TAG Oil (NZ) Ltd
Vanner Landfarm
Monitoring Programme
Annual Report
2016-2017

Technical Report 2017-06

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Executive summary

TAG Oil (NZ) Ltd (the Company) holds consent for the Vanner Landfarm. The landfarm is located on Lower Ball Road, Kakaramea, in the Mangaroa catchment. This site has been operated since 2012 with the consent granted in October 2011. The consent allowed the facility to discharge drilling wastes (consisting of cuttings and fluids from drilling operations with water based muds and synthetic based muds) onto and into land via landfarming.

This report for the period July 2016 to June 2017 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 26 conditions setting out the requirements that the Company must satisfy.

During the monitoring period, TAG Oil (NZ) Ltd demonstrated an overall High level of environmental performance.

The Council's monitoring programme for the year under review included four inspections. The consent holder had satisfied their requirement to assess landfarmed soils and the site was provisionally surrendered in March 2015. However, one condition remained outstanding and is in the process of being satisfied by the Company, so the consent remains in force.

The remaining condition 15, which formed the primary key performance indicator with respect to monitoring this landfarm in this period, stipulated that areas of land utilised for the practice of landfarming must be revegetated post application.

Ten locations have been farmed at this site between April 2013 and November 2014. The initial seven areas were landfarmed and successfully revegetated. However, the remaining three areas were affected by elemental erosion. In the previous monitoring period one of the remaining areas was found to have revegetated to an acceptable standard. The other two areas are more exposed to the southerly winds as they have less cover from the southerly wind when compared to areas where successful revegetation was achieved.

During this monitoring period, the consent holder installed numerous aged vehicle tyres across the eroded areas with a view to stabilise the wind erosion. In addition to the tyres, a direct dairy shed effluent line was installed from the landowner's oxidation ponds and an associated irrigator was also acquired to add additional carbon and fertiliser sources to the eroded areas.

It was found that revegetation had progressed when compared to the previous monitoring periods. Continued progress will likely occur in the spring when fresh crops will be planted in these areas.

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

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% 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 high level in the year under review.

This report includes recommendations for the 2017-2018 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 2016 to June 2017 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by TAG Oil (NZ) (the Company). The Company operates a landfarm (Vanner Landfarm) situated on Lower Ball Road at Kakaramea, in the Mangaroa catchment.

The Vanner site became operational during the 2011-2012 monitoring period, when there was a single disposal of 1,390 m^3 of primarily water/synthetic based cuttings and fluids, with smaller quantities of contaminated water and soil. The waste spread in 2012-2013 was sourced from the Mangahewa C and D, Sidewinder, Puka and KA-1 wellsites and Cheal production station.

On 30 July 2013 consent 7942-1 was transferred from BTW to the Company and the site began exclusively disposing of the Company's mud. The site remained under BTW management and had continued to stockpile and landfarm muds and cuttings for the remainder of the 2013-2014 monitoring period.

During the previous monitoring period 2014-2015, one area was landfarmed on site. This was described as area F10, and it represented the final parcel of land of the Northern portion of the landfarm. This material consisted of water based drilling cuttings and fluids, exclusively from the Company's operations at their Waitangi 1 wellsite.

Post the final application of material to area F10, the land was reinstated. The site has since been inactive in terms of landfarming. The Company provided the Council with sufficient information to allow for a partial surrender of the portions of land which had historically been utilised for the practice of landfarming.

Of note, the southern portion of the landfarm is still consented should the Company require additional areas to re-commence the landfarming process.

The monitoring of the 2016-17 year as defined by the recommendations from 2015-16 was focused on monitoring the degree of revegetation in the final application areas, F9 and F10.

This report includes the results and findings of the monitoring programme implemented by the Council in respect of the consent held by TAG Oil that relate to the discharges of drilling material within the Managaroa 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 5th annual report by the Council for the Company.

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 though annual programmes;
- the resource consents held by the Company in the Mangaroa 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.

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 2017-2018 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 significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

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

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative 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 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% of the consents, a good level of environmental performance and compliance was achieved.

1.2. Process description

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 $3-4000/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 levelling out uneven ground.
3. Waste is transferred to the prepared area by excavator and truck and spread out with a bulldozer. Liquids may be discharged by tanker or a spray system.
4. Waste is allowed to dry sufficiently before being tilled into the soil to the required depth with a tractor and discs.
5. The disposal area is levelled with chains or harrows.
6. Stockpiled or brought in topsoil/clay is applied to aid stability and assist in grass establishment.
7. Fertiliser may be applied and the area is sown in crop or pasture at a suitable time of year.

The landfarming process utilised at the Vanner site is on a single application basis. This means dedicated spreading areas receive only single applications of waste. When disposal is complete, the area is reinstated and monitored until consent surrender criteria have been met.

In the previous monitoring period (2015-2016) the Company provided the Council with sufficient information to allow for the partial surrender of the Vanner site.

1.3. Site description

The Vanner Landfarm is located on Lower Ball Road at Kakaramea, flanked by Origin Energy Ltd's former Spence Road Landfarm to the south. These sites are located on marginal coastal farm land situated on reworked dune fields. An extensive (50-150 m) foredune is located seaward of the consented site, it remained undisturbed by site activities. The foredune provides a considerable natural buffer from prevailing onshore winds.

Figure 1 Site location and regional inset

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 deep water table (especially in the proximity of the storage areas). Test bores were augured to 10 m in the pit area, mostly through coarse sand without intercepting significant soil moisture. Pit construction revealed mostly coarse sand at the pit bases (approximately 3-4 m below surface).

Average annual rainfall for the site is 1,043 mm (taken from the nearby Patea monitoring station). As with the other South Taranaki coastal sites, the Vanner site is subject to strong winds predominantly from the N-NW at average speeds of 10-20 knots (taken from Hawera automated weather station).

The Mangaroa Stream runs through the northern extent of the site separating the stockpiling facilities and some of the available spreading area from the main spreading area at the southern end of the site. Prior to any spreading activities the Company were required to install a culvert across the stream to prevent unauthorised discharges and stream bed damage from earthworks and transporting processes.

Location: TAG Oil (NZ) Vanner Landfarm	
Word descriptor:	Lower Ball Road, Kakaramea, Taranaki
Map reference:	E 1720685
(NZTM)	N 5602731
Mean annual rainfall:	1,043 mm
Mean annual soil temperature:	~15.1°C
Mean annual soil moisture:	~32.9%
Elevation:	~25 m asl
Geomorphic position:	Cliffed / dune backslope
Erosion / deposition:	Erosion
Vegetation:	Pasture, dune grasses
Parent material:	Aeolian deposit
Drainage class:	Free / well draining
Land use:	Active disposal

1.4. Resource consents

1.4.1. 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.

The Company holds discharge permit **7942-1.1** to discharge waste (consisting of drilling cuttings and drilling fluids from the drilling operations with WBM and SBM) onto and into land via landfarming. This permit was issued by the Council on 21 October 2011 under Section 87(e) of the RMA. It is due to expire on 1 June 2028.

- Condition 1 sets out definitions.
- Condition 2 requires the consent holder to adopt the best practicable option to minimise any environmental effects.
- Conditions 3 to 7 require the notification and the provision of information and analytical data prior to receipt of wastes on site for stockpiling, and prior to discharge.
- Condition 8 stipulates the discharge area.
- Condition 9 requires a buffer zone between areas of disposal and surface water bodies and property boundaries.
- Conditions 10 to 13 stipulate the manner and dispersal of wastes and discharge limits.
- Conditions 14 and 15 specify further site management requirements.
- Conditions 16 to 23 specify receiving environment limits for both soil and water.
- Condition 24 concerns archaeological remains.

- Conditions 25 and 26 concern lapse provisions and consent reviews.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

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 Vanner Landfarm consisted of four 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;
- in 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 Vanner site was visited four times during the monitoring period. The inspections focussed on the following aspects:

- observable and/or ongoing effects upon soil and groundwater quality associated with the land disposal process
- effective incorporation of material, application rates and associated earthworks
- integrity and management of storage facilities
- dust and odour effects in proximity of the site boundaries
- housekeeping and site management
- the neighbourhood was surveyed for environmental effects; and
- revegetation of the final landfarmed areas.

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.

As discussed previously, the Company applied for a partial surrender in the previous monitoring period. The partial surrender was achieved by providing the Council with analytical evidence of the soil condition to support the idea that areas of land which had been utilised for the practice of landfarming had met the conditional limit for surrender as detailed in their consent 7942-1.1. As such the Council does not require additional samples to be collected in this monitoring period. Results of the soil and groundwater analysis are provided in the previous monitoring years report.

As such, post the successful surrender of the landfarm the main performance indicator which is still required to be met is limited to condition 15 of consent 7942-1.1 which states the following:

Consent 7942-1.1 Condition 15

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.

1.5.4. Provision of consent holder data

In an active monitoring year, when the site is stockpiling or in the mode of remediation, the Company would supply a certain amount of analytical soil samples to meet the specific consent conditions.

The Company would also supply surface water sample results from the Mangaroa Stream for review.

As the site was partially surrendered in the previous monitoring period, there remained no requirement for the Company to provide analysis of the soil.

2. Results

2.1.1. Inspections

15 November 2016

At the time of inspection the following was observed. The wind was from the north, at a speed of 5 knots. No objectionable odours or visible emissions were found during the inspection. No storage pits were present on-site as they were removed a few monitoring periods before. No recent spreading activities had occurred. The original southern spreading area had good pasture cover across all areas and the pasture appeared healthy.

The more recent spread areas, where the pits were previously located had been re-sown. Tyres has been placed in rows across the predominant wind direction in an effort to establish pasture cover. Drilling muds were well incorporated and very little had migrated to the surface. All muds at the surface were well weathered and broke apart easily.

23 February 2017

During the inspection the following was observed. The wind was from the west, at a speed of 1-2 knots. No objectionable odours or visible emissions were found during the inspection. No recent storage activities have occurred as no storage pits were present. The original spreading area was inspected. The pasture cover looked good across the entire area and the pasture appeared healthy, no muds were identified at the surface.

Most recent spreading area had some pasture cover at each end of the site. The area in the middle of the northern portion was observed to be barren due to the low point in the dunes on the seaward side. A clear wind channel through the area was preventing pasture growth.

Within the car tyres which have been laid, the pasture had grown nicely. Muds were identifiable at the surface where the pasture was absent. The muds broke apart easily and had typical mud odours.

The following action was to be taken: Undertake works to establish pasture cover in the barren areas where muds have previously been spread.

14 June 2017

At the time of inspection the following was observed. Wind was from the southwest at a speed of 5 knots. No objectionable odours or visible emissions were found during the inspection. No recent disposal activities had occurred at the site and no storage pits were present. The original spreading areas had very good pasture cover across all areas. The pasture appeared healthy and no muds were identified at the site surface.

The recent spreading areas where storage pits were originally contained two large bare patches. Straw had been applied to other bare areas. The tyres were observed, which were still in place to reduce wind erosion. FDE (Farm Dairy Effluent) had been applied to the spreading area the morning of the inspection. It had been applied along the coastal side of the site. The pasture had recently been grazed prior to FDE application. No drilling muds were found at the surface. The grazed pasture appeared healthy. The access gate had been replaced by a boundary fence.

20 June 2017

No changes had occurred since the last inspection. The irrigator remained stationary, which would indicate that no further FDE had been applied. A discussion was held with the landowner. It was outlined that the spreading areas were being reseeded by landowner, with further seeding to occur across bare patches in the upcoming spring. Straw would be applied in the interim as required. The original spreading areas had good

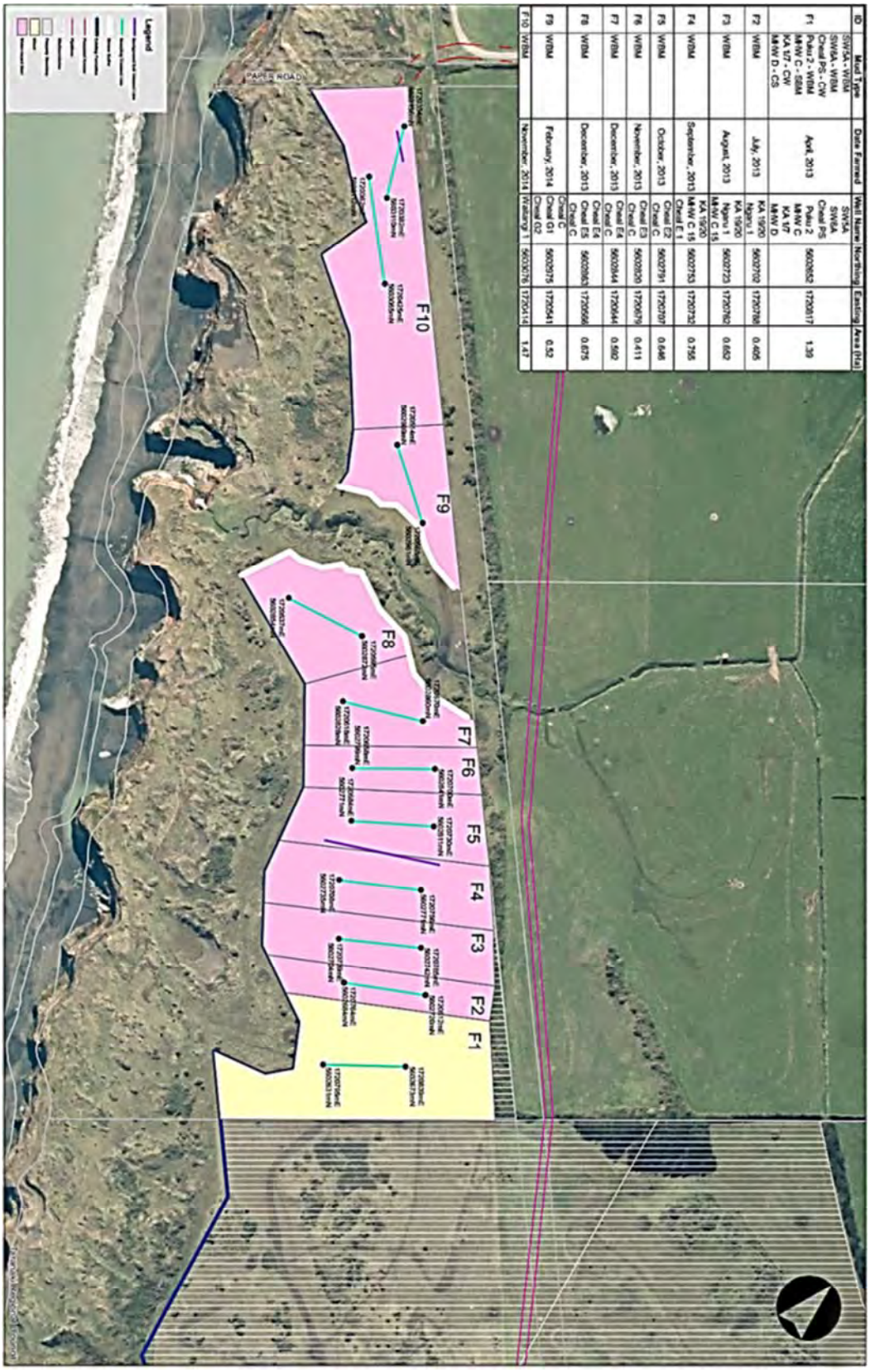
pasture cover which appeared healthy. The landowner had no plans to dispose of anymore drilling mud on-farm at present. No incidents were reported.

2.1.2. Results of abstraction and discharge monitoring

The site received and discharged its last delivery of land farmable material in November 2014. This material originated from the Waitangi 1 wellsite and consisted of WBM. While this discharge was outside of the monitoring period of this report it has been included as it was the final discharge to this site prior to partial surrender. A full list of the discharges to the site is provided in Table 1, this is also provided graphically in Figure 2.

Table 1 Vanner Landfarm application dates and details

Location ID	Mud Type	Date Farmed	Well name	Area (Ha)
F1	WBM WBM CW WBM SBM CW CS	April 2013	SW5A SW6A Cheal PS Puku-2 MHW-C KA 1/7 MHW D	1.39
F2	WBM	July 2013	KA 19/20	0.405
F3	WBM	August 2013	KA 19/20	0.652
F4	WBM	September 2013	KA 19/20	0.755
F5	WBM	October 2013	Cheal E2	0.646
F6	WBM	November 2013	Cheal E3	0.411
F7	WBM	December 2013	Cheal E4	0.592
F8	WBM	December 2013	Cheal E4	0.675
F9	WBM	February 2014	Cheal C	0.52
F10	WBM	November 2014	Waitangi 1	1.47
Mud key: WBM: Water based mud; WW: Waste Water; CS: Contaminated soil; SBW: Synthetic based mud and CW: Contaminated water.				



ID	Mud Type	Date Farmed	Well Name	Northing	Easting	Area (Ha)
F1	SWSA - WBM SWBA - WBM Chisel PS - CW Pukui 2 - WBM MHW C - SBM KA 1/7 - CW MHW D - CS	April, 2013	SWSA SWBA Chisel PS Pukui 2 MHW C KA 1/7 MHW D	5600853	1720617	1.39
F2	WBM	July, 2013	KA 19/20	5607102	1720788	0.405
F3	WBM	August, 2013	Ngaru 1 KA 19/20 Ngaru 1 MHW C 15 KA 10/20	5607723	1720780	0.662
F4	WBM	September, 2013	MHW C 15 Chisel E 1	5607753	1720720	0.755
F5	WBM	October, 2013	Chisel E2 Chisel C	5607791	1720707	0.646
F6	WBM	November, 2013	Chisel E3 Chisel C	5608826	1720679	0.411
F7	WBM	December, 2013	Chisel E4 Chisel C	5608844	1720644	0.582
F8	WBM	December, 2013	Chisel E5 Chisel C	5608863	1720566	0.675
F9	WBM	February, 2014	Chisel C Chisel G1 Chisel G2	5608875	1720541	0.52
F10	WBM	November, 2014	Waikanga 1	5609276	1720414	1.47

Figure 2 Site map and application areas Vanner Landfarm with BTW soil sample transects

2.1.3. Results of receiving environment monitoring

The consent holder's main intention in this monitoring period was to satisfy condition 15 of consent 7942-1.1

Revegetation of the Vanner Landfarm has proved problematic. The initial landfarming exercise resulted in vegetation coverage of the lower areas, undertaken across areas F1- F7 inclusive (Figure 2), with little or no real revegetation issues. However, area F8 initially proved problematic in the establishment of the vegetation. Figure 3 (March 2015) indicated the scale of the revegetation required at the time. By November of 2015 (Figure 4) the establishment of vegetation had been undertaken. Note that this was two years after the application of material to land in this specific location.

Figure 3 Area F8 March 2015 North West projection

Two additional areas were landfarmed after area F8. Area F9 and F10 were farmed later, February 2014 and November 2014.

Areas F9 and F10 in similarity to area F8, had proved difficult to revegetate. The consent holder's attempts of sowing seed, which had resulted in the initial establishment of vegetation, were stripped in heavy weather in September 2015 (Figure 5).

Since this date, numerous attempts had been undertaken to re-establish the vegetation, however wind and rain erosion had hindered the progress.

Figures 6 and 7 denote the follow up re-sown grass which was undertaken in May 2016. The re-sown grass was blown out through wind and rain erosion throughout the 2016 winter. In February of 2017, the site was revisited. The site management had undertaken additional works with a view of meeting condition 15 of consent 7942-1.1 The consent holder deployed and utilised tyres across the site with a view of mitigating the wind erosion (Figures 8 and 9).

Figure 4 Area F8 November 2015 North West projection

The initial findings of this monitoring year (2016-2017) indicated that the tyres appeared to be aiding with vegetation establishment in certain areas of the site. The Northern portion of F10 appeared to take well, while area F9 and the southern portion of F10, which are the more exposed of the remaining areas will require careful management (Inspection 23 February 2017). In some areas the effects of the wind erosion were clearly evident. The erosion had exposed the clay in places and these specific areas will require additional mitigation moving forward. As discussed in the final inspection, the landowner is monitoring these areas and adding straw when required, with a view of replanting in spring.

Figure 5 Areas F9 and F10 November 2015 North West projection

Upon inspection in February 2017, it could be inferred that the scale of revegetation required was similar to area F8 in March 2015 (Figure 3), which had under gone similar issues during its revegetation.

After a meeting with the Council officer in February 2017, the consent holder installed and managed a dairy shed effluent line with an associated irrigator to apply dairy shed effluent to the site with a view of providing additional sources of carbon and fertiliser.

Figure 6 Area F10 towards Area F9 May 2016 South East projection

The site was visited again in August 2017, the observations by the Council's officer indicated that in certain parts of areas F9 and the northern F10 vegetation had taken hold (Figure 10). However, for portions of both these areas wind blown erosion was evident (Figure 11).

Figure 7 Area F9 May 2016 South East projection

Overall, the consent holder had been proactive with their response to the erosion of areas F9 and F10. The application of used car tyres coupled with the application of dairy shed effluent and associated irrigator appear to be mitigating the erosion issue.

Figure 8 Area F10 looking towards F9 on South East Projection January 2017

While the erosion is visible in certain parts, mainly area F9 and the southern portion of F10. The observation is that both areas, F9 and significantly F10, contain more vegetation (Figure 12 & 13) when compared to the same period last year (Figure 5).

Figure 9 Area F9 February 2017 South West projection

Figure 10 Area F9/F10 August 2017 South West projection

Figure 11 Area F9 towards F10 North West projection August 2017

Figure 12 Area F10 towards F9 South West projection

Figure 13 Area F10 towards F9 South projection

2.2. Investigations, interventions, and incidents

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 consent holder. 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.

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

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

In the 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3. Discussion

3.1. Discussion of site performance

The performance of the consent holder at the Vanner Landfarm site in 2016-2017 monitoring period was primarily aimed at attempting to satisfy the final outstanding consent condition 15. As previously stated this condition related to revegetation of previously landfarmed areas. In attempting to satisfy this condition over the last few monitoring years the consent holder has amongst other treatments, drilled seeds on numerous occasions. Their efforts had been mostly unsuccessful due to elemental erosion (both wind and rain).

In this monitoring period the consent holder purchased used vehicle tyres which were deployed across the affected areas of F9 and F10 with a view of stabilising the areas from wind blown erosion. In addition to the tyres, a direct dairy shed effluent line was purchased and installed, coupled with an associated irrigator to apply this effluent.

The result at the end of this monitoring period indicated that the application of the engineering control appears to be aiding with the scale of revegetation required to satisfy condition 15. Additional work will be required to satisfy this condition in certain areas of the site (mainly F9 which appears more susceptible to erosion than F10). Area F10 specifically, appears to be improving with significantly more vegetation observed in this area than in the previous monitoring year. While area F10 appears to be revegetating more effectively it still requires more time, as the southern end of F10 is more exposed than the northern end. Equally, area F9 has been successful in certain portions and it is likely that careful management, especially of the blow outs (areas where wind and rain erosion have been more prevalent) will bring this area to full scale revegetation.

The Council will continue to monitor this landfarm until the consent conditions are met and it is fully surrendered.

3.2. Environmental effects of exercise of consents

The environmental effects in relation to the exercise of this consent are discussed in the previous annual report. Presently the landfarm is not receiving or discharging drilling wastes and as such are in the phase of ensuring that the consent requirements are met to allow for surrender of consent.

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 2.

Table 2 Summary of performance for consent 7942-1 2016-2017 monitoring year

Purpose: ***To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from drilling operations with water based muds and synthetic based muds) onto and into land via landfarming.***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Definitions which apply to the consent	Not applicable	
2. Best practicable option to be adopted	Inspection and liaison with consent holder	Yes
3. Notify the Council 48 hrs prior to stockpiling	Notifications received, landfarming now complete, no requirement for future notifications	Yes
4. Notify the Council 48 hrs prior to landfarming	Notifications received, landfarming now complete, no requirement for future notifications	Yes
5. 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	Sampling undertaken when required, no longer required, please see annual report 2015-2016 for full analysis	Yes
6. Keep records relating to wastes, areas, compositions, volumes, dates, treatments and monitoring	Company records	Yes
7. Report on records in condition 6 to Council by 31 August each year	Report received last monitoring year, no requirement for report this year	Yes
8. The discharge shall only occur on the area East of area F1	Inspections, no further landfarming undertaken, though there is facility	N/A in this monitoring period
9. No discharge within 25 m of a water body or property boundary	Inspection	Yes
10. Discharge depth limited to 100 mm for waste with hydrocarbons <5%, or 50 mm for waste with hydrocarbons >5%	Company records and inspection	Yes
11. Incorporation into soil as soon as practicable to a depth of at least 250 mm	Inspection and sampling	Yes
12. Hydrocarbon concentrations in soil shall not exceed 50,000 mg/ kg dry weight	Sampling	Yes

Purpose: *To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from drilling operations with water based muds and synthetic based muds) onto and into land via landfarming.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
13. 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
14. All material to be landfarmed as soon as practicable and no later than 12 months	Company records and inspections	Yes
15. Re-vegetate landfarmed areas as soon as practicable	Inspections, areas F9 and F10 still revegetating	On going
16. Total dissolved salts in any fresh water body shall not exceed 2,500 g/m^3	Sampling	Yes
17. Disposal of waste shall not lead to contaminants entering surface water or ground water exceeding background concentrations	Sampling	Yes
18. Disposal of waste shall not result in any significant adverse environmental effects on the Mangaroa Stream	Inspection and sampling	Yes
19. Soil conductivity must be less than 400 mS/m. If background conductivity exceeds 400 mS/m, then increase shall not exceed 100 mS/m	Sampling	Yes
20. Sodium absorption ratio [SAR] must be less than 18.0, if background SAR exceeds 18.0 then increase shall not exceed 1.0	Sampling	Yes
21. Concentrations of heavy metals in the soil shall at all times comply with MfE guidelines	Sampling	Yes
22. Prior to expiry/cancellation of consent these levels must not be exceeded: a. conductivity, 400 mS/m b. chloride, 700 g/m^3 c. dissolved salts, 2,500 g/m^3 d. sodium, 460 g/m^3 e. PAHs, MAHs and TPH, Tables 4.12 and 4.15, Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand (MfE 1999)	Sampling prior to surrender	Yes, supplied when facility was partially surrendered please see annual report 2015-2016

Purpose: *To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from drilling operations with water based muds and synthetic based muds) onto and into land via landfarming.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
23. If condition 22 not met, consent cannot be surrendered	Sampling	Yes, consent partially surrendered in previous period
24. Notification of discovery of archaeological remains	None found	N/A
25. Lapse condition	Inspection for evidence of exercise	N/A
26. Optional review provision re environmental effects	Next optional review June 2016	N/A
Overall assessment of environmental performance and compliance in respect of this consent		**High**
Overall assessment of administrative compliance in respect of this consent		**High**

N/A = not applicable

Table 3 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2011-2012	7942-1	1			
2012-2013	7942-1	1			
2013-2014	7942-1	1			
2014-2015	7942-1.1	1			
2015-2016	7942-1.1	1			
2016-2017	7942-1.1	1			
Totals		6	0	0	0

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

3.4. Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. That monitoring of consented activities at the Vanner Landfarm in the 2016-2017 year continues in line with what was undertaken in 2015-2016 due to the fact the site is inactive and partially surrendered with only revegetation issues. The revegetation monitoring will form the basis for monitoring in the 2016-2017 year.

This recommendation was undertaken.

3.5. Alterations to monitoring programmes for 2017-2018

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

- the extent of information made available by previous authorities;
- its relevance under the RMA;
- its obligations to monitor emissions/discharges and effects under the RMA; and
- to report 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2017-2018 monitoring period, the monitoring of consented activities at the Vanner Landfarm continue as undertaken for the current monitoring period.

4. Recommendations

1. THAT monitoring of consented activities at the Vanner Landfarm in the 2017-2018 year continues at the same level as in 2016-2017.

Glossary of common terms and abbreviations

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

As*	Arsenic.
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.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m^3s^{-1}).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$g/m^2/day$	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.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).

NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
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	*Resource Management Act 1991* 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 the Council’s laboratory.

Bibliography and references

BTW Limited – TAG OIL (NZ) Limited Landfarm Annual Report – Consent 7942-1—13314—22 July 2014.

Ministry for the Environment (1999): Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand, Ministry for the Environment.

Ministry for the Environment (2003): Guidelines for the safe application of biosolids to land in New Zealand, Ministry for the Environment.

Taranaki Regional Council (2016): *TAG Oil (NZ) Ltd Vanner Landfarm Monitoring programme Annual report 2015-2016*. Technical Report 2016-90.

Taranaki Regional Council (2015): *TAG Oil (NZ) Limited Vanner Landfarm Monitoring programme Annual report 2014-2015*. Technical Report 2015-63.

Taranaki Regional Council (2014): *TAG Oil (NZ) Limited Vanner Landfarm Monitoring programme Annual report 2013-2014*. Technical Report 2014 – 47.

Taranaki Regional Council (2013): *BTW Limited Vanner Landfarm Monitoring Programme Annual Report 2012-2013*. Technical Report 2013 – 58.

Appendix I

Resource consents held by TAG Oil (NZ) Ltd

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

Discharge Permit

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

Name of Consent Holder:	TAG Oil (NZ) Limited PO Box 402 New Plymouth 4340	
Decision Date (Change):	27 March 2015	
Commencement Date (Change):	27 March 2015	(Granted Date: 21 October 2011)

Conditions of Consent

Consent Granted:	To discharge drilling wastes (consisting of drilling cuttings and drilling fluids from drilling operations with water based muds and synthetic based muds) onto and into land via landfarming
Expiry Date:	1 June 2028
Review Date(s):	June 2016, June 2022
Site Location:	Lower Ball Road, Kakaramea
Legal Description:	Lot 1 DP 8481 Sub 2 & 3 Blk II Carlyle SD (Discharge site)
Grid Reference (NZTM)	1721037E-5602605N
Catchment:	Mangaroa

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.

Notifications, monitoring and reporting

3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, (by emailing worknotification@trc.govt.nz) at least 48 hours prior to permitting drilling wastes onto the site for stockpiling, from each well drilled. Notification shall include the following information:

    a) the consent number;
    b) the name of the well(s) from which the waste was generated;
    c) the type of waste to be stockpiled; and
    d) the volume of waste to be stockpiled.

4. The consent holder shall notify the Chief Executive, Taranaki Regional Council, (by emailing worknotification@trc.govt.nz) at least 48 hours prior to landfarming stockpiled material, 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.

5. 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 (C_6-C_9, C_{10}-C_{14}, C_{15}-C_{36});
   b) benzene, toluene, ethylbenzene, and xylenes;
   c) polycyclic aromatic hydrocarbons screening; and
   d) chloride, nitrogen, pH, potassium, and sodium.

6. 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.

7. 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

8. The discharge shall only occur on the area East of area F1 as shown in Drawing No 13314-109-GIS Rev 0 attached.

9. Notwithstanding condition 8, there shall be no discharge within 25 metres of the Mangaroa Stream or property boundaries.

10. For the purposes of landfarming, drilling wastes shall be applied to land in a layer not exceeding:

    a) 100 mm thick for wastes with a hydrocarbon concentration less than 50,000 mg/kg dry weight; or
    b) 50 mm thick for wastes with a hydrocarbon concentration equal to or greater than 50,000 mg/kg dry weight; and
    c) in a rate and manner such that no ponded liquids remain after one hour, for all wastes;

    prior to incorporation into the soil.

11. 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.

12. 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.

13. 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

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

15. 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

16. The exercise of this consent shall not result in the concentration of total dissolved salts in any fresh water body exceeding 2500 g/m^3.

17. Other than as provided for in condition 15, 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.

18. The exercise of this consent shall not result in any of the following effects in the Mangaroa Stream:

    a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
    b) any conspicuous change in the colour or visual clarity;
    c) any emission of objectionable odour;
    d) the rendering of fresh water unsuitable for consumption by farm animals;
    e) any significant adverse effects on aquatic life.

Receiving environment limits - soil

19. 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 mS/m, the landfarming of waste shall not increase the soil conductivity by more than 100 mS/m.

20. The sodium absorption 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.

21. The concentration of heavy metals in the soil shall at all times comply with the Ministry for the Environment and New Zealand Water & Wastes Assoication'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

22. 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 - napthalene, non-carc. (pyrene), benzo(a)pyrene eq.
TPH - total petroleum hydrocarbons (C_7-C_9, C_{10}-C_{14}, C_{15}-C_{36})

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.

23. This consent may not be surrendered at any time until the standards in condition 22 have been met.

Archaeological remains

24. 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

25. This consent shall lapse on 31 December 2016, 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.

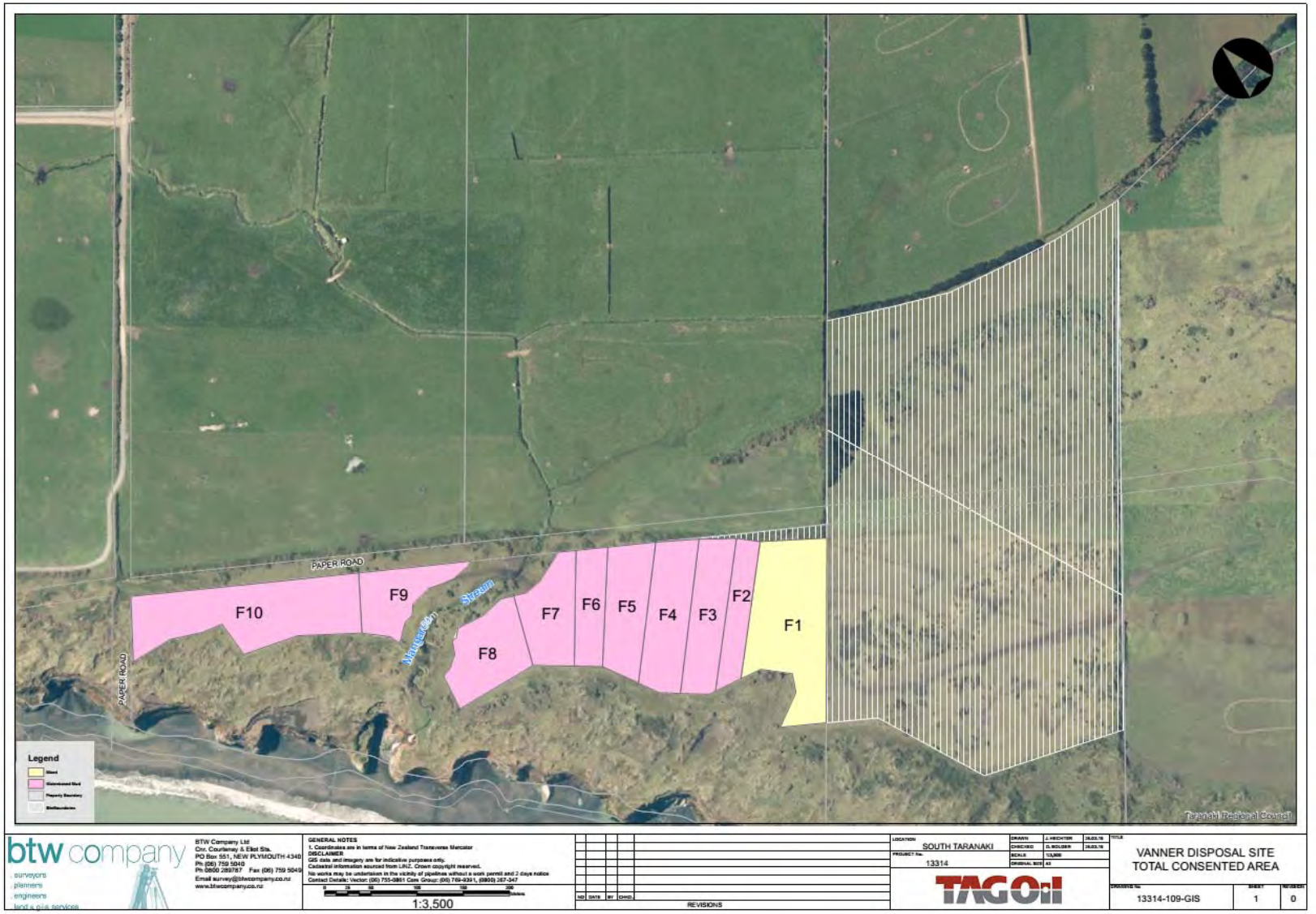
26. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2016 and/or June 2022, 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.

Signed at Stratford on 27 March 2015

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management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Manaia Stream
Legend
Taranaki Regional Council
btw company
surveyors
planners
engineers
land & gis services
BTW Company Ltd
Cnr. Courtenay & Eliot Sts.
PO Box 551, NEW PLYMOUTH 4340
Ph (06) 759 5940
Ph 0800 289787 Fax (06) 759 5049
Email survey@btwcompany.co.nz
www.btwcompany.co.nz
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NO DATE BY CHKD
REVISIONS
LOCATION
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PROJECT No.
13314
DRAWN J. HEICHTER 26.02.16
CHECKED S. BOLDER 26.02.16
SCALE 1:3,500
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