	0.38
Chloride	g/m ³	710	1,170	1,360	1,740

Site		GND2303	GND2303	GND2303	GND2303
Parameter	Date/Unit	05 Oct 2018	05 Dec 2018	27 Feb 2019	18 Jun 2019
Total Sodium	g/m ³	147	230	220	240
Total Dissolved Solids (TDS)	g/m ³	1,560	2,900	2,900	3,900
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06	< 0.06
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7	< 0.7

The groundwater monitoring indicated the following:

No benzene, toluene, ethylbenzene, or xylenes (BTEX) was reported above the limit of detection, as set by the laboratory, across all four wells during the monitoring period.

No total petroleum hydrocarbon (C₇-C₉, C₁₀-C₁₄, C₁₅-C₃₆) results were reported above the limit of detection, as set by the laboratory, across all four wells during the monitoring period.

Total dissolved solids/salts (TDS) indicated a range of values across the four monitoring wells this period. There is a specific consent defined value in respect of TDS in groundwater, in condition 18 of consent 7795-1. This condition states that the exercise of consent shall not result in a value of TDS within a freshwater body of greater than 2,500 g/m³.

The monitoring indicated that two wells (GND2300 and 2303) of four were in breach of this condition. GND2300 reported a marginal exceedance in the June 2019 monitoring round with a value of 2,600 g/m³, with a range of 950-2,600 g/m³. This also demonstrated an increasing trend in concentration throughout the monitoring period. The other well, GND2303, also recorded its most elevated value during the June 2019 monitoring round (3,900 g/m³). The range 1,560-3,900 g/m³, demonstrated the largest increase in this analyte, in this period.

While these values are in breach of the condition 18, which will result in the consent holder being marked down due to the reported values, it is not the most elevated value observed in this data set over time. Previous results from monitoring wells GND2301 recorded a value in excess of 12,000 g/m³ during the 2013-2014 monitoring period. During that time a torn storage liner resulted in elevated values within the groundwater and the issuance of an abatement notice to rectify the issue. If these values continue to increase, further enforcement will be considered.

Reported sodium values mirrored the findings of the TDS results, albeit with lower values. The most elevated result was observed in GND2300 with a range of 119-260 g/m³, followed by GND2303 with a range of 147-240 g/m³. GND2301 ranged 69-132 g/m³. While GND2302 ranged 63-88 g/m³.

Chloride values were found to be elevated in GND2303 with a maximum value of 1,740 g/m³, this well ranged 710-1,740 g/m³. This was followed by GND2300 with a maximum reported value of 1,390 g/m³ and a range of 390-1,390 g/m³. GND2302 ranged 163-400 g/m³ and GND2301 69-132 g/m³.

Dissolved barium analysis recorded low values across the four wells this period. The highest value recorded (0.38 g/m^3) was found in GND2303, with a range of $0.26\text{--}0.38 \text{ g/m}^3$. GND2301 held the next elevated result, with value of 0.33 g/m^3 , ranging $0.136\text{--}0.33 \text{ g/m}^3$. GND2302 and GND2300 ranged between $0.032\text{--}0.101 \text{ g/m}^3$.

Acid soluble barium concentrations were found to range from below the laboratory limit for detection in the case of monitoring wells GND2300 and GND2302, to 0.5 g/m^3 in monitoring location GND2301, this well also contained range of $0.16\text{--}0.5 \text{ g/m}^3$.

pH values across all wells ranged between 6- 7.1 pH this period, (GND2300, range 6- 6.3 pH), (GND2301, 6.3 – 7.1 pH). GND2301 also contained the greater range of pH values recorded this period 0.8 pH units.

Electrical conductivity values ranged from 75.1- 524 mS/m. The higher results were found in the saline impacted wells of GND2300 and 2303, which reflects the increased ions within the groundwater.

2.1.3 Soil monitoring results

Soil monitoring was undertaken on the most recently landfarmed area of M1810. Six compliance soil samples were collected from this landfarmed area, the sample transects are provided in Figure 2. The method through which the samples were collected was discussed earlier in Section 1.5.4.



Figure 2 WRS landfarmed area M1810 with soil transects A-F 2018-2019 monitoring period

Area M1810	Transect	Consent	A	B	C	D	E	F
Parameter	Unit/ date	7795-1	18/06/2019	18/06/2019	18/06/2019	18/06/2019	18/06/2019	18/06/2019
Ethylbenzene	mg/kg dry wt	53	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
m&p-Xylene	mg/kg dry wt	48	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	mg/kg dry wt	48	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
pH and salts								
pH	pH Units		8	7.8	7.8	8	8.1	6.8
Dry Matter (Env)	g/100g as rcvd		90	89	89	90	92	93
Total Recoverable Barium	mg/kg dry wt		510	500	500	490	490	220
Conductivity from soluble salts	mS/cm		<20	<20	40	<20	<20	<20
Chloride	mg/kg dry wt	700	63	32	380	6	8	5
Total Recoverable Calcium	mg/kg dry wt		3,900	3,900	5,600	4,400	3,600	3,000
Total Recoverable Magnesium	mg/kg dry wt		2,200	2,100	2,300	2,100	1,800	1,630
Total Recoverable Potassium	mg/kg dry wt		710	600	1,050	580	370	210
Total Recoverable Sodium	mg/kg dry wt	460	250	240	310	260	210	220
Sodium Absorption Ratio (SAR)		18	1	1	1.7	0.7	0.5	0.8
Soluble Salts	mg/kg dry wt	2,500	700	500	1,400	<500	<500	<500
Total recoverable heavy metals								
Total Recoverable Arsenic	mg/kg dry wt	20	< 2	< 2	< 2	< 2	< 2	< 2
Total Recoverable Cadmium	mg/kg dry wt	1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	600	17	17	16	14	15	13
Total Recoverable Copper	mg/kg dry wt	100	12	14	16	14	11	9
Total Recoverable Lead	mg/kg dry wt	300	2.5	2.8	3.4	2.7	2.1	1.5
Total Recoverable Mercury	mg/kg dry wt	1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	60	9	9	8	8	7	7
Total Recoverable Zinc	mg/kg dry wt	300	60	65	57	54	54	45

The analysis of the six soil samples indicated the following:

No measurable polycyclic aromatic hydrocarbons (PAH's) were reported above the limit of detection (LOD), as given by the laboratory, across all six soil samples.

Total petroleum hydrocarbon (TPH) analysis indicated the following:

No TPH C₇-C₉ was recorded above the LOD, which is 8 mg/kg this period.

TPH C₁₀-C₁₄ results above the LOD were recorded in four of six samples, of these four results, one result (transect C) recorded a value (113 mg/kg) marginally above the surrender criteria for mid-range TPH which is set at 58 mg/kg. The remaining three results (range 21-30 mg/kg) were recorded below the surrender criteria value.

TPH C₁₅-C₃₆ results above the LOD were recorded in all six soil samples at relatively low concentrations (range 128- 540 mg/kg). The surrender concentration value for this parameter is 1,200 mg/kg, with all results found below this value. Of note, the most elevated value recorded (540 mg/kg, Transect C) is also the same transect which contained the marginally elevated mid-range TPH C₁₀-C₁₄.

Mono-aromatic hydrocarbons: Benzene, toluene, ethylbenzene and xylene (m, p and O) analysis values were all below the LOD across all six soil samples.

pH values ranged between 6.8 – 8.1 pH across the six samples.

Total recoverable (TR) barium ranged 220-510 mg/kg.

Chloride values were reported below the consent defined limit of surrender (700 mg/kg) across all six samples. The majority of the results were below 70 mg/kg, with one transect, transect C, recording a value of 380 mg/kg.

TR calcium values ranged from 3,000-5,600 mg/kg.

TR magnesium values ranged 1,630-2,300 mg/kg.

TR potassium values ranged 210-1,050 mg/kg.

TR sodium values ranged 210-310 mg/kg, well below the surrender value (460 mg/kg).

Sodium absorption ratio (SAR) values were all low, ranging 0.5- 1.7 SAR, which were well below the surrender value which is set at 18.

Soluble salt values ranged from below the limit of detection in three of the six samples. Transects D, E and F to 1,400 mg/kg in transect C. All recorded values were below the surrender value which is set at 2,500 mg/kg.

TR heavy metal concentrations were recorded all below the requisite consent defined limits, across all eight parameters, in all six samples.

2.1.4 Lake Taumaha Sample

A single surface water sample was collected from the nearby Lake Taumaha (Figure 3) this monitoring period. The results of the sampling are provided below in Table 7.



Figure 3 Lake Taumaha sample location (central)

Table 7 Lake Taumaha sample result

Parameter	Unit/date	30 Jan 2019
Temperature	°C	24.4
Acid Soluble Barium	g/m3	< 0.11
Benzene	g/m3	< 0.0010
C ₇ - C ₉	g/m3	< 0.06
C ₁₀ - C ₁₄	g/m3	< 0.2
C ₁₅ - C ₃₆	g/m3	< 0.4
Total hydrocarbons (C ₇ - C ₃₆)	g/m3	< 0.7
Chloride	g/m3	69
Electrical Conductivity (EC) 25°C	mS/m	38.7
Ethylbenzene	g/m3	< 0.0010
m&p-Xylene	g/m3	< 0.002
o-Xylene	g/m3	< 0.0010
pH	pH Units	9.5
Toluene	g/m3	< 0.0010
Total Dissolved Solids (TDS)	g/m3	199
Total Sodium	g/m3	40

The analysis of the singular sample indicated negligible impacts as process of the exercise of consent in this monitoring.

No measurable petroleum hydrocarbons (all chains) results were reported above the LOD.

No measurable benzene, toluene, ethylene, or xylenes (m, p or o) (collectively known as BTEX) were reported above the LOD this monitoring period.

Acid soluble barium analysis was similarly below the LOD.

The pH result at 9.5 pH, while quite basic, was indicative of increased photosynthetic activity within the water body. The sample was collected just after midday: 13:45 on a clear and hot summer day (30 January 2019).

The temperature of the sample was recorded at 24.4 °C.

The sample electrical conductivity was recorded as 38.7 mS/m.

2.1.5 Provision of consent holder data

The consent holder provided the Council with an annual report, as required by the resource consent 7795-1. The report provided information about the Company operation in the year under review.

This report (Appendix II), stated that no new landfarmable material was received on this site during the monitoring period. The only landfarm oriented work which was undertaken by the Company this period, was the final contouring and seeding of the most recent landfarmed area, area M1810.

2.2 Incidents, investigations, and interventions

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

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

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 individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

Table 8 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Company activities during the 2018-2019 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 8 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
01/07/2018-30/06/2019	<p>Consent condition exceedance in terms total dissolved salt (TDS) concentrations within groundwater in two monitoring wells.</p> <ul style="list-style-type: none"> GND2300 on one occasion of four with a marginal exceedance value of 2,600 g/m³. GND2303 on three occasions of four with a measurable value of 3,900 g/m³. <p>The consent defined limit as per condition 18 is TDS less than 2,500 g/m³.</p>	N	No	<p>Consent holder informed, all storage cells liners checked for integrity.</p> <p>The initial monitoring from the upcoming monitoring period has indicated a reduction in these values.</p> <p>Potentially related to a legacy impact from up gradient well GND2301 in the 2013-2014 monitoring period when an abatement notice was issued to previous consent holder for significant impacts to groundwater (TDS 13,000 g/m³ GND2301) as a process of a torn storage liner.</p>

3 Discussion

3.1 Discussion of site performance

The WRS Symes Manawapou Landfarm in the 2018-2019 monitoring period was in-active from a stockpiling stand point. No new landfarmable material was received on site. The last delivery was received in the 2017-2018 monitoring period. The main performance item undertaken by the consent holder in this period was the final contouring and seeding of the most recently landfarmed area of M1810. Inspections indicated that this was finalised by November 2018, with good pasture strike observed post inclusion.

However, yellow bristle grass was observed in the newly planted area, post the November seeding and contouring. To remedy this, the consent holder undertook spraying of the recently landfarmed area M1810. This area then required another round of re-seeding. This was undertaken towards the end of the monitoring period and the second round of pasture strike was observed to strike well, although the odd location of limited strike was noted during inspections.

Pit liners were observed throughout the monitoring period and found to be in a good state of repair with reasonable free board reported during inspections. The annual report, as required by the consent, was provided in a timely manner by the consent holder.

3.2 Environmental effects of exercise of consents

Environmental effects associated with the exercise of the consent in this monitoring period were primarily related to saline impacts in the groundwater. Two wells (GND2300 and GND2303) reported values in excess of the consent 7795-1, condition 22 defined values for total dissolved salts. The conditional limit is 2,500 g/m³. The analysis indicated that GND2300 was marginally above this value on one occasion of four with value of 2,600 g/m³. GND2303, was also found to contain values greater than the conditional limit on three of four occasions, the most elevated value reported was 3,900 g/m³.

These impacts are in close proximity to the landfarm and are associated with landfarming, whereby the saline component of the drilling material will leach from the soil profile. Historically, un-lined storage cells were used in the Taranaki Region for the storage of drilling mud. This directly resulted in significant elevated saline impacts to groundwater at certain landfarms, as it would have been a continuous source of hyper saline fluid to groundwater. As this consent holder utilises lined storage cells which are regularly checked for integrity, the impacts observed are likely to be short term.

There are no likely receptors or uses of the groundwater in the near proximity to this landfarm. The consent holder is aware of these impacts, however mitigating them once they have occurred is quite difficult. In future, farming exercises will focus on limiting the potential for elevated salinity impacts to groundwater.

For context, this landfarm had observed significant saline impacts to groundwater during the 2013-2014 monitoring period. During that time period a value of 13,000 g/m³ TDS was reported in one (GND2301) of the monitoring wells. This elevation was due to a torn storage cell liner. It is not possible to ascertain whether the saline impacts observed in this monitoring period, in the down gradient well of GND2303, is a result of this legacy impact, without specific testing for hydraulic gradient and flow direction. The Council will continue to monitor the network quarterly.

Six soil samples were collected from the most recently landfarmed area of M1810. The analysis indicated that one soil sample held values above the surrender criteria for mid-range petroleum hydrocarbons (C₁₀-C₁₄). This will likely further reduce in the upcoming monitoring period. The remaining analysis indicated values which were within surrender concentrations.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 9.

Table 9 Summary of performance for consent 7795-1

Purpose: To discharge drilling waste cuttings (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Definitions which apply to the consent	N/A	N/A
2. Best practicable option to be adopted	Inspection and liaison with consent holder	Yes
3. The consent holder shall provide a stockpiling and landfarming management plan prior to the exercise of the consent	Management plan received and approved	Yes
4. Install groundwater monitoring wells prior to exercise of consent	Inspections indicated groundwater monitoring wells installed in 2012	Yes
5. Notify TRC 48 hrs prior to stockpiling	Notifications received when stockpiling. No stockpiling in this monitoring period	Yes
6. Notify TRC 48 hrs prior to landfarming	Notifications received when landfarming. No landfarming undertaken in this monitoring period	Yes
7. The consent holder shall sample for the following: a. Total petroleum hydrocarbons b. Benzene, toluene, ethylbenzene, xylenes c. Polycyclic aromatic hydrocarbons d. Chloride, nitrogen, pH, potassium, sodium	Predisposal samples analysis supplied by consent holder as requested, though no material landfarmed in this period, thus no analysis provided	Yes
8. Keep records relating to wastes, areas, compositions, volumes, dates, treatments and monitoring	Company records provided in annual report	Yes
9. Report on records in condition 6 to Council by 31 August each year	Report received	Yes
10. Discharges made only within area as specified by submitted application	Inspection indicated the discharges occur within the consented area	Yes

Purpose: To discharge drilling waste cuttings (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming

Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. No discharge within 25 m of a water body, 10 m from any property boundary and 50 m from the QEII covenant Key Native Ecosystems	Inspection indicated the discharges are of sufficient distance from water courses	Yes
12. Maximum application thickness for wastes: a. 100 mm TPH <5% b. 50 mm TPH >5% c. No ponded liquids 1 hr after application	Company records and inspection	Yes
13. Incorporation into soil as soon as practicable to a depth of at least 250 mm	Inspection and sampling	Yes
14. Hydrocarbon concentrations in soil shall not exceed 50,000 mg/kg dry weight	Sampling	Yes
15. Landfarming areas to be used in accordance with conditions 10 and 11 and shall not be used for any subsequent discharges of drilling wastes	Inspection	Yes
16. All material to be landfarmed as soon as practicable and no later than 12 months	Company records and inspections	Yes
17. Re-vegetate landfarmed areas as soon as practicable	Company records and inspections	Yes
18. Total dissolved salts in any fresh water body shall not exceed 2,500 g/m ³	Sampling indicated two wells impacted by salinity above the prescribed 2,500 g/m ³	No
19. Disposal of waste shall not lead to contaminants entering surface water or ground water exceeding background concentrations	Sampling, see above note	No
20. Conductivity must be less than 400 mS/m. If background conductivity exceeds 400 mS/m, then increase shall not exceed 100 mS/m	Sampling of soil indicated compliance with this condition	Yes

Purpose: To discharge drilling waste cuttings (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
21. Sodium absorption ratio [SAR] must be less than 18.0, if background SAR exceeds 18.0 then increase shall not exceed 1.0	Sampling of soil indicated compliance with this condition	Yes
22. Concentrations of heavy metals in the soil shall at all times comply with MfE guidelines	Sampling of soil indicated compliance with this condition	Yes
23. Prior to expiry/cancellation of consent these levels must not be exceeded: a. conductivity, 290 mSm ⁻¹ b. chloride, 700 g/m ³ c. dissolved salts, 2500 g/m ³ d. sodium, 460 g/m ³	Areas RNZ 1, 2, 3 and X, M1408 and M1610 have been assessed against this condition and found to be compliant.	N/A
24. If condition 23 is not met, consent cannot be surrendered	Not applicable , see above	N/A
25. Notification of discovery of archaeological remains	Not applicable – none discovered in this monitoring period	N/A
26. Consent shall lapse on 30 June 2017	Not applicable – consent exercised	N/A
27. Optional review provision re environmental effects	Next optional review June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

Table 10 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2012-2013	7795-1	-	-	-	1
2013-2014	7795-1	-	1	-	-
2014-2015	7795-1	-	1	-	-
2015-2016	7795-1	-	1	-	-
2016-2017	7795-1	-	1	-	-
2017-2018	7795-1	-	1	-	-
Totals	-	0	5	0	1
WRS gained consent of the Symes Manawapou facility at the end of the 2013-2014 monitoring period					

During the year, the Company demonstrated a good level of environmental and high level of administrative performance with the resource consent as defined in Section 1.1.4.

3.4 Recommendations from the 2017-2018 Annual Report

In the 2017-2018 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at the WRS Symes Manawapou Landfarm in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019 period, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Recommendation 1 was undertaken.

Recommendation 2 was not required.

3.5 Alterations to monitoring programmes for 2019-2020

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account 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 exercising resource consents.

It is proposed that for 2019-2020 monitoring period the analysis of the groundwater monitoring network remains unchanged, with four wells monitored at quarterly intervals throughout the monitoring period.

The number of soil samples will be reduced from the current six soil samples per annum, to two soil samples per annum. The rationale for this reduction is due to the level of activity within the landfarm reducing to an in-active level. The landfarm has not stockpiled any new material and the most recent landfarming exercise occurred in the 2018 monitoring period.

The Council assessed this area during this period under review and the resultant analysis indicated that one soil transect was marginally above the surrender criteria for mid-range hydrocarbons. Thus two samples will be sufficient to assess this area in the upcoming monitoring period.

The Lake Taumaha sample collection will proceed as normal.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2019-2020.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at WRS Symes Manawapou landfarm in the 2019-2020 year be amended from that undertaken in 2018-2019, by the following:
 - a. Groundwater monitoring will continue at quarterly intervals unchanged.
 - b. Spot Lake Taumaha sample collection will continue unchanged.
 - c. Soil sampling will be reduced from six soil samples to two soil samples to account for the reduced activity at the landfarm.
2. THAT should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

As*	Arsenic.
BODF	Biochemical oxygen demand of a filtered sample.
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.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in $\mu\text{S}/\text{cm}$.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second ($1 \text{ m}^3\text{s}^{-1}$).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$\text{g}/\text{m}^2/\text{day}$	Grams/metre ² /day.
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.
Incident register	The 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.
L/s	Litres per second.
m^2	Square Metres.
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.
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.
MPN	Most Probable Number. A method used to estimate the concentration of viable microorganisms in a sample.
$\mu\text{S}/\text{cm}$	Microsiemens per centimetre.
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).
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.
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	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
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 a Science Services Manager.

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- Waste Remediation Services Ltd (WRS), Waikaikai (Wards) & Manawapou (Symes) Landfarm Management Plan 2019-2020.

Appendix I

Resource consents held by WRS Ltd

(For a copy of the signed resource consent
please contact the TRC Consents department)

Consent number	Purpose	Granted	Review	Expires
Discharge of wastes to land				
7795-1	To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.	May 2012	June 2022	June 2028

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA 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. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

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

Name of
Consent Holder: Andrew James Symes
156 Manawapou Road
RD 2
Patea 4598

Decision Date: 01 May 2012

Commencement Date: 01 May 2012

Conditions of Consent

Consent Granted: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming

Expiry Date: 01 June 2028

Review Date(s): June 2016, June 2022

Site Location: 156 Manawapou Road, Manutahi

Legal Description: Lot 1 DP 7324 (Discharge site)

Grid Reference (NZTM) 1717244E-5608736N

Catchment: Manawapou

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

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 with section 36 of the Resource Management Act 1991.

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 for the purpose of interim storage prior to landfarming, but without subsequently spreading onto, or incorporating the discharged material into the soil within 48 hours; and
 - b) landfarming means the discharge of drilling wastes onto land, subsequent spreading and incorporation into the soil, for the purpose of attenuation of hydrocarbon and/or other contaminants, 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.

Requirements prior to exercise of consent

3. Prior to the exercise of this consent, the consent holder shall provide a stockpiling and landfarming management plan that, to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council, demonstrates the activity can and will be conducted to comply with all of the conditions of this consent. The management plan shall be reviewed annually (on or about the anniversary of the date of issue of this consent) and 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 site preparation;
 - e) procedures for landfarming drilling wastes (including means of transfer from stockpiling area, means of spreading, and incorporation into the soil);
 - f) procedures for sowing landfarmed areas, post-landfarming management, monitoring and site reinstatement;
 - g) contingency procedures;
 - h) sampling regime and methodology;
 - i) control of site access; and
 - j) documentation for all the procedures and methods listed above.
4. Prior to the exercise of this consent, the consent holder shall after consultation with the Chief Executive, Taranaki Regional Council, install a minimum of three groundwater monitoring bores. The bores shall be at locations and to depths, that enable monitoring to determine any change in groundwater quality resulting from the exercise of this consent. The bores shall be installed in accordance with NZS 4411:2001 and all associated costs shall be met by the consent holder.

Notifications, monitoring and reporting

5. 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.

6. 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, or material brought onto the site for landfarming within 48 hours. 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 (or density) of the waste to be landfarmed;
 - e) the concentration of chlorides, nitrogen and hydrocarbons in the waste; and
 - f) the specific location and area over which the waste will be landfarmed.

7. The consent holder shall take a representative sample of each type of waste, from each individual source, and have it analysed for the following:
 - a) total petroleum hydrocarbons (C₆-C₉, C₁₀-C₁₄, C₁₅-C₃₆);
 - b) benzene, toluene, ethylbenzene, and xylenes;
 - c) polycyclic aromatic hydrocarbons screening; and
 - d) chloride, nitrogen, pH, potassium, and sodium.

8. The consent holder shall keep records of the following:
 - a) wastes from each individual well;
 - b) composition of wastes (in accordance with condition 5);
 - 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; and
 - 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.

9. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 31 August of each year, a report on all records required to be kept in accordance with condition 6, for the period of the previous 12 months, 1 July to 30 June.

Discharge limits

10. The discharge shall only occur on the disposal sites shown in the Drawing entitled 'Remediation NZ Ltd Proposed Disposal Site' submitted with the application and attached to this consent.
11. There shall be no discharge within buffer zone, being:
 - 25 metres of the Manawapou River;
 - 25 metres of the unnamed tributary;
 - 10 metres from any property boundary; and
 - 50 metres from the QE II covenant Key Native Ecosystem areas.
12. 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;
 - 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.
13. As soon as practicable following the application of solid drilling wastes to land, the consent holder shall incorporate the wastes into the soil to a depth of at least 250 mm.
14. The hydrocarbon concentration in the soil over the landfarming area shall not exceed 50,000 mg/kg dry weight at any point where:
 - a) liquid waste has been discharged; or
 - b) solid waste has been discharged and incorporated into the soil.
15. An area of land used for the landfarming of drilling wastes in accordance with conditions 10 and 11 of this consent, shall not be used for any subsequent discharges of drilling waste.

Operational requirements

16. All material must be landfarmed as soon as practicable, but no later than twelve months after being brought onto the site.
17. 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

18. The exercise of this consent shall not result in the concentration of total dissolved salts in any fresh water body exceeding 2500 g/m³.

19. Other than as provided for in condition 18, the exercise of this consent shall not result in any contaminant concentration, within surface water or groundwater, which after reasonable mixing, exceeds the background concentration for that particular contaminant.

Receiving environment limits - soil

20. The conductivity of the soil/waste layer after landfarming shall be less than 400 mS/m, or alternatively, if the background soil conductivity exceeds 400 S/m, the landfarming of waste shall not increase the soil conductivity by more than 100 mS/m.
21. The sodium adsorption ratio (SAR) of the soil/waste layer after landfarming shall be less than 18.0, or alternatively if the background soil SAR exceeds 18.0, the landfarming of waste shall not increase the SAR by more than 1.0.
22. The concentration of heavy metals in the soil over the disposal area shall at all times comply with 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), as shown in the following table:

Constituent	Standard (mg/kg dry weight)
Arsenic	20
Cadmium	1
Chromium	600
Copper	100
Lead	300
Mercury	1
Nickel	60
Zinc	300

23. From 1 March 2028 (three months prior to the consent expiry date), constituents in the soil shall not exceed the standards shown in the following table:

Constituent	Standard
conductivity	290 mS/m
chloride	700 mg/kg
sodium	460 mg/kg
total soluble salts	2500 mg/kg
MAHs PAHs TPH	Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand (Ministry for the Environment, 1999). Tables 4.12 and 4.15, for soil type sand.

MAHs - benzene, toluene, ethylbenzene, xylenes
 PAHs - naphthalene, non-carc. (pyrene), benzo(a)pyrene eq.
 TPH - total petroleum hydrocarbons (C₇-C₉, C₁₀-C₁₄, C₁₅-C₃₆)

The requirement to meet these standards shall not apply if, before 1 March 2028, the consent holder applies for a new consent to replace this consent when it expires, and that application is not subsequently withdrawn.

24. This consent may not be surrendered at any time until the standards in condition 23 have been met.

Archaeological remains

25. In the event that any archaeological remains are discovered as a result of works authorised by this consent, the works shall cease immediately at the affected site and tangata whenua and the Chief Executive, Taranaki Regional Council, shall be notified within one working day. Works may recommence at the affected area when advised to do so by the Chief Executive, Taranaki Regional Council. Such advice shall be given after the Chief Executive has considered: tangata whenua interest and values, the consent holder's interests, the interests of the public generally, and any archaeological or scientific evidence. The New Zealand Police, Coroner, and Historic Places Trust shall also be contacted as appropriate, and the work shall not recommence in the affected area until any necessary statutory authorisations or consents have been obtained.

Lapse and review

26. This consent shall lapse on 30 June 2017, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
27. 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 2016 and/or June 2022, 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.

Transferred at Stratford on 30 May 2014

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix II

WRS supplied Annual Report



28 Aug 2019

Chief Executive
Taranaki Regional Council
Private Bag 713
47 Cloten Road
Stratford
Attention Nathan Crook

Dear Nathan

RE: Resource Consent 7795-1 - Manawapou (Symes) - 156 Manawapou Road, RD 2, Patea

As required under special condition 9 of resource consent 7795-1, please find all relevant information recorded from the operational period 1 July 2018 to 30 June 2019 relating to stockpiling and landspreading activities undertaken at Waste Remediation Services (WRS) Manawapou disposal site. It is the fifth report completed by WRS following the previous periods;

2014-15
2015-16
2016-17
2017-18

This report is designed to follow on from the previously submitted 2017-18 consent monitoring report and is as such focussed on activities, records and results from the 2018-19 period. This report is structured into 6 sections, as per the following:

1. Overview and Background
2. Wastes Received for Disposal
3. Disposal and Rehabilitation Operations (preparatory earthworks, landspreading/ incorporation and rehabilitation - comprising topsoil application, sowing, additional works)
4. Monitoring

5. Additional Consent Requirements
6. Summary

1. OVERVIEW AND BACKGROUND

WRS began operating the Manawapou disposal site in 2014, replacing the original site operators Remediation NZ Ltd, who were issued resource consent 7795-1 in 2012. Between 2014 and the currently reported on year (2018-2019), there have been intermittent periods of activity at the site, reflecting fluctuating levels of activity within the local drilling industry.

During 2018-19 there has been minimal activity at the Manawapou site. The site has received no further drilling or production wastes, and all disposal areas other than the most recent M1810 have been surrendered, with receiving soil samples having met consent surrender criteria. Operations were therefore mostly limited to rehabilitation and maintenance, which is described in detail in Section 3.

Monitoring of the site undertaken in the 2018-19 year by both the Taranaki Regional Council (TRC) and WRS management has shown the operations undertaken at Manawapou to be compliant with consent conditions, and no incidents have been recorded against the site in 2018-19.

2. WASTES RECEIVED FOR DISPOSAL

Waste Types and Volumes

No new material has been received onsite in the 2018-19 operational period. An updated mud register is attached as Appendix C for reference.

Waste Characterisation

Consent 7795-1 requires the site operator to sample and keep records of waste chemical composition. Composite samples are taken (generally by wellsite staff prior to transport) across each waste stream before materials leave the wellsite for delivery. WRS also takes pre-spreading samples from the pits prior to landspreading for further waste characterisation. All samples are sent to RJ Hill Laboratories for analyses. Results are forwarded directly to TRC for their records and for cross referencing purposes. Results are kept and logged by WRS, and are used to calculate required spreading areas as per condition 12 of consent 7795-1 to ensure the hydrocarbon limit in condition 14 is adhered to. Elevated salinity is expected from KCL based mud wastes arriving onsite for disposal. Wastes are analysed for several salinity related parameters, and monitoring of receiving soil and groundwater is conducted by the TRC to check for any adverse effects on soil quality and/or groundwater quality from application of highly saline muds.

As stated in Section 2, no further wastes were received onsite in 2018-19, and no landspreading was undertaken; as such, no predisposal samples have been taken during this period.

3. DISPOSAL AND REHABILITATION OPERATIONS

At the commencement of the monitoring year 1 July 2018 all the waste drilling mud solids and liquids received at the site for storage and final disposal had been spread. The wastes from TAG's deep Pukatea well received for storage in Pits 1, 2 and 3 had been recovered and spread over area M1810 in the summer and autumn of 2018; however final rehabilitation had not been undertaken at that time due to wet winter conditions.

The 2018-19 operations at Manawapou were therefore limited to waiting for the spread wastes to dry out, levelling, tilling wastes in and final contouring of the subsoil prior to recovery of the topsoil and rehabilitation comprising levelling, seeding and fertilizer application. Most of this work was completed in September/October with the fertilizer and final seeding occurring on 19 October with a mixture of chicory, white clover, Zulu and Laser Persian annual ryegrass. Weeds also struck well in the area requiring control by spraying, which was undertaken in late November.

Also around this time, small clusters of yellow bristle grass were observed in the margins of area M1810 and also within the previously completed areas M1610 and M1408. WRS had originally attributed the introduction of this highly vigorous weed to agricultural contractors, but it was later found to be prevalent on adjacent properties. As there was no overall plan by any national or regional organisation/s to educate farmers and co-ordinate recognition, control and eradication of this pest species, WRS embarked upon a programme, at the direction of an agronomist, of grazing, staged spraying and under-sowing the affected areas covering 5.3 Ha. This direct drilling was completed in late April 2019.

Following the final remedial seeding the site has been under care and maintenance through to the end of the monitoring year. It is expected this will remain the status quo for some time. Recent photographs of the stockpiling facilities and finished spreading areas at the Manawapou site are attached as Appendix A.

4. MONITORING

Site Inspections - WRS

WRS closely supervise site operations to ensure all contractors are following best practice as per the site operation management plan and conditions specified in consent 7795-1. Regular site inspections are also undertaken during periods of inactivity at the site.

Site Inspections – TRC

WRS has received seven inspection notices from the TRC for the 2018-19 year. All notices indicated the TRC inspector was satisfied with the physical state of the site, and with operations being undertaken around the time of inspection. Copies of the TRC inspection notices are attached as Appendix E.

Receiving Environment Sampling

Composite soil sampling and groundwater sampling is now undertaken exclusively by TRC field staff, with all samples being sent to RJ Hill Laboratories for the full suite of analyses required under consent 7795-1. WRS have no supplementary receiving environment sample results to submit as part of this Annual Report. Additionally, as was noted in the previous report, surrender criteria has been reached in all previous spreading areas at this site (RNZ1-3, M1408 and M1610) as identified in the Manawapou site map, attached in Appendix B.

5. ADDITIONAL CONSENT REQUIREMENTS

As per condition 3 of consent 7795-1, the site management plan has been reviewed and updated for the period July 2019 to June 2020. Operations at the Manawapou disposal site are all undertaken generally in accordance with the WRS' Landfarm Management Plan that covers both the Manawapou and Waikaikai sites. It is a live document and is constantly reviewed and updated as necessary to reflect operational requirements and practices at both sites operated by WRS. This updated plan is attached as Appendix D.

The previous compliance report discussed the status of the stockpiling facilities at the site, particularly discussing the integrity of synthetic pit liners. As of the end of the 2018-19 year the condition/status of the pits remains fairly unchanged, Pit 3 remains rope -off and unused until such a time as the old liner is replaced, or the pit may be decommissioned and reinstated in favour of a new lined pit.

6. SUMMARY

During 2018-19 there was a relatively low level of activity at the Manawapou site, with operations mostly limited to remediation of spreading area M1810, and ongoing control of pest plants. No new material was received for disposal, and operations as of the end of June 2019 are limited to site maintenance, with any further activity subject to industry requirements. Historic spreading areas have met surrender criteria, and no incidents/significant issues have been identified at the site.

Waste Remediation Services Ltd

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Address 141 – 143 Connett Road East, Bell Block 4312, New Zealand
Post PO Box 7150, New Plymouth 4341, New Zealand
Email: keith@wrsLtd.co.nz

Appendix A Field Photographs

Manawapou pits 1 and 2 with area M1810 permanent pasture sown mid April 2019 in background.



Chicory and Clover annual crop at time of spraying out for Yellow Bristle grass early April 2019.



Appendix C Mud Register

Date	Source	Customer	Disposal Site m3		
1 July 2018 - 30 June 2019					
July 2018	NIL		-	-	-
August 2018	NIL		-	-	-
September 2018	NIL		-	-	-
October 2018	NIL		-	-	-
November 2018	NIL		-	-	-
December 2018	NIL		-	-	-
January 2019	NIL		-	-	-
February 2019	NIL		-	-	-
March 2019	NIL		-	-	-
April 2019	NIL		-	-	-
May 2019	NIL		-	-	-
June 2019	NIL		-	-	-
		2018-19 ANNUAL TOTAL MANAWAPOU m3	-	-	-

Appendix D WRS Landfarm Management Plan 2019-20

Appendix E TRC Inspection Notices

.....END

Appendix III

WRS Manawapou and Waikaiki Landfarms 2019-2020 Management Plans



Waste Remediation Services Ltd (WRS)

Waikaikai (Wards)

&

Manawapou (Symes)

Landfarm Management Plan

2019 - 2020

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Rev	Date	Reason for Issue	Prepared	Checked	Approved
A	May 2014	Issued for review	KMB		
B	Aug 2015		KMB		
C	Aug 2016		KMB		
D	Jun 2017		KMB		
E	Aug 2018		KMB		
F	Jul 2019		KMB		

This Landfarm Operations Management Plan (OMP) describes the process and procedures/requirements for disposal by land farming of drilling muds and cuttings and production station wastes in accordance with the Taranaki Regional (TRC) and South Taranaki District Councils (STDC) resource and landuse consent conditions and relevant New Zealand guidelines.

1. Safety

Waste Remediation Services Ltd will comply with all current Occupational Safety and Health Legislation in operating the landfarm sites at Waikaikai and Manawapou. The company has the services of an in-house Symons Group dedicated HSEQ Manager and HSEQ Advisor who provide regular input and advice on all site and operational safety matters to identify risks and hazards, record and manage these through site visits and conduct safety meetings with site personnel, contractors and staff and undertake group wide Safety Audits. All visitors to the landfarm sites irrespective of the purpose of their visit are required to sign the visitors log in and out of the site, and comply with all directions and notices displayed at the site. The Operations Manager's contact telephone number is clearly signposted at both landfarm sites should any queries arise

2. Scope

This Landfarm Operations Management Plan sets out the location, parties involved, safety practices and methodologies adopted by the operator to meet all legal requirements, and to minimise the risks and effects of the disposal of oil and gas exploration, production and workover drilling and production station wastes to land.

Management of the landfarm sites involves liaison by Waste Remediation Services Ltd (the Operator) with the landowners (P and K Wards at Waikaikai and A Symes at Manawapou), the Taranaki Regional Council and South Taranaki District Councils (as the consenting authorities), offsite service providers and agents (laboratories, surveyors, couriers..), the exploration/drilling/production station companies supplying the wastes, and contractors involved with the delivery and landfarming of the wastes from time to time.

This liaison particularly with the TRC along with regular site and operations supervision and the keeping of comprehensive and timely records are key components of site management.

The landfarm and each delivery of waste through to disposal needs to be managed to ensure compliance with resource consent conditions and both regional and national guidelines viz the New Zealand guidelines for the safe application of bio solids to land (NZWWA, 2003), guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand (MfE, 1999) and the TRC's guidelines for disposal of oilfield wastes by landfarming, and the consents specific to each site viz **Waikaikai 5956-2.0, Manawapou 7795-1**

Storage Pit Capacities

At July 2019 the following storage capacities currently exist at the two WRS operated facilities

- | | | |
|--------------|---------------------------|---------------------|
| 1. Waikaikai | 3 pits, combined capacity | 1,200m ³ |
|--------------|---------------------------|---------------------|

2. Manawapou 3 pits, combined capacity 1,100m³

Total available storage 2,300m³

3. Consents

The site is authorised and operated under the following consents;

A) Waikaikai (Wards)

1. TRC: Consent number 5956-2.0 - Issued 19 April 2017, Expiry 1 June 2034
2. STDC: Landuse Consent RM 010155 Issued 9 January 2002.

B) Manawapou (Symes)

1. TRC : Consent number 7796-1 - Issued 01 May 2012, Expiry 1 June 2028
2. STDC : STDC : Landuse Consent RM

4. Abbreviations

WBM	Water based (drilling) mud
SBM	Synthetic based (drilling) mud
TRC	Taranaki Regional Council
MfE	Ministry for the Environment
NZWWA	New Zealand Water and Wastes Association
STDC	South Taranaki District Council

5. Landfarming Process

Landfarming is the practice of disposing of drilling and production station wastes to land. It comprises collection and delivery to site, storage to allow natural (solar and atmospheric) degradation to occur, and to enable a volume of wastes to accumulate to make ground preparation and spreading practical on a campaign basis, viz > 500 m³.

WRS undertakes this with four distinct earthmoving and agricultural phases resulting in up to the equivalent of 15 machinery ground passes;

- a) **Dewatering** – removal of any storm water from the pits and discharge onto any consented area by vacuum tank removal and discharge spraying. Stormwater is determined as the “slab” of largely undisturbed, unmixed water overlying the mud in the storage pits.

- b) **Ground Preparation** - stripping existing organic soil horizons and placing this in windrows around the designated spread area, followed by cut and fill earthworks to provide a rolling contour over the spread area/s.
- c) **Waste Spreading** - the waste is then discharged onto land, allowed to dry, spread across the prepared area, incorporated into the soil by tilling and deep ripping down to > 1m depth to remove any likelihood of ponding and to maximize dilution and incorporation into the underlying sand horizons.
- d) **Rehabilitation** - the stripped topsoil is recovered from storage and spread over the entire spread area. This is levelled and further tilled if required. The final rehabilitation step involves final levelling, then cultivating and re-sowing the area to pasture or crop to facilitate natural soil processes to effectively biodegrade, transform and assimilate the waste. This process results in improved soil properties particularly on light, free draining sandy soils resulting in dry matter pasture yields being increased several fold, and the elimination of sand blow holes developing and spreading that result from the persistent prevailing winds very typical of this coastal area in South Taranaki

The overall process involves the following broad steps:

1. Notification to the Taranaki Regional Council (TRC) prior to removal from the wellsite of landfarm site discharge consent number, well site name and well number, waste source, type and volumes, sampling (for hydrocarbon characterization) and assessment of the wastes to be disposed of.
2. Collection of fluids and cuttings from the wellsite and transport to the disposal site in purpose built, sealed units. Fluids are pumped into tankers (also known as “tubes”), and solids are transported by sealed well-side trucks using an excavator to load the material at the wellsite from both in/above ground sumps, cellars and mud tanks.
3. Discharge at the landfarm site of water based muds (WBM) cuttings and fluids, synthetic based mud (SBM) cuttings and fluids, and oily wastes, from transport vehicles to in-ground FPE lined storage pits to allow firstly natural atmospheric degradation and dilution, and until storage volumes are sufficient to allow campaigned final disposal.
4. Preparation of spreading areas by removal and stockpiling of topsoil (A soil horizon) usually into perimeter windrows/stockpiles, re-contouring and levelling the spreading area to improve uniformity, eliminate mud flow/ponding as much as practicable and control of waste application rates. Establishment of spread area margin bunding if required may also occur.
5. Spreading of the cuttings (solids) and thick slurry materials over land at the consented rates using tractor and trailers, digger and/or bulldozer, motor scraper or spray systems (depending on the fluid content of the mud). Fluids are usually distributed onto the disposal area using a tractor drawn effluent vacuum tank with a spray irrigation discharge system.
6. Allowing the cuttings and fluid to dry and degrade sufficiently to enable effective working into the sub-soils (B horizon) to required depths.
7. Levelling the soil surface with a levelling bar or similar to provide an easy grade workable field surface.

8. Replacement of the stockpiled A horizon clay/topsoil to aid stability and assist in grass establishment.
9. Fertilising and sowing either in crop or pasture in consultation with the landowner.
10. Application of fertilizer with or just after seed sowing and again within one year to assist establishment of good ground cover vegetation

6. Wastes Consented for Landfarming

There are only three types of waste able to be disposed of at the Waikaikai Landfarm from exploration and production activities

1. Water Based Mud (WBM) drill cuttings and fluids,
2. Synthetic Based Mud (SBM) drill cuttings and fluids
3. Oily Wastes from wellsites and production facilities .

But only two at the Manawapou Landfarm from exploration and production activities

1. Water Based Mud (WBM) drill cuttings and fluids
2. Synthetic Based Mud (SBM) drill cuttings and fluids

NOTE Unlike some other drilling mud disposal sites in the region both land farms operated by WRS are unable to accept for on-site disposal to ground Produced Water which may have high mineral or salt content associated with the production of oil and gas from reservoirs. This produced water may include water, water that has been injected into the reservoir and any chemicals added during the production/treatment/enhancement process, including hydraulic fracturing.

Produced water can contain residual chemicals from treatment and enhancement; however the definition does not extend to any “flush fluid and/or fluid containing proppant”.

There does not however appear to be any restriction upon WRS from processing stimulation returns on site for onward transport to approved disposal sites.

7. Landfarm Management Process/Activities

This management plan includes, as a minimum:

1. Notification to TRC of receipt of wastes for storage/disposal;
2. Procedures for the receipt and stockpiling of wastes onto the site;
3. Provision to the TRC of each waste types characteristics prior to spreading during each landfarming campaign
4. Methodology for the stripping and recontouring/levelling of area to be land farmed;
5. Methodology for landfarming drilling wastes (including methods of transfer to and from stockpile area/s, methods of spreading, and incorporation into the soil);
6. Methodology for sowing land farmed areas;
7. Contingency procedures;
8. Sampling regime and methodology;
9. Post-landfarming management, monitoring and site reinstatement;
10. Record keeping; and
11. Control of site access and records.

8. Landfarm Management Responsibilities

The following table provides a step-by-step process of landfarm site management.

Table 1 Overview of site management process

Step	What	Who
1	<p>Contact WRS Operations Manager (Ops Mngr) to discuss waste type/volume/sampling/timing of delivery to site</p> <p>Provide WRS Ops. Manager with written notification of source, delivery date, waste type, volume and transporting company.</p> <p>Receive the OK for delivery/disposal of material from WRS Ops Mngr</p>	<p>Client production supervisors/ drilling supervisors/ well services supervisors/mud engineers</p>
2	<p>Receive notification in regard to waste for disposal;</p> <ul style="list-style-type: none"> • Receive notification of well exploration activities and programme for collection and delivery of waste to land farm site • Ensure all information required by consent is provided by the client ; • Confirm delivery and sample collected point and by who • Record all collection details on WRS/Symons Transport waybills. Assign each 'parcel' of waste a number (Waste Transfer Docket number) to ensure source, transport and storage location are recorded • Collect and submit pre-disposal sample for analysis. 	<p>WRS Operations Manager, transporting companies management and truck drivers, clients drilling supervisor</p>
	<p>TRC Notification (delivery for storage):</p> <ul style="list-style-type: none"> • 48 hours prior to delivery for stockpiling on site; including • consent number, name of well/site, type of waste, volume of waste. <p>Planning for delivery/stockpiling:</p> <ul style="list-style-type: none"> • Arrange and assign storage pit into which the waste consignment is to be discharged taking into account mud type, characteristics and storage volumes available • Ensure delivery driver completes delivery details into WRS Site Delivery Record (used to compile the electronic Mud Register) located in the disposal site shack. 	<p>WRS Operations Manager/client's drilling engineer / mud engineer</p> <p>WRS Operations Manager</p>
	<p>Delivery:</p> <ul style="list-style-type: none"> • Once location for stockpiling at landfarm has been arranged liaise with delivery contractor • Notify WRS of all deliveries to site, providing as much notice as practicable. 	<p>Client production supervisors/drilling supervisors/well services supervisors/ mud engineer/ transport companies Dispatch Manager</p>

Step	What	Who
	<p>Managing Stockpiles:</p> <ul style="list-style-type: none"> Maintain a record of volumes of wastes in storage pits and ensure freeboard and storage capacities are commensurate with drilling waste volumes as far as is practicable. If heavy rainfall reduces pit capacity and freeboard removal of excess rainwater by vacuum tanker to suitable land farming areas until land spreading of mud and solids is practical 	WRS Operations Manager
	<p>Planning for spreading:</p> <ul style="list-style-type: none"> Identify volumes delivered and to be spread Take sample for analysis, dispatch to lab. and provide results to TRC; Consider mixing similar waste to provide the appropriate and /or practical soil improvement properties sought by the landowner 	WRS Operations Manager
	<p>Resample for pre-disposal results</p> <ul style="list-style-type: none"> Calculate loading, area required and spreading rate calculations according to the consent; and Identify location for disposal site based on area required and separation distances (at least 25 metres away from waterways and un-consented property boundaries, 6m from existing gas pipelines, and 2m from other disposal sites). 	WRS Operations Manager
	<p>TRC Notification (spreading):</p> <p>48 hours prior to spreading advise TRC of date; consent number; well/site; type of waste; volume and location/area it will be spread upon Send sample to laboratory to establish ; concentrations of chloride, nitrogen and TPH.</p>	WRS Operations Manager

9. Pre-Delivery and Storage Waste Characterisation

The consent requires that a representative samples are taken from each type of waste to be delivered to the landfarm for either storage or direct spreading. WRS requires that this is taken at source by the well owner or drilling contractor or other suitably qualified person and forwarded to WRS without delay for analysis or a representative sample is taken from by WRS staff at the point of discharge to storage

The sample containers depend upon the waste type sampled – where practical WRS will make all reasonable endeavors to stipulate and provide the correct sample containers.

10. Pre-Disposal Testing of Wastes

There are no specific numeric limits specified in the consent for any waste type or consignment received for storage, but spreading rates are determined by TPH concentrations and upper limits for heavy metals in the soils after spreading viz

The concentration of heavy metals in the soil over the disposal area shall at all times comply with the MfE NZ Water and Wastes Association Guidelines for the application of Bio solids to land NZ (2003) and the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011*, as shown in the following table.

These limits in effect act only as a guide to attaining the required dilution and dispersal to meet heavy metal limits via the spreading rates and mixing/ dilution activities

Similarly, the surrender limits for constituents specified in consent 05956-2.0 Condition 29. below provides guidance for pre-spreading calculation/rates.

Table 1 Pre-surrender analytes and limits – see Condition 29. Consent 05956-2.0

Parameter	Consent Limit (mg/kg unless otherwise stated)	Minimum pre-disposal analysis required
Conductivity	290mS/m (guideline)	
Chloride	700 mg/kg (guideline)	
Sodium	460 mg/kg (guideline)	
Total Soluble Salts	2500mg/kg	
TPH Fraction	Guideline Value Agricultural Ecological Direct Soil Contact (Fine Sand) From table5.2	
F1 (C6-C10)	210	
F2 (>C10-C16)	150	
F3 (>C16-C34)	1300	
F4 (>C34)	5600	
Canadian Council of Ministers of the Environment (CCME), in the document Canada Wide Standard for Petroleum (PHC) in Soil: Scientific Rationale,2008.Table 5.2		
Soil Type Contaminant	Depth of contamination Surface (<1m) (mg/kg)	
Sand Silt MAHs	1.1	i
Benzene	82	
Toluene	59	
Ethylbenzene		
e	59	
Xylenes		

PAH (Polycyclic Aromatic Hydrocarbons)	7.2	
Naphthalene	160	
Pyrene non-carc	0.027	
Benzo(a)pyrene eq.		
Table 4.12 SANDY SILT Guidelines for Assessing and Managing Petroleum Hydrocarbon Contamination Sites in NZ (MfE 1999)		

11. Mixing Waste

It is not practical or necessary to maintain separation of waste types by providing separate sealed pits as during spreading waste types are generally mixed by the spreading and soil incorporation processes. Actual discharge of wastes into the available sealed pits at the site is generally solids into Pit 1 and liquids into Pit 2, 3 and 4, but if capacities are limited spreading of all waste types occurs on the basis of maintaining the maximum free board possible across all pits.

Predisposal assessment of waste will be carried out for each storage pit prior to any decision to spread. Both the combined product volumes and species concentrations of the resultant aggregated waste will be assessed to guide and provide a check on spreading rates prior to spreading occurring.

12. Calculating spreading areas and depth requirements from pre-disposal sample results

The pre-disposal sample results are used for pre-planning of each waste disposal. The consents restrict the thickness that waste can be spread as follows:

- 100mm for wastes with hydrocarbon content less than 50,000mg/kg dry wgt;
- 50mm for wastes with hydrocarbon content greater than 50,000mg/kg dry wgt

Application must be at a rate such that there is no overland flow of liquids; and at a rate such that no ponded liquids remain one hour, after application

To ensure these limits can be met, calculations are based upon results of the pre-disposal sample.

To obtain the minimum area for spreading the calculation is:

a) for TPH < 50,000mg/kg)
 $\text{volume (m}^3\text{)} / \text{depth allowed (0.10m)} = \text{area m}^2$

b) for TPH > 50,000 mg/kg

volume (m³)/ depth allowed (0.05m) = area m²

e.g. Volume to be spread is 200 m³

Spread Area= 200/0.05 = 4,000 sq. = 0.4Ha

13. Monitoring

13.1. Site Inspections

Regular monitoring inspections of the landfarm sites will be undertaken monthly on average as a minimum when sites are inactive, and weekly or more often the site is active to check for:

- Housekeeping of site (rubbish, access tracks, site layout, safety, security, hazards)
- Status of storage pits (volume, contamination, stability, wastes) and signage (wellsite and waste type)
- Land farming (progress, application, depth/area, slopes, separation, reinstatement), and
- Environmental (boundary distances, discharges/spills, water bodies).

13.2. Soil Sampling

TRC has developed a set of guidelines for the disposal of drilling wastes onto and into land that are reflected in the conditions of resource consents.

These guidelines, along with MFE and NZWWA guidelines, set target concentrations of metals, salts and hydrocarbons at all times, and subsequently the levels of hydrocarbons and other species and physical parameters at surrender.

Although there is no specific condition setting consent holder soil sampling frequencies, consent surrender criteria levels form the basis for the type and frequency of monitoring that will be undertaken at the site for specific purposes.

The suite of analytes that are monitored through periodic sampling of the landfarm spreading areas are determined by sampling purpose e.g. if surrender of land farmed areas is to be applied for.

Soil sampling type, methodology and frequency undertaken by WRS also depends upon two key drivers

- 1) Animal Health and Welfare/ Food Security
- 2) Decision/s to Surrender all or any part of the Consent Area

The sampling requirements and reasons are:

1. Pre-spreading - representative sample/s of the wastes to ascertain levels of hydrocarbons to calculate loadings and rates.
2. Heavy Metals - composite, representative soil samples of each disposal area following spreading at approx. one month after spreading, and then periodically, but not more than

- annually, until consent levels cited in conditions in 5659-2.0 and /or 7795-1.0 are attained;
and
3. Surrender -full testing undertaken on part or all disposal areas prior to lodging an application to surrender part of or close the site.

Analyses are normally conducted on a composite sample fraction. The composite is collected from a surveyed transect or representative “W” across the disposal area. Three to five soil cores are taken at each nominated sample points at depths determined by the objective for sampling from 75mm (for annual health and welfare criteria) to 400mm (for environmental sampling required for surrender assessment) From this bulk sample a representative fraction is submitted for analysis. The sampling methodology provides material from the zone of interest eg exposure of livestock (nominally < 75mm) to the depth the material was applied, plus an additional margin to the depth tilling may have occurred to (nominally 400mm).

All analysis will be provided by R J Hill Laboratories in Hamilton and copies of these analysis results are provided to the TRC by direct electronic transfer simultaneously with receipt by WRS.

Not all parameters are tested at every sample due to cost and practicality – generally a surrogate analytical suite is established in consultation with R J Hills Labs and agreed with the TRC.

Before any consent can be surrendered all parameters will be analysed. The consent cannot be surrendered and the site closed to land farming activities until all species specified in the consent meet the surrender criteria as below for consent 7795-1.0 (Manawapou), or as in Table 1 above for consent 5956-2.0 (Waikaikai).

Table 2 Sampling requirements and consent limits

Parameter	Consent Limit (mg/kg unless otherwise stated)	Typical Sampling requirements for WBM/SBM/Oily Wastes		
		1 month after*	6 months after*	Annual *
Chloride	700 mg/kg (expiry)	/	/	
Sodium (Na)	460 (expiry)			
Conductivity	290 mSm (expiry)			
Sodium Absorption Ratio	18 (post-app)			
Total soluble salts (g/100g)	2500 (expiry)			i

Parameter	Consent Limit (mg/kg unless otherwise stated)	Typical Sampling requirements for WBM/SBM/Oily Wastes		
BTEX		/	/	/
Benzene				
Toluene				
Ethylbenzene				
Xylenes				
PAH	Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in [New Zealand MfE 1999]. Tables 4.12 and 4.15, for soil type sand.			
Naphthalene				
Pyrene				
Benzo(a)pyrene				
TPH				
C6-C9				
C10-C14				

13.3. Pasture/Vegetation Monitoring

Pasture/vegetation monitoring will be carried out on a monthly basis in consultation with the landowner/farmer.

Any remedial action will be by agreement with the operator /landowner to enable return to the desired use as soon as practical.

13.4. Photographic Records

Representative photos of the site will be taken before spreading, after spreading and then approx.. 1- 2 months and 12 months post spreading. These will be held by the operator for 5 years and made available to the landowner and TRC upon request.

14. Contingency Procedures - Transport Spills

The primary transport contractor maintains a spill plan that will be implemented should a spill occur during transport of wastes from the rig to the land farm site. A request for a copy of this plan should be made directly to the transporting company –Symons Transport Ltd or any other carrier used by the client from time to time.

15. Site Reinstatement and Closure

When the area consented for landfarming at a particular site has been completed, stockpiling of material on the site will cease and the storage pits and discharge platform area will be reinstated to a standard and conformation compatible with the adjacent land farmed areas.

Monitoring of the site will continue until all spread areas within the site have met consent surrender conditions and guidelines. Typically under the current landfarming methodology this is achieved anywhere from 9-18 months after final rehabilitation

A final campaign of compliance sampling results are required before consents can be surrendered. The final round of sampling will be taken at 100m intervals along parallel transect lines (100m apart) crossing the entire site. This method will treat the site as a whole and provide an overview of waste remediation spatially across the landfarm. This method mirrors the process that the TRC uses to monitor the site on an annual basis.

16. Record Keeping

Records are kept of the following, and provided to the Taranaki Regional Council as required by consent conditions:

- Notifications to TRC for disposal delivery and landfarming; trucking contractor and delivery volumes;
- Wastes from each individual well, including records of additives (only if the client/drilling contractor is able or willing to provide these) used at the wellsite during the drilling process;
- Source descriptors (date collected, waste description, volume, any peculiarities in wastes for example: waxy, high percentage water, stony/sandy etc., cement returns);
- Stockpiling (area, volumes stockpiled, dates and times of commencement and completion);
- Disposal (area (including a survey map and GPS co-ordinates), volumes, dates and times of commencement and completion);
- Composition of material (including conductivity, concentrations of , chloride, sodium, total soluble salts and total hydrocarbons, and C6-C9, C10-C14 and C15-C36 fractions);
- Treatments applied (e.g. fertilisers);
- Site Inspections; and
- Sampling, analysis, and results of monitoring.

Records that are to be kept for 5 years from the date of closure include copies of the TRC monitoring programs, inspection notices, sample forms, sample results and notifications. These will be held on disc and/or in hard copy, all of which are managed by Waste Remediation Services Ltd's Operations Manager.

17. Accountabilities/Responsibilities On and Off Site

These personnel are responsible for the following activities:

Operations Manager	Implementation of this plan, maintaining records of all wastes approved for disposal via land farming, manage landfarm sites, provide notifications and reports to TRC as required by resource consent conditions.
Operations Manager	Liaison with landowners for all land farming matters
Client production supervisors, drilling supervisors, well services supervisors, mud engineers	Provide notification and information on source, nature and volume of wastes to WRS's Operations Manager. Collect sample at source and forward to WRS's Operations Manager Organise transport to the landfarm site.

Civil/Earthworks/Spreading Contractor	Undertake spreading of wastes as instructed by WRS's Operations Manager, and in accordance with TRC consent conditions.
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18. Reference Documents

Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand, Ministry for the Environment, 1999.

Disposal of Hydrocarbon Drilling Wastes near Geary Road, Taranaki Regional Council Report, June 2000.

Public Health Guidelines for the safe use of Sewage Effluent and Sewage Sludge on Land, Department of Health.

Guidelines for the control of disposal of drilling wastes onto and into land, Taranaki Regional Council, July 2003,2005 and 2013.

Review of typical TRC consent conditions to discharge drilling wastes and oily wastes via landfarming

Alberta Energy Et Utilities Board Guide 50: Drilling Waste Management, October 1996
Resource Consents

Consent Monitoring and Compliance Programmes

New Zealand Water and Wastes Association (2003): New Zealand guidelines such as Guidelines for the safe application of bio solids to land.

KMB August 2019

END

Appendix IV

TRC Inspection Notices

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2019-59381
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 14 Jun 2019
Inspection Time: 09:15

Weather Details:
Rainfall:
Wind Direction:
Wind Strength:

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments: No objectionable odours or visible emissions were found during the inspection. No recent mud deliveries or spreading activities have occurred, pit liners appeared in good repair and the pits appeared to contain storm water only. All spreading areas had good pasture cover which appeared healthy.

Further Actions Advice:

Signed:



Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2019-57832
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 06 May 2019
Inspection Time: 09:45

Weather Details:
Rainfall:
Wind Direction:
Wind Strength:

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments: No objectionable odours or visible emissions were found during the inspection. No recent mud deliveries have occurred, all lined pits had available storm water capacity. No recent spreading activities have occurred. The most recent spreading area has been sprayed out and all vegetation was dead, some muds migrating to the surface, typical mud odour present and the muds broke apart easily. Historic spreading areas found to have good pasture cover which appeared healthy, no muds were identified at the surface.

Further Actions Advice:

Signed:



Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2019-56981
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 08 Apr 2019
Inspection Time: 09:00

Weather Details:

Rainfall:	Light
Wind Direction:	S
Wind Strength:	Medium

Samples Taken: No

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments:

No objectionable odours or visible emissions were found during the inspection. No recent land farming activities have occurred, recent spreading areas had good chicory crop cover, some muds visible at the surface where the crop hasn't taken. Historic spreading areas had complete pasture cover which appeared healthy, no muds were identified at the surface. Storage pit liners appeared in good repair, plenty of capacity was available to cope with storm water inputs.

Further Actions Advice: Nil



Signed:

Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2019-55461
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 26 Feb 2019
Inspection Time: 14:15

Weather Details:

Rainfall:	None
Wind Direction:	W
Wind Strength:	Light

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments: Inspection found the recent spreading area has been sown in Chicory and red clover and the strike was good across the majority of the area, a few bare patches with muds at the surface, the mud broke apart easily, contractors bringing in equipment for land-farming have introduced yellow bristle grass onto the property and the crop will allow easier eradication of the pest plant. Storage pits found to contain product, liners appeared in good repair and storage capacity was available within the pits. No drilling mud was present at the surface in the historic spreading areas and the pasture appeared healthy.

Further Actions Advice:

Signed:



Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2018-52967
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 22 Nov 2018
Inspection Time: 11:40

Weather Details:
Rainfall:
Wind Direction:
Wind Strength:

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments: No objectionable odour or visible emissions were found beyond the boundary of the site. Pit 1 and 2 both contained red liquid with essentially no surface hydrocarbons, pit 4 appeared to contain storm water only. The balance pipe between pits 1 and 2 was blocked, pit 2 level high, the outlet pipe into pit 4 was above the liquid level. Recent spreading areas have been worked and the topsoil has been reinstated across the areas, pasture has been sowed and the strike looked good across all areas. Some mud has migrated to the surface in places, the mud broke apart easily. Shoreline inspected, no adverse effects found at the time of inspection.

Further Actions Advice:

Signed:



Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2018-50419
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 13 Aug 2018
Inspection Time: 09:30

Weather Details:

Rainfall:	None
Wind Direction:	NE
Wind Strength:	Light

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments: No objectionable odours or visible emissions were found during the inspection. No recent deliveries appear to have occurred, no further spreading has occurred either. Previous spread area has muds drying out at the surface, the northern end of the spreading area has been worked and partially incorporated, the southern end has been bunded to prevent storm water run-off which was discharging into pit 1. Stockpiled topsoil remaining stable and revegetating. Pit liners appeared in good repair and all pits were well below capacity.

Further Actions Advice:



Signed:

Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.

Inspection Notice

Under section 332 of the Resource Management Act 1991

Consent Number: R2/7795-1
Consent Name: 7795-1 (156 Manawapou Road, Manutahi)
Contact Name: Waste Remediation Services Limited
Postal Address: PO Box 7150, New Plymouth 4341
Site Location Address: 156 Manawapou Road, Manutahi

Inspection Number: OBS-2018-49466
Inspection Type: Compliance Monitoring Insp.
Inspection Date: 06 Jul 2018
Inspection Time: 10:00

Weather Details:

Rainfall:	None
Wind Direction:	NE
Wind Strength:	Light

Samples Taken: No

Consent Purpose: To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from water based muds and synthetic based muds), from hydrocarbon exploration and production activities, onto and into land via landfarming.

Overall Compliance Status: Compliance

Inspection Comments:

No objectionable odours or visible emissions were found during the inspection. Pit 1 has been emptied of all muds, the muds have been spread across the area of exposed land directly west of the storage pits, the material is drying and is yet to be incorporated into the soil profile. The exposed area north of the current discharge location has been worked and the muds have been incorporated, area yet to have topsoil reapplied and pasture sown. Pit 2 was found to be essentially full of liquid which had a red appearance. Pit 4 contained brown storm water. The contouring of the land from the spreading area access ramp and around the south of pit 1 discharges storm water into pit 1. Historic spreading areas inspected, pasture cover appeared healthy and no drilling mud was identified at the soil surface.

Further Actions Advice: Nil

Signed:



Council Officer: John Cooper

Officer Warrant Number: 174

Disclaimer: The compliance rating reflects the warranted Officer/s observations at the time of inspection and does not provide a comprehensive assessment of compliance with the consent. Therefore the compliance rating is limited to the exact period during which the inspection was undertaken as well as the specific aspects that were inspected.