



REPORT

Preliminary Site Investigation

Tauranga Bay Quarry

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List of Abbreviations and Units

Acronym	Meaning
amsl	Above mean sea level
AST	Above ground storage tank
BDC	Buller District Council
bgl	below ground level
bmsl	Below mean sea level
CSM	Conceptual site model
DSI	Detailed site investigation
ha	Hectare
HAIL	Hazardous Activities and Industries List
HNZL	Holcim (New Zealand) Limited
IBC	Intermediate bulk container
km	Kilometre
L	Litre
LOR	Limit of reporting
m	Metre
MfE	Ministry for the Environment
NAPL	Non-aqueous phase liquids
NES	National Environmental Standard (soil)
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PID	Photo-ionisation detector
PSI	Preliminary site investigation
PVC	Polyvinyl chloride
SCS	Soil contaminant standard
SGV	Soil guideline value
SVOC	Semi-volatile organic compounds
TPH	Total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compounds
WCRC	West Coast Regional Council

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1.0 INTRODUCTION

1.1 Purpose

Holcim (New Zealand) Limited (HNZL) has moved away from local cement manufacturing to importing cement for the New Zealand market. The Tauranga Bay limestone quarry (the Quarry) at Cape Foulwind formed part of HNZL's cement production on the west coast, but the Quarry has now ceased operations and the quarry pits are filling with groundwater and stormwater.

Given the cessation of cement production on the west coast, HNZL is planning to divest the Quarry. However, as a precursor to divestment, HNZL wish to understand the condition of the Quarry with respect to land contamination. HNZL commissioned Golder Associates (NZ) Limited¹ (Golder) to undertake a review of historical land use activities and prepare this Preliminary Site Investigation (PSI) report.

This PSI report also includes the results of a limited soil sampling programme to characterise potential soil contamination identified during the site inspection undertaken as part of this PSI.

HNZL has indicated that the Quarry will remain zoned as cement production zone (essentially industrial) land for the purposes of this PSI.

1.2 Background

The Quarry commenced operations in the 1950s and was operated by Milburn New Zealand Limited (formerly New Zealand Cement Holdings Ltd). Since the 1990s, HNZL has owned and operated the Quarry to support cement production at the Westport Cement Works.

Quarrying activities initially commenced in "G" quarry, in the northern part of the Quarry site and later moved into a larger open cut pit to the south, known as the Main ("M") quarry. As part of the quarrying operations, groundwater abstraction (dewatering) was undertaken. Quarrying ceased in May 2016 and the dewatering pumps were switched off. When the dewatering pumps were switched off, the quarry pits started to fill with groundwater.

The Quarry is understood to have been operationally self-sufficient, which required the following facilities/processes:

- Vehicle and equipment refuelling.
- Mechanical maintenance.
- Rock processing (crushing/screening).
- Processed rock storage.
- Explosive storage.
- Waste disposal.
- Administration.
- Power supply.

¹ Golder undertook the PSI in accordance with our proposal (P1779210-001-P-Rev0-PSI_DSI) dated 5 May 2017 and the short form agreement for consultant engagement (including variations) between HNZL and Golder for the Westport Cement Works DSI dated 11 January 2016.

1.3 Scope of Work

The scope of work undertaken to support this PSI is summarised below:

- Review of property files held by Buller District Council (BDC).
- Review of any information held by the West Coast Regional Council (WCRC), including consents and consent monitoring requirements.
- Review of relevant information held by HNZL, including aerial images.
- Review of available and relevant technical reports prepared for the Quarry.
- Undertake a site walkover, including discussions with HNZL staff on site and limited targeted soil sampling.
- Preparation of a PSI report.

This report has been prepared in accordance (where relevant) with the Ministry for the Environment (MfE 2011a) Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand.

This report complies with Regulation 3 of the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES) and has been written and reviewed by persons considered to be suitably qualified and experienced practitioners, see Record of Review in Appendix A.

2.0 SITE SETTING

2.1 Site Description

The Quarry is located to the south-west of the Cement Works, at the end of Limestone Road, Cape Foulwind (accessed from Tauranga Bay Road, some 8 kilometres (km) to the west of Westport). The Quarry comprises an area of approximately 120 hectares (ha) and its boundary is shown on Figure 1. The main quarry pit is located approximately 0.5 km (at its closest) from the Tauranga Bay coastline.

The Quarry is zoned as a 'Cement Production Zone'. The legal description of the Quarry is defined by the following land parcels:

- Pt Sec 3 Blk 1 (SO 2827).
- Pt 5 Blk 1 (DP 4458).
- Pt Sec 5 Blk 1 (SO 2829).
- Lots 1, 2 and 3 (DP 51).
- Lots 1, 2 and 3 (DP 5455).
- Lots 1 and 3 (DP 2078).
- Pt Sec 3 Blk 1 (SO 2827).
- Sec 41 Blk 111 (SO 11713).
- Pt Sec 15 Square 142 (SO 3431).
- Sec 9 Square 142 (SO 2829).

- Pt Sec 12 Square 142 (SO 3431).
- Pt Sec 16 Blk (SO 6263).
- Pt Sec 9 and Sec 10 Blk III (SO 2831).
- Pt Sec 7 Blk III (SO 2831).

The Quarry comprises two main pits and various settling ponds, buildings, material stockpiles and quarrying infrastructure. The layout of the Quarry is described in Section 5.0.

2.2 Physical Setting

2.2.1 General

The Quarry is surrounded by farmland (mainly pasture) and areas of regenerating native bush. The topography of the general area in the vicinity of the Quarry is defined by uplifted marine terraces and coastal dunes dissected by small streams and gullies which drain into Tauranga Bay. The Quarry land surface sits around 40 metres (m) above mean sea level (amsl) and drops off sharply (via cliffs) into Tauranga Bay to the west.

The vegetation on and surrounding the Quarry has been heavily modified to form pasture and scrub.

Annual rainfall at Westport Airport (6 km to the north of the Quarry) is approximately 2,100 millimetres (mm), spread fairly evenly throughout the year.

2.2.2 Geology

A review of published geological maps for Cape Foulwind (Nathan et al. 2002) indicates that the Quarry is predominantly underlain by the Undifferentiated Nile Group Limestone (a high grade algal limestone) consisting of marine sedimentary limestone and calcareous mudstone (known also as marl). The limestones are overlain by beach, dune and lagoonal deposits of the last inter-glacial period (Oturi), which form part of the Waites Formation.

The north-western portion of the Quarry, which is largely undeveloped, is underlain by Foulwind Granite, which is a felsic intrusive basement rock common to the west coast of New Zealand.

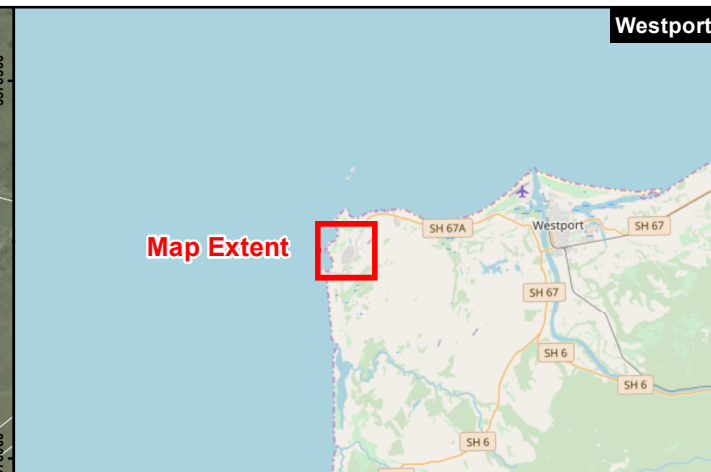
Previous investigations at the Westport Cement Works, documented in the Cement Works PSI (Golder 2016b) have found the Waites Formation to comprise an interbedded sequence of predominantly sand with silt and clay layers; the sequence has considerable lateral and vertical heterogeneity. In the vicinity of the Cement Works, the Waites Formation is between 4 m and 16 m thick. Beneath the Waites Formation is a sandy clay unit termed the 'Blue Bottom Clay'.

The sand deposits in the Cape Foulwind area are understood to be rich in ilmenite (an iron mineral) and leaching and subsequent re-deposition of iron has resulted in the formation of extensive iron pans within the soil profile. Iron pans are characterised by layers of relatively low permeability that restrict the vertical movement of groundwater resulting in the formation of boggy or marshy soils (referred to as Pakahi). Iron pan layers are often broken up and re-worked by landowners to improve drainage (Golder 2016b).

2.2.3 Surface water

Based on a review of the Topographic Maps of New Zealand (LINZ 2017), there does not appear to be any surface water discharge into the Quarry. However, streams exist to the north (Williams Gully) and south (Walls Creek, also named Limestone Creek) of the Quarry, both of which discharge to Tauranga Bay. The Quarry is essentially located in the catchment divide of the Williams Gully and Walls Creeks.

Storm water in the quarry is collected from several areas and is currently directed into M Quarry.



LEGEND

- Site boundary
- Parcel boundary

NOTES

1. Aerial: WCRC aerial, flown 2016, CC-BY-3.0-NZ.
2. Map image: © OpenStreetMap (and) contributors, CC-BY-SA West Coast Regional Council, Buller District Council, Grey District Council, Westland District Council
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REFERENCE SCALE: 1:10,000 (at A3)
 PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
SITE LOCATION PLAN

CONSULTANT	YYYY-MM-DD	2018-01-30
GOLDER	PREPARED	KC
	REVIEW	RK
	APPROVED	TW

PROJECT NO. 1779210 REPORT 002 REV. 0 FIGURE 01

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2.2.4 Groundwater

Before the quarrying commenced, the interbedded sands, silts and clays would have formed an unconfined aquifer system, with groundwater flow controlled by the occurrence and continuity of the more permeable sandy units. The presence of silt and clay layers and iron pans at various levels within the vertical sequence would have resulted in the formation of perched water tables and some confinement of deeper sand units. It is likely that unconfined groundwater would have discharged (to some extent) into the Williams Gully and Walls Creeks.

Pre-quarrying, groundwater within the bedrock would have likely flowed towards the ocean to the west. However, during operation of the Quarry, the quarry pits (which extended below the water table) were dewatered. Abstraction of groundwater from around the quarry pits would have affected groundwater gradients in the vicinity of the quarry, essentially drawing groundwater from the surrounding area towards the void formed by the quarry. The details of the dewatering and the associated infrastructure are unknown.

The dewatering (groundwater abstraction) is understood to have ceased in May 2016, around the time quarrying activities came to an end. The quarry pits are now filling with groundwater and this will continue until pit water levels equalise with surrounding groundwater levels. No borehole logs containing groundwater level data for the Quarry were sighted by Golder during the preparation of this report.

Given the proximity of the Quarry to the Tasman Sea and the 50 year dewatering timeframe, it is unlikely that abstraction of groundwater for potable supply would be occurring down hydraulic gradient of the Quarry. No evidence for such groundwater abstraction was discovered during the information review.

3.0 SITE OPERATIONS

3.1 General

The Quarry commenced operation in 1957 initially starting in the “G” Quarry. However, the “G” quarry was abandoned because the limestone was too dark for use in cement production and operations moved to a new “M” quarry to the south; the relative locations of the “G” and “M” quarries are shown on Figure 2. The “M” quarry floor is approximately 24 m below mean sea level (bmsl) (Golder 2016a).

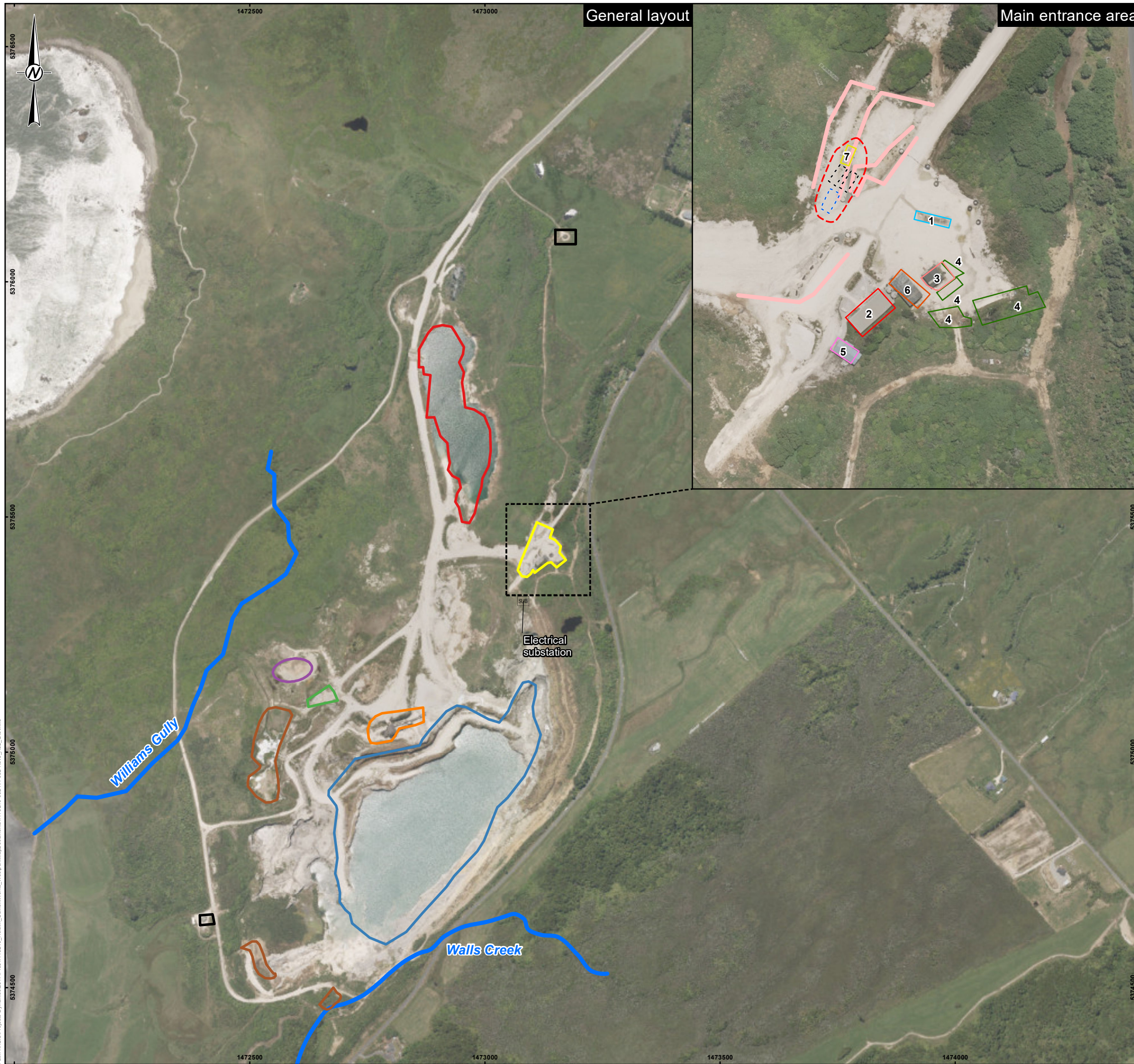
Limited information on quarrying operations has been discovered during the information review. However, based on conversations with HNZL staff and observations during the site walkover (see Sections 4 and 5), explosives were used to blast and extract rock. The rock was then recovered using mobile plant and transported to the crusher for processing prior to transport to the Cement Works.

The Quarry operations were supported by various infrastructure such as refuelling areas, workshops, and power supply.

3.2 Post Closure Discussion

Quarrying ceased in May 2016 and the dewatering pumps were switched off. At the time of writing this report, groundwater was still discharging into the “M” and “G” pits and this would continue until pit water levels equilibrate with surrounding groundwater levels, projected to be five years from cessation of dewatering (Golder 2016a).

While some of the land surrounding the Quarry has been rehabilitated with native bush, at the time this report was written the full details of the rehabilitation of the Quarry, including the fate of the remaining equipment and plant were unknown. The Quarry is zoned as 'Cement Production Zone' in the Buller District Plan.



LEGEND

General layout

- "G" quarry
- "M" quarry
- Clinker and crushed limestone
- Quarry Landfill
- Limestone crusher (including transformers)
- Explosive Store
- Main Entrance Area
- Settling pond
- Creek
- SUB Electrical substation

Main entrance area

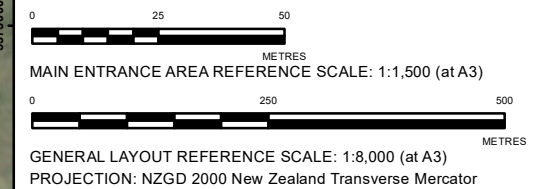
- 1 AST footprint
- 2 Canteen
- 3 Inferred core storage
- 4 Burning area / dumping ground
- 5 Office
- 6 Workshop
- 7 Building footprint - former vehicle maintenance shed
- Refuelling area
- Inferred former UST (13,600L)
- Inferred former UST (40,000L)
- Windrows

NOTES

1. Aerial: WCRC aerial, flown 2016, CC-BY-3.0-NZ..
2. Main entrance area: features are approximate locations only.
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CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
QUARRY SITE LAYOUT

CONSULTANT	YYYY-MM-DD	2017-12-14
GOLDER	PREPARED	KC
	REVIEW	RK
	APPROVED	TW

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4.0 INFORMATION REVIEW

4.1 HNZN Information

4.1.1 Overview

The review of HNZN information included the information provided to Golder in 2016 (for assessment of the Cement Works Plant and various Buffer Land sites), and information provided as part of this PSI.

4.1.2 Landfilling activities

A resource consent application (prepared by Milburn (NZ) Ltd) dated 2009, for retrospective landfilling activities at the Quarry and a subsequent WCRC Resource Consent (RC09061) was identified. The location of the 'landfill' (the Quarry Landfill) is shown on Figure 2.

The consent application was to discharge the following materials to land at the Quarry:

- Road sweepings from the Cement Works.
- Storm water pond sediment (dewatered sludge) from the Cement Works storm water treatment ponds.
- Spent kiln brick liners.
- Clinker (burnt lime) and waste material from the Cement Works.

An assessment of environmental effects from the discharge of waste to land was undertaken within the consent application. The key mitigation of effects from the discharge are summarised below:

- The site was deemed a suitable waste disposal area on the basis that the cited location for filling is actively used for quarrying activities.
- Upon cessation of landfilling activities (the discharge), HNZN intend to cap the landfill with overburden to limit water infiltration through the waste (at the time of writing this report, the landfill had not been capped as it was still in use).
- The Quarry site is located within the Cement Production Zone in the BDC District Plan.
- The site of the landfilling is located on the coast and, if contamination of groundwater occurs, there is no down hydraulic gradient user of the groundwater.

The waste material was tested for leachable metals using a Synthetic Precipitation Leaching Procedure (SPLP) and the results generally indicated that leachable metals were within the adopted ANZECC 2000 water quality and aquatic ecosystem protection guidelines.

In 2009, WCRC granted consent (Consent No: RC09061/1) for the discharge of solid waste, that may contain contaminants, to land. Under this Consent, HNZN is required to collect surface water samples from Limestone Creek and Williams Gully every six months (a plan showing the monitoring locations is provided in the Resource Consent document in Appendix B). Water samples are required to be tested for total concentrations of arsenic, cadmium, chromium, copper, lead, thallium and zinc. Discharge from the landfill must not result in an increase in the 'background' total concentrations of the metals tested within the creeks. The compliance monitoring data has not been reviewed during this PSI.

The resource consent is included in Appendix B.

4.1.3 Dangerous goods licence

A dangerous goods licence renewal (not dated but assumed to be from 2004 based on the required renewal date) indicates the presence of the following dangerous goods:

- 40,000 litre (L) diesel underground storage tank (UST), emptied and awaiting removal.

- 40,000 L diesel above ground storage tank (AST), in use and replacing the UST.
- 1,400 L and 650 L diesel mobile tanks (assumed by Golder to be above ground).
- Maximum of 60,000 kilograms (kg) of ammonium nitrate (used to manufacture explosives).

The renewal document is reproduced in Appendix B.

4.2 Historical Aerial Photographs

A review of historical aerial photographs was undertaken and the observations are summarised in Table 1. The images reviewed are reproduced (where available), with the Quarry site boundary and areas of interest superimposed, in Appendix C.

Table 1: Historical aerial photograph review.

Photograph	Observations
1959 – Black and White	<p>On site: The area within the Quarry boundary appears to be mostly undisturbed, except for a small area in the north (at what is now the northern end of “G” quarry) where some ground disturbance and possible stockpiling is evident. The Quarry access road has been constructed. The following features of interest are noted on Figure C1 in Appendix C:</p> <ul style="list-style-type: none"> ■ Features 1, 2 and 4 appear to be buildings related to quarrying operations. ■ Features 5 to 10 appear to be farm buildings or lifestyle block residences. <p>Surrounding land: The surrounding land use appears to be bush and pasture. Tauranga Bay Road is evident traversing in a north-east – south-west direction.</p>
1980* – Black and White	<p>On site: Significant development is evident within the Quarry boundary, comprising access roads and ground disturbance. The following features of interest are noted on Figure C2 in Appendix C:</p> <ul style="list-style-type: none"> ■ Feature 1 appears to be earthworks or some form of deposition. ■ Features 2 and 3 appear to be buildings related to quarrying activities (some of which are evident on the 1959 aerial). HNZN staff indicated that Feature 3 is the explosive’s store. ■ Feature 4 appears to be buildings (which may be the early development of the Main Entrance). ■ Features 5 and 6 appear to be buildings related to quarrying activities which were not evident in the 1959 aerial. <p>Surrounding land: The surrounding land use (where visible) appears similar to that in the 1959 image.</p>
1998 – Black and White	<p>On site: Further development and expansion of the quarry is evident comprising access tracks and excavations. The settling ponds are visible in the south-west. Feature 1 in the 1980 image appears to have been covered over or revegetated.</p> <p>Surrounding land: The surrounding land use appears similar to the 1980 image.</p>

Photograph	Observations
2010 – Colour	<p>On site: The “G” quarry is evident to the north and contains water. Further expansion of the quarry is evident to the east and south-west.</p> <p>Surrounding land: The surrounding land use appears similar to the 1980 image.</p>

Notes: The 1980 image does not display full coverage of the Quarry.

4.3 Buller District Council Property Files

A representative from Golder visited the BDC offices in Westport on 13 June 2017 to view archived property files pertaining to the Quarry. Information relating to potentially contaminating activities is summarised below and reproduced in Appendix D.

- Building permits and building descriptions for a nitrate shed (1982) (inferred to be the Explosives Store), new substation at the crusher (1984), extension to existing garage, and conversion for existing gypsum hopper (1990).
- Records indicating the presence of two 13,600 litre (L), one 40,000 L, one 6,750 L, three 35,400 L, and four 47,925 L diesel USTs at the Quarry. A letter from BP Oil New Zealand Limited to BDC dated 23 November 1992 indicated that the 6,750 L UST and the two 13,600 L USTs were to be removed.

4.4 West Coast Regional Council Records

A request was submitted to WCRC on 21 June 2017 for any information relating to potentially contaminating activities at the Quarry. WCRC responded on 27 June 2017 and a summary of the relevant information is summarised below and reproduced in Appendix E:

- Letter from HNZL to Trevor James (dated 7 January 2004) at WCRC stating that 16 registered property parcels associated with the quarry are considered to contain hazardous substances. During review of the first draft of this PSI, HNZL indicated that it is unlikely that all 16 land parcels contained hazardous substances, and that they were likely to have been included to cover all bases.
- Assessment of environmental effects report to support renewal of resource consent for Cape Foulwind Quarry storm water discharge to William’s Gully. Report prepared by Milburn (August 1998). The key points from the report are:
 - The assessment indicated storm water in the quarry is generally collected or pumped into the settling ponds from where it is discharged into William’s Gully Creek. In general, the water discharge into William’s Gully Creek was described as a “yellow Pakihi colour”.
 - Water quality monitoring of the William’s Gully Creek at points upstream and downstream from the discharge location was undertaken for basic water quality parameters (pH, dissolved oxygen, turbidity, specific conductivity and temperature). The results for upstream and downstream water quality were deemed comparable and within testing concentration ranges compared to the upstream water quality. Variations in pH and turbidity were attributed to the presence of minor amounts of limestone sediment.
 - Overall, it was stated that few changes in water quality were detected and all parameters measured at the downstream monitoring points were within adopted aquatic protection limits.

4.5 Resource Consents

Ten resource consents (listed in Table 2) are understood to have been issued for operations at the Quarry. Only one consent from Table 2 was sighted by Golder, this being the Discharge to Land Consent (RC09061) for the Quarry landfill.

Table 2: List of active resource consents.

Consent no.	Authority	Date of issue	Term (years)	Expiry date	Status	Description
BDP CPZ	BDC	-	-	-	In use.	Cement Production Zone.
RCN98332	WCRC	08 Dec 1998	35	08 Dec 2032	In use.	Water Permit. Quarry, Williams Gully.
RCN98333	WCRC	11 Dec 1998	35	11 Dec 2032	In use.	Water Permit. Quarry, Limestone Creek.
RC05008	BDC	-	-	-	On hold. Completed.	Drill holes for core sampling.
RC07008	BDC	22 Mar 2007	-	26 Oct 2021	In use.	Iron Sands Mining.
RC07160	WCRC	03 Mar 2008	20	03 Mar 2028	No longer used.	Mussel Shells. Air Discharge & Land Use Permit.
RC07161	WCRC	06 Nov 2007	20	20 Nov 2027	In use.	Water Discharge/ Take/ Diversion. Replace WLD 840054.
RC09061	WCRC	29 Jun 2009	25	29 Jun 2034	In use.	Quarry Landfill.
RC09057	WCRC	22 Sep 2009	20	22 Sep 2029	In use.	Air Discharge Permit, Quarry Crusher.
ML323234	-	-	-	10 Jun 2033	In use.	Mining Licence Quarry.

4.6 Tauranga Bay Quarry Hydrological Investigations (Golder 2016a)

As part of the cessation of cement production on the west coast, Golder was commissioned by HNZL to undertake hydrological investigations at the Quarry. The purpose of the investigations (Golder 2016a) was to estimate the timeframe for groundwater levels to equilibrate within the “M” quarry following the cessation of dewatering, and to predict water quality within the pit. The main findings of the investigation were:

- Cessation of dewatering has resulted in groundwater discharge into the “M” quarry (forming a lake), which would be enhanced by surface run-off and rainfall events over time.
- Groundwater discharge into the “M” quarry will flood at least the lower of the two sediment ponds (settling ponds) and two overflow outlets were proposed; one located to the south of the “M” quarry which discharges to Williams Gully; the second located to the west which discharges to Limestone Creek.
- Equilibration of groundwater levels within the “M” quarry were calculated to be reached within approximately five years from the cessation of dewatering (May 2016). Once a stable water level has been reached, overflow would be predominantly controlled by outlet weirs into Williams Gully and Limestone Creeks.
- Water quality of the lake within “M” quarry was suitable for contact recreation purposes. However, further monitoring was recommended prior to allowing public access to the lake.
- It was considered likely that an ‘overburden dump’ at the southern end of the “M” quarry would be submerged by the lake, and that lake water quality could be affected.

5.0 SITE WALKOVER

5.1 Overview

A walkover of the Quarry site was conducted on 12 June 2017 by two representatives of Golder, escorted by Karl Clementson of HNZL. The Quarry is accessed via a series of locked gates branching off Tauranga Bay Road, after the Wilsons Lead Road turn-off. The following sections describe the observations made during the walkover and the location of the areas/features discussed are presented on Figure 2. A photograph log of the areas visited in the site walkover is included in Appendix F.

5.2 Main Entrance Area

The Main Entrance Area is located in the north-east corner of the Quarry site at the end of the access road (off Tauranga Bay Road). Based on the observations and conversations with HNZL staff, this area comprised the Quarry site office, maintenance operations and car parking. The buildings/structures in this area included:

- A refuelling area comprising a former vehicle maintenance shed (only the concrete floor slab remains) and USTs (now removed). This area is considered to be the location of the two 13,600 L and one 40,000 L USTs referred to in Section 4.3.
- Footprint of former above ground storage tank (AST).
- Core storage shed – no longer present.
- A workshop/garage (black staining was observed on the concrete pad at the front of the workshop).
- A canteen (including wash rooms).
- Offices.
- A transformer on a concrete pad.

In general, the ground surface in this area generally comprised compacted hard fill. Overburden material appeared to have been used to batter side slopes and a stockpile of overburden was present to the south of the office building.

Laydown and waste storage (dumping ground on Figure 2) was evident in the south-east car parking area. Materials observed to be present included an empty open top plastic 1,000 L intermediate bulk container (IBC), scrap metal and wood, wooden pallets, rope, vehicle tyres, several old and rusted 40 gallon drums (former contents unknown), and polyvinyl chloride (PVC) piping. Surface evidence of burning was also observed.

In the north-west of the area, a series of windrows (constructed of overburden material) were used to demarcate car parking. A concrete floor slab was observed beneath one of the windrows and anecdotal evidence from Robert Hazeldine (HNZL) indicated the slab to be the remains of a former vehicle service shed, which contained engine oils and lubricants for vehicle maintenance. To the south of the former service shed, Mr Hazeldine indicated the presence of two former USTs (inferred to be the 13,600 L diesel tanks referenced above) for vehicle and plant refuelling. The USTs were associated with refuelling infrastructure, including a bowser, which were no longer present.

The area to the north-west of the main entrance was vegetated and HNZL staff indicated this land was used by local farmers to access their property. Dumped vehicle tyres, scrap metal and wood were observed in the bush.

5.3 Processed Material Storage Area

The Processed Material Storage Area consisted of piles of clinker and crushed limestone. Anecdotal evidence from HNZL staff indicated that these materials were used to cover/maintain paths and tracks within and outside the Quarry. The material was typically overgrown with weeds and shrubs.

5.4 Quarry Landfill

The Quarry Landfill comprised a stockpile of waste material containing kiln bricks, cylindrical pieces of concrete (inferred to be test blocks of concrete from the Cement Works), hessian bags, coal dust (clinker dust and stack dust inferred), mill balls, plastic, silicon, scrap metal and wood. The waste appeared to have been placed on bare ground and the surface of the waste stockpile was not vegetated. Brown coloured water had ponded around the base of the stockpile and surface run-off from this area appeared to drain into the settling pond (see Section 5.6).

Disposal of waste materials at the Quarry Landfill is authorised by WCRC discharge consent (RC09061).

5.5 The Crusher

The crusher was located close to the edge of the “M” quarry. The crusher comprised a series of four transformers with an associated switch room. The crusher itself consisted of a metal shed-like building (housing two large conveyor belts, both of which extended out of the building), crushing mechanisms, pumps, motors, and a network of metal stairs and walkways. The building contained a basement area, which was filled with water, and was not accessible. One of the conveyor belts connected to a second structure, assumed to be where rocks were loaded onto the crusher.

A circular metal structure with connected pipework was located adjacent to the crusher. However, it is not known what this was used for.

Various stockpiles of crushed limestone were present around the periphery of the crusher and a number of PVC pipes extended from the crusher into the “M” quarry (assumed to be for drainage purposes).

5.6 Settling Pond

Three settling ponds have historically been documented to exist at the Quarry site, however, only one settling pond has been in recent use. During the site walkover, the current settling pond was observed to be split into three ponds due to sediment accumulation.

The historical settling ponds (now filled in) are understood to have been located to the south-west of the “M” quarry.

5.7 Quarry Pits

The “G” and “M” quarries contained water and HNZL staff confirmed that water levels were continuing to rise. There was no visible evidence for contamination of water within the pits such as discolouration or slicks or sheens.

5.8 Explosives Storage

Two explosives stores are known to be present at the Quarry, though they were not observed during the walkover as the local HNZN staff did not know where they were located. Since the walkover was undertaken, local HNZN staff have located and photographed one of the explosives stores (close to the Main Entrance) and taken photographs. The photographs (Appendix F) indicate that the store comprises a square building of concrete construction.

Photographs of the second explosives store (located in the south-west of the Quarry) have also been provided by HNZN (see Appendix F). The photographs show:

- Two buildings (sheds) of wood and corrugated metal sheet construction which were used to store materials used in explosives manufacture (ammonium nitrate and diesel). We understand from HNZN that the components of the explosives were mixed on site by HNZN staff.
- Within and surrounding the sheds were pallets, cardboard boxes, polythene wrapping and bags, plastic drums, and corrugated metal sheets.
- An area close to the sheds appeared to be a general waste dumping area containing timber, metal grills, bricks, pipes (plastic and metal), polythene sheets, and possible evidence of waste burning.

5.9 Other Areas

In general, the surface of the Quarry site comprised hard fill (including vehicle access tracks). Evidence from artificial drainage channels suggests that storm water run-off from the site surface is draining predominantly into the "M" quarry, with some drainage from areas to the north-west draining into the settling pond.

Immediately to the south of the Main Entrance Area, a small shed-like structure was present, which appeared to be a former electrical substation. The shed was constructed of concrete panels. Cable trenches were present in the concrete floor slab and redundant wiring was observed in one trench.

In general, invasive weed species were growing across large areas of the Quarry. HNZN staff indicated that pesticide spraying was used to control the spread of weeds and that the spraying was undertaken in conjunction with the Department of Conservation using glyphosate based sprays.

Some areas of the Quarry (mainly in the south-west) were not accessed due to instability of access tracks and unfavourable weather conditions. Review of aerial photographs (since the walkover was completed) has identified areas that warrant inspection. These areas are represented as Features 1, 2, 3 and 7 on Figure C2, Appendix C.

5.10 Petroleum Hydrocarbon Storage

With respect to the USTs documented in Section 4.3, the information search and site walkover (including discussions with HNZN staff) has identified that:

- Two 13,600 L diesel tanks, formerly located in the Main Entrance Area, have been removed. It is not known if soil benchmarking was undertaken during tank removal.
- One 40,000 L diesel tank, formerly located in the Main Entrance Area, has been removed. It is not known if soil benchmarking was undertaken during tank removal.
- One 6,750 L diesel tank (former location unknown) has been removed. It is not known if soil benchmarking was undertaken during tank removal.
- Three 35,400 L diesel tanks may be unaccounted for.

- Four 47,925 L diesel tanks may be unaccounted for.

5.11 Site Walkover Summary

In summary, the Quarry walkover (including information provided by HNZL) identified a variety of activities and processes which have the potential to cause contamination of land and/or water. The activities are listed below (by area):

Main Entrance

- Waste burning areas
- Former AST footprint
- Black staining of concrete at the Workshop
- Former USTs (1 x 40,000 L and 2 x 13,600 L) and maintenance shed associated with the refuelling area
- Transformer

Quarry Landfill

- Waste disposal area

The Crusher

- Transformers
- Machinery

Settling Ponds

- Sediment within the ponds

Explosives Stores

- Explosives manufacturing materials
- Waste disposal/burning areas.

6.0 PRELIMINARY CONCEPTUAL SITE MODEL

6.1 Overview

The conceptual site model (CSM) is a mechanism for identifying contaminant sources, routes of exposure and potentially affected receptors (both human and environmental). The CSM needs to consider physical and environmental conditions at the site and the ways in which they interact to facilitate the movement and availability of contaminants. The development of a CSM is an iterative process, whereby initial assumptions are tested and confirmed, or rejected during successive stages of data collection and/or interpretation.

The preliminary CSM for the Quarry has been developed as follows:

- A discussion of the physical conditions at the site that could influence the occurrence, nature and distribution of contaminants (Section 6.2).
- A summary of the source-pathway-receptor relationships for identified contaminants of concern (Section 6.3).

6.2 Physical Setting

The Quarry is located at an elevation of approximately 40 m amsl in the catchment divide of the Williams Gully and Walls Creeks. The area is subject to relatively high rainfall (>2,000 mm per year).

The superficial geology beneath the site comprises interbedded sands, silts and clays, with the more impermeable silts and clays likely supporting the development of perched groundwater. Where silts and clays overlie sand, groundwater in the sand is likely to be semi-confined. Iron rich soils have facilitated the formation of iron pans, which can impede the vertical flow of groundwater. The bedrock geology beneath the superficial deposits comprises limestone and marl. Groundwater within bedrock would likely have flowed west towards the Tasman Sea.

Quarrying operations have modified and potentially impacted the natural system as follows:

- The quarrying has resulted in the formation of two quarry pits. The larger “M” quarry extends to approximately 24 m bmsl, equating to a depth of approximately 64 m below ground level (bgl).
- Groundwater levels and gradients at the Quarry would have been heavily modified by dewatering of the quarry pits with significant reduction of groundwater levels around the Quarry. However, since the cessation of dewatering in May 2016, groundwater levels are rebounding and gradually filling the pits.
- The clearance of vegetation, construction of relatively impermeable ground surfaces (concrete, compacted hardfill, etc.), and covering of the ground surface with overburden stockpiles are likely to have modified rainwater infiltration and runoff patterns. Evidence from the site walkover suggests that surface water run-off from a large area of the site is draining into the quarry pits.
- The construction of settling ponds to collect and discharge surface water run-off has concentrated discharge from other parts of the site to a single point in Williams Gully Creek.

Based on the information review and site walkover, the CSM with respect to the sources and migration of contaminants is as follows:

- The infrastructure and activities that supported quarrying operations (workshops, maintenance sheds, fuel storage, power supply, etc.) could have introduced contaminants onto land which could migrate to surface water and groundwater.
- Activities such as below ground fuel storage and waste burial could have introduced contaminants directly into soil and groundwater.
- Rebounding groundwater levels could mobilise contaminants in soils (beneath the areas of interest).
- The post-closure site drainage regime could result in contaminants being preferentially concentrated in the quarry pits.

6.3 Source Pathway Receptor Relationships

6.3.1 Hazardous Activities and Industries List

The information review and site walkover provides a basis for identifying whether land use activities included on MfE’s (2011b) Hazardous Activities and Industries List (HAIL) have been undertaken. The HAIL activities are used to define the contaminants of concern and the source (location) of those contaminants.

The HAIL activities are listed in Table 3 together with the area of the Quarry where they are being, or have been undertaken. The contaminants of concern are based on the findings of the PSI and site walkover.

Table 3: HAIL activities identified at the Quarry.

HAIL activity	Location/Area	Contaminants of concern
A17: Storage tanks or drums for fuels, chemicals or liquid waste	Main Entrance – former AST; refuelling area and workshop.	Petroleum hydrocarbons, in particular polycyclic aromatic hydrocarbon (PAH) compounds.
B2: Electrical transformers	South of the Main Entrance; crusher.	Petroleum hydrocarbons, polychlorinated biphenyls (PCB), copper, tin, lead and mercury.
C1: Explosive bulk storage	Explosives store.	Ammonium nitrate and hydrocarbons.
F4: Motor vehicle workshops	Main Entrance.	Metals, petroleum hydrocarbons, PAH, solvents, and asbestos.
F7: Refuelling facilities	Main entrance – former USTs.	Petroleum hydrocarbons, in particular PAHs.
G5: Waste disposal to land	Quarry Landfill; Main Entrance - dumping/burning ground.	Metals and metalloids, petroleum hydrocarbons, PAHs, and asbestos.

6.3.2 Potential contaminant linkages

The potential contaminant linkages listed in Table 4 define the exposure pathway for identified contaminants of concern.

Table 4: Potential Contaminant linkages.

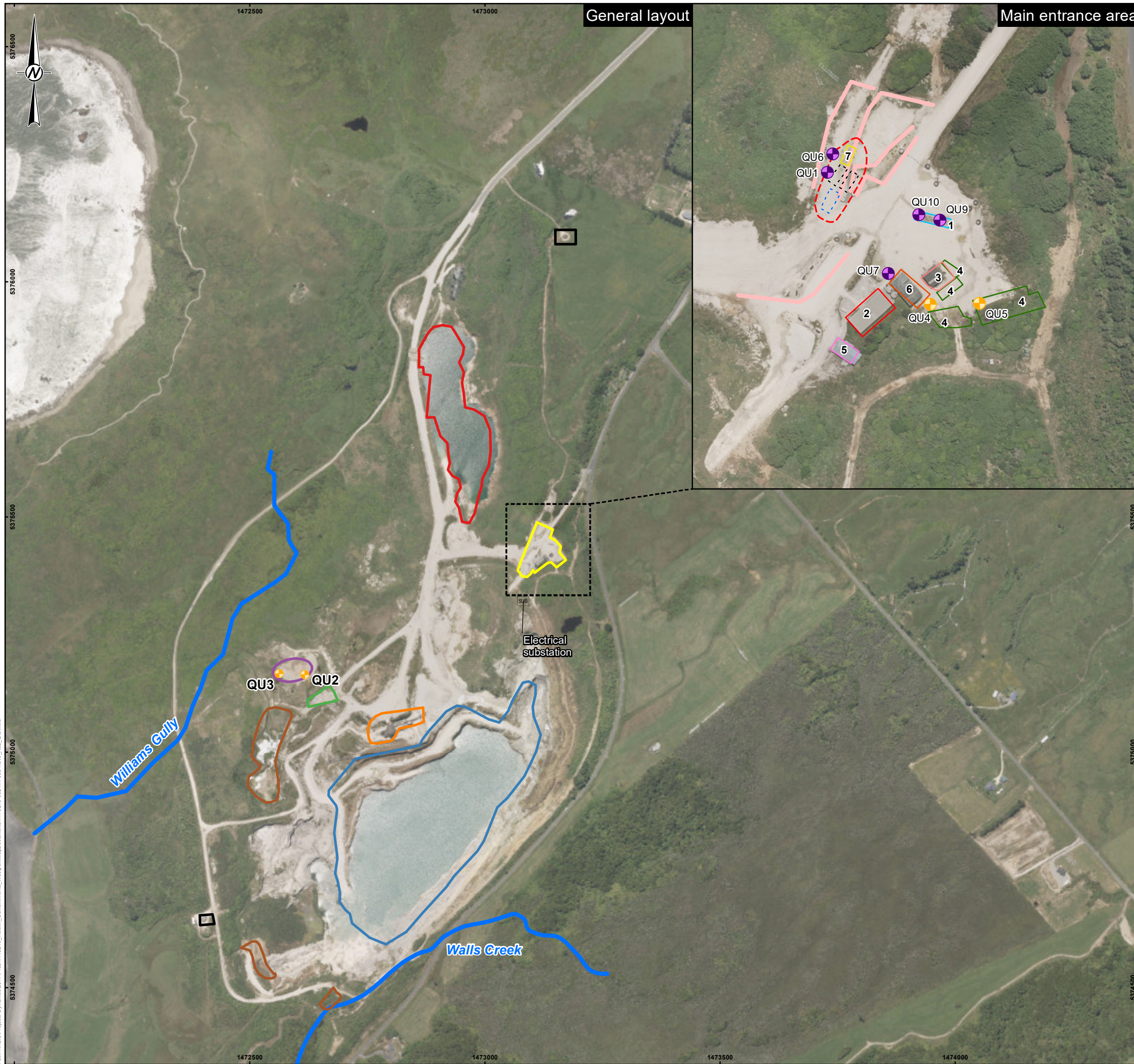
Contaminants of concern	Exposure pathway	
	Human health	Environment
Metals and metalloids	Ingestion and dermal contact – contaminated soil, dust.	Leaching/Entrainment in surface water run-off. Leaching to groundwater. Discharge of surface water run-off and groundwater into the quarry pits.
PAH	Ingestion, dermal contact – contaminated soil, dust.	Entrainment in surface water run-off. Leaching to groundwater. Discharge of surface water run-off and groundwater into the quarry pits.
Petroleum hydrocarbons	Ingestion, dermal contact – contaminated soil.	Leaching/direct discharge to groundwater. Discharge of groundwater into the quarry pits.
PCB	Ingestion, dermal contact – contaminated soil.	Leaching to groundwater. Discharge of groundwater into the quarry pits.

Contaminants of concern	Exposure pathway	
	Human health	Environment
Nitrates from explosives manufacture	Not applicable	Leaching to surface water and groundwater.

7.0 LIMITED SOIL SAMPLING

A programme of limited soil sampling was undertaken by Golder on 14 and 15 June 2017 during the Quarry site walkover, see Figure 3. The soil sampling was targeted at selected areas of interest (re-fuelling area, burning/dumping ground, former AST, and the Quarry Landfill) where evidence for possible contamination was observed during the site walkover.

Eighteen soil samples were collected from selected areas, nine of which were analysed for contaminants of concern (metals, organochlorine pesticides, petroleum hydrocarbons and PAH). Detailed description of the soil sampling methodology and findings are presented in Appendix G along with a figure showing the sampling locations.



LEGEND

- Hand excavation
- Test pit excavation

General layout

- "G" quarry pit
- "M" quarry pit
- Clinker and crushed limestone
- Quarry Landfill
- Limestone crusher (including transformers)
- Explosive Store
- Main Entrance Area
- Settling pond
- Creek
- Electrical substation

Main entrance area

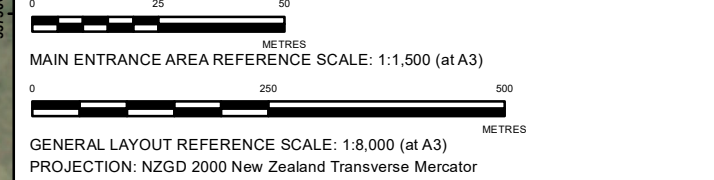
- 1 AST footprint
- 2 Canteen
- 3 Inferred core storage
- 4 Burning area / dumping ground
- 5 Office
- 6 Workshop
- 7 Building footprint - former vehicle maintenance shed
- Refuelling area
- Inferred former UST (13,600L)
- Inferred former UST (40,000L)
- Windrows

NOTES

- Aerial: WCRC aerial, flown 2016, CC-BY-3.0-NZ.
- Main entrance area: features are approximate locations only.
- Schematic only, not to be interpreted as an engineering design or construction drawing.

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CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
INVESTIGATION LOCATION PLAN

CONSULTANT	YYYY-MM-DD	2017-12-14
	PREPARED	KC
	REVIEW	RK
	APPROVED	TW

Path: K:\GIS\Projects\Dynamics\2017\4051779210_Holcim_Cement\Works_Web\portMapDocuments\1779210-002-R-F003-Rev0_A31_GIS.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SUBJECT HAS BEEN MODIFIED FROM A 25mm

The results of soil analysis identified the following contaminants:

- TPH (C₇-C₉) above the adopted MfE (2011d) Tier 1 assessment criteria for protection of human health at the Quarry Landfill.
- Evidence for non-aqueous phase liquids (NAPL) in near surface soils at the re-fuelling area.

The limited soil sampling has confirmed a potential human health contaminant linkage with respect to petroleum hydrocarbons, should soils in the Quarry Landfill be disturbed. In addition, a potential linkage has been identified with respect to NAPL and groundwater.

Recommendations for further work based on the findings of the limited sampling are documented in Appendix G and summarised in Section 8.0. Supporting information/data is included in Appendix H (test pit logs), Appendix I (chain of custody records and laboratory results) and Appendix J (quality assurance documentation).

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

HNZL commissioned Golder to undertake a PSI to assess the potential for contamination at its Tauranga Bay Limestone Quarry following the cessation of quarrying activities in 2016.

The PSI has comprised review of information from HNZL, the district council, and the regional council; review of historical aerial photographs and previous investigation reports; and a site walkover. Limited soil sampling was also undertaken during the site walkover.

The Quarry dewatering pumps were switched off in May 2016 and, since then, the two main quarry pits have been filling with groundwater. In addition, much of the surface water drainage is flowing into the quarry pits.

The PSI has identified six HAIL activities at the Quarry. The activities with potential to cause contamination of soil and water are: petroleum hydrocarbon storage, explosives storage, workshops, electrical sub-stations, and waste disposal.

There is uncertainty on the number and location of former USTs at the Quarry, with BDC information suggesting that there could be seven USTs which are unaccounted for.

Limited soil sampling has identified one potential contaminant linkage with respect to human health and identified one potential contaminant linkage with respect to the environment (groundwater). The potential linkages relate to storage of waste disposal and storage of petroleum hydrocarbons.

8.2 Recommendations

Based on the findings of the PSI and limited soil sampling at the Quarry, the following additional investigation/assessment is recommended:

- Detailed Site Investigation to characterise contamination in relation to the fuel storage areas, transformers, explosives storage, and workshops.
- Further assessment of the Quarry Landfill to establish the degree of hydrocarbon contamination and the potential impacts on groundwater quality.
- Assessment of surface water quality in the settling ponds and in the “G” and “M” quarry.

- Investigation into the possible location of additional USTs based on BDC documentation.
- Inspection of the areas not accessed (explosives store and former access road) during the site walkover.

9.0 LIMITATIONS

Your attention is drawn to the document, “Report Limitations”, as attached in Appendix K. The statements presented in that document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks to which this report relates which are associated with this project. The document is not intended to exclude or otherwise limit the obligations necessarily imposed by law on Golder Associates (NZ) Limited, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

10.0 REFERENCES



- Golder 2016a. Holcim (NZ) Limited – Tauranga Bay Quarry Hydrogeological Investigations. Prepared by Golder Associates (NZ) Limited for Holcim (New Zealand) Limited, December 2016.
- Golder 2016b. Westport Cement Works – Preliminary Site Investigation. Prepared by Golder Associates (NZ) Limited for Holcim (New Zealand) Limited, October 2016.
- Golder 2017. Westport Cement Works – Preliminary and Detailed Site Investigation Scoping. Prepared by Golder Associates (New Zealand) Limited for Holcim (New Zealand) Limited, May 2017.
- HNZL 2009. Cape Foulwind Quarry Landfill Consent: Resource Consent Application and Assessment of Effects on the Environment. Prepared by Holcim New Zealand Limited for West Coast Regional Council, 2009.
- MfE 2011a. Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand. Ministry for the Environment, Wellington, 2011.
- MfE 2011b. Hazardous Activities and Industries List. Ministry for the Environment, Wellington 2011.
- MfE 2011c. Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values. Ministry for the Environment, Wellington, 2011.
- MfE 2011d. Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Ministry for the Environment, Wellington, 2011.
- Milburn 1998. Assessment of Environmental Effects – Cape Foulwind Quarry Stormwater Discharge to William’s Gully, Prepared by Milburn (NZ) Limited for the West Coast Regional Council, August 1998.
- Nathan S, Rattenbury MS, Suggate RP (compilers) 2002. Geology of the Greymouth Area. 1:250000 geological map 12. Institute of Geological and Nuclear Sciences Limited, Lower Hutt, New Zealand.
- NES 2011. Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
- US EPA 2016. United States Environmental Protection Agency Regional Screening Levels – Generic Tables (May 2016) – Screening Levels for Industrial Soil (THQ 1).

APPENDIX A

Record of Review

NES¹ - Record of Review²

Client Name:	Holcim (New Zealand) Limited
Project Number:	1779210
Project:	Tauranga Bay Quarry - Preliminary Site Investigation
Project Manager:	Terry Widdowson

	Role	Qualifications	Years of contaminated land experience	Signature	Date
Cara Di Vitto	Author	BEnvENG (Hons)	5		14-Sep-17
Terry Widdowson	Reviewer	BSc (Hons), MSc	25		14-Sep-17

Notes:

- 1 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
- 2 Record of review demonstrating that the persons preparing and certifying this report are suitably qualified and experienced practitioners.

APPENDIX B

HNZL Consent



Confirmation of Renewal of Licence to Store Dangerous Goods (Pursuant to HAZARDOUS SUBSTANCES AND NEW ORGANISMS ACT 1996)

This form must be completed in full and returned to **ERMA New Zealand, DG Licence Renewal, P O Box 131, Wellington** by **30 April 2004**. You can obtain an electronic form from the ERMA Website (www.ermanz.govt.nz).

SECTION A – PARTICULARS OF APPLICANT /LICENCE

1. Name (in full): <i>(If a limited company, state title; if a partnership give names of partners)</i>	Holcim (New Zealand) Limited	
2. Contact Person:	Trish Costelloe	
3. Company Details:	Postal Address:	P.O. Box 245, Westport
	Phone number:	03 789 7259
	Fax number:	03 789 5892
	Email address:	
4. Details of premises to be licensed <i>(if different)</i> :	Property Address <i>(if any or different from above):</i>	Holcim Quarry
	Phone number:	
	Fax number:	
	Email address:	
5. City or District Council/Authority in whose area the premises is located:	Buller District Council	<i>Licence Number:</i> 846

RENEWAL OF DANGEROUS GOODS LICENCE:

Yes No

6. I have completed all the sections of this form (A, B, C, D, E) and confirm that I have examined my previous Dangerous Goods Licence and that, other than the changes noted in the following sections, no alterations to my licence are required.

Yes No

CHANGE OF OWNERSHIP:

Yes No

7. If the premises have changed hands please provide the name and address of the new owners.

CANCELLATION OF LICENCE:

Yes No

8. Please cancel this licence. I confirm that:

(a) No dangerous goods in drums, tanks or other containers are being stored, either above ground or underground, on the premises referred above.

Yes No

(b) All underground storage tanks for dangerous goods of Class 3 have been/are to be removed.

Yes No

(c) I have or will seek written permission to retain the tanks under such conditions determined by ERMA New Zealand.

Yes No

I confirm that this form has been completed accurately to the best of my knowledge.

Signature:

Date:

SECTION B – CLASS 2 – COMPRESSED LIQUEFIED OR DISSOLVED GASES

Note: If you prefer, attach a separate schedule of Class 2 substances including their use and the maximum quantity you hold by type of container. Alternatively, if your current Dangerous Goods Licence contains this information attach a copy to this form.

9. Are Dangerous Goods of Class 2 used on the premises? Yes No
(If no, go to Section C. If yes, complete questions 10 & 11.)

10. List the Class 2 substances recorded on your current Dangerous Goods Licence
(including the substances, their use, quantity held by type of container):

11. List any additional Class 2 substances that you hold
(including the substances, their use, quantity held by type of container):

Oxygen 24m³ / 2(a): 8m³ x 3
Acetylene 18m³ / 2(c): 6m³ x 3

SECTION C – CLASS 3 – FLAMMABLE LIQUIDS

Note: If you prefer, attach a separate schedule of Class 2 substances including their use and the maximum quantity you hold by type of container. Alternatively, if your current Dangerous Goods Licence contains this information attach a copy to this form.

12. Are Dangerous Goods of Class 3 used on the premises? Yes No
(If no, go to Section D. If yes, complete questions 13 & 14.)

13. List the Class 3 substances recorded on your current Dangerous Goods Licence
(including the substances, their use, quantity held by type of container):

~~Underground Tank: 40,000 lts / 3(c) x 1 (Diesel) (now emptied to be removed)~~
Aboveground Tank 40,000 lts / 3(c) x 1 (Diesel) (Now in use, replacing underground tank)

14. List any additional Class 3 substances that you hold
(including the substances, their use, quantity held by type of container):

Mobile Tanks: 1,400 lts / 3(c) x 1 (Diesel)
Tank: 650 lts / 3(c) x 1 (Diesel)
Dispenser pumps 2 x 3(c)

SECTION D – OTHER DANGEROUS GOODS CLASSES 4 & 5

Note: If you prefer, attach a separate schedule of Class 4 & 5 substances including their use and the maximum quantity you hold by type of container. Alternatively, if your current Dangerous Goods Licence contains this information attach a copy to this form.

15. Are Dangerous Goods of Class 4 & 5 used on the premises? Yes No
(If no, go to Section E. If yes, complete questions 16 & 17.)

16. List any Class 4 & 5 the substances recorded on your current Dangerous Goods Licence
(including the substances, their use, quantity held by type of container):

17. List any additional Class 4 & 5 substances that you hold
(including the substances, their use, quantity held by type of container):

Ammonium nitrate 5(a) 25 kg bags. Maximum storage 60,000kg

SECTION E – ADDITIONAL NOTES

18. Is there any additional information that you think may be relevant to your licence? Yes No
(If no, go to question 20. If yes, complete question 19.)

19. Record any additional information here:

20. Have you attached any schedules or information to this form? Yes No
(If yes, ensure you attach it securely to this form and note the number of pages.)

Indicate the number of pages attached here:

Now send this form and any attachments to **ERMA New Zealand, DG Licence Renewal, P O Box 131, Wellington**. If you have any questions, please contact ERMA New Zealand on **0800 ERMADG (0800 376 234)** or email 'dginfo@ermanz.govt.nz'. The 0800 number will be available from 15 March 2004.

Privacy Statement

The information you provided in this form is to assist in determining whether you meet the requirements for a Dangerous Goods Licence or continue to do so in accordance with Hazardous Substance and New Organisms Act 1996 (HSNO Act). It will also allow ERMA New Zealand to provide you with timely information which may impact on your Dangerous Goods Licence. All the information is collected in accordance with the HSNO Act and is held by ERMA New Zealand. The information you provide will be made available to enforcement agencies as defined by Section 97 of the HSNO Act for the purpose of enforcing the provisions of the Act. Under the Privacy Act 1993 you are entitled to access and seek correction of any personal information held.



THE WEST COAST
REGIONAL COUNCIL

388 Main South Road, Paroa
P.O. Box 66, Greymouth.
The West Coast, New Zealand.
Telephone (03) 768 0466
Toll Free 0508 800 118
Facsimile (03) 768 7133
email: info@wrc.govt.nz
www.wrc.govt.nz

RESOURCE CONSENT

Pursuant to Part VI of the Resource Management Act 1991 The West Coast Regional Council hereby grants to:

HOLCIM (NEW ZEALAND) LIMITED
PO Box 6040
UPPER RICCARTON
CHRISTCHURCH 8442

A Resource Consent for the term and upon the conditions hereinafter set forth:

FILE NO.: RC09061
RESOURCE CONSENT No.: RC09061/1
DATE OF ISSUE: 29 June 2009
TERM: 25 years from date of issue
LOCATION: Cape Foulwind Quarry – Cape Foulwind
MAP REFERENCE: At or about NZMS 260 K29: 825-368

RESOURCE CONSENTS:

RESOURCE CONSENT NO.	TYPE OF RESOURCE CONSENT	PURPOSE
RC09061/1	Discharge Permit	To discharge solid waste that may contain contaminants to land in circumstances where they may enter water, Williams Gully, Tauranga Bay.

CONSENT CONDITIONS

Pursuant to section 108 of the Resource Management Act 1991, the resource consent includes the following conditions:

1. The discharge shall be carried out in general accordance with the details contained in the consent application submitted to the Consent Authority, except where inconsistent with these conditions. Any change or cancellation must be made in accordance with section 127 of the Resource Management Act 1991.
2. The Consent Holder shall cap and plant fill areas following (within 12 months of) their cessation of use to minimise any infiltration of rainwater into those areas.
3. The Consent Holder shall collect surface water samples from the following sites at intervals not exceeding 6 months and test them for total concentrations of arsenic, cadmium, chromium, copper, lead, thallium, and zinc:
 - (a) Limestone Creek at the upstream (control) monitoring site that was used for Resource Consent N98333.

- (b) Williams Gully at the site labelled "Williams Gully Monitoring Location RC09061 & N98332" on the attached aerial photograph titled, "Annexure 1 – RC09061 – Holcim (New Zealand) Ltd Williams Gully monitoring location".
4. The Consent Holder shall ensure that the samples are collected, tested and reported on by suitably qualified personnel.
5. The discharge shall not increase the 'background' total concentrations of the following metals (as measured in water samples collected from the Limestone Creek upstream (control) monitoring site) in the surface water at the "Williams Gully Monitoring Location" by more than the following:

Metal	Allowable Increase in Total Concentration (μgL^{-3})
Arsenic	24
Cadmium	370
Chromium	30
Copper	1.4
Lead	3.4
Thallium	0.03
Zinc	8

The "background" water quality samples from Limestone Creek and the surface water quality samples from the Williams Gully Monitoring Location shall be collected on the same day no more than two hours apart.

6. The Consent Holder shall submit an "Annual Environmental Monitoring Report" to the Consent Authority at yearly intervals which as a minimum includes the following information:
- (a) The quantity of solid waste deposited (discharged) at the solid waste site;
 - (b) The monitoring results for the metals specified in Condition 2;
 - (c) An assessment of any adverse environmental effects relating to the discharges and potential ways of mitigating against further adverse environmental effects; and
 - (d) Any further information that the Consent Authority may reasonably request or information that the Consent Holder deems pertinent to the exercising of these Resource Consents.
7. Pursuant to section 128 of the Resource Management Act 1991, the Consent Authority may review the conditions of the consent by serving notice within a period of one month commencing each anniversary of the date of issue of this consent for any of the following purposes:
- (a) To change the standards imposed by the conditions of the consent or to impose additional conditions in relation to standards or monitoring in order to avoid, remedy or mitigate and adverse effects on the environment which may arise from the exercise of the consents, and which it is appropriate to deal with at a later stage.
 - (b) To change the standards imposed by conditions of the consent to standards that are consistent with any relevant Regional Plan, District Plan or Act of Parliament.
 - (c) To require the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.
 - (d) To assess the appropriateness of imposed compliance standards, monitoring regimes and monitoring frequencies and to alter these accordingly.

8. The Consent Holder shall pay to the Consent Authority such annual administration, supervision and monitoring fees as are fixed from time to time by the Consent Authority in accordance with section 36 of the Resource Management Act 1991.



Colin Dall

CONSENTS & COMPLIANCE MANAGER



Annexure 1 - RC09061 - Holcim (New Zealand) Ltd Williams Gully monitoring location

APPENDIX C

Aerial Photographs



LEGEND

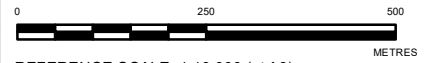
- Site boundary
- Parcel boundary

NOTES

1. Aerial: LINZ Data Service, flown 2009-2011, CC-BY-3.0-NZ.
2. Schematic only, not to be interpreted as an engineering design or construction drawing.

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REFERENCE SCALE: 1:10,000 (at A3)

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
2009-2011 AERIAL IMAGE

CONSULTANT	YYYY-MM-DD	2018-01-30
	PREPARED	KC
	REVIEW	RK
	APPROVED	TW

PROJECT NO. 1779210	REPORT 002	REV. 0	APPENDIX C4
------------------------	---------------	-----------	-----------------------

Path: K:\GIS\Projects-Dynamics\2017\408179210_Holcim_Concrt\Work\MapDocuments\1779210-002-RC-004-Rev0_A3L_GIS.mxd

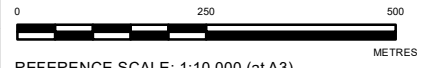
25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SUBJECT HAS BEEN MODIFIED FROM A3



LEGEND
 [Red outline] Site boundary
 [White outline] Parcel boundary

NOTES
 1. Aerial: WCRC aerial, flown 1996-1998, CC-BY-3.0-NZ.
 2. Schematic only, not to be interpreted as an engineering design or construction drawing.

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REFERENCE SCALE: 1:10,000 (at A3)
 PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
1996-1998 AERIAL IMAGE

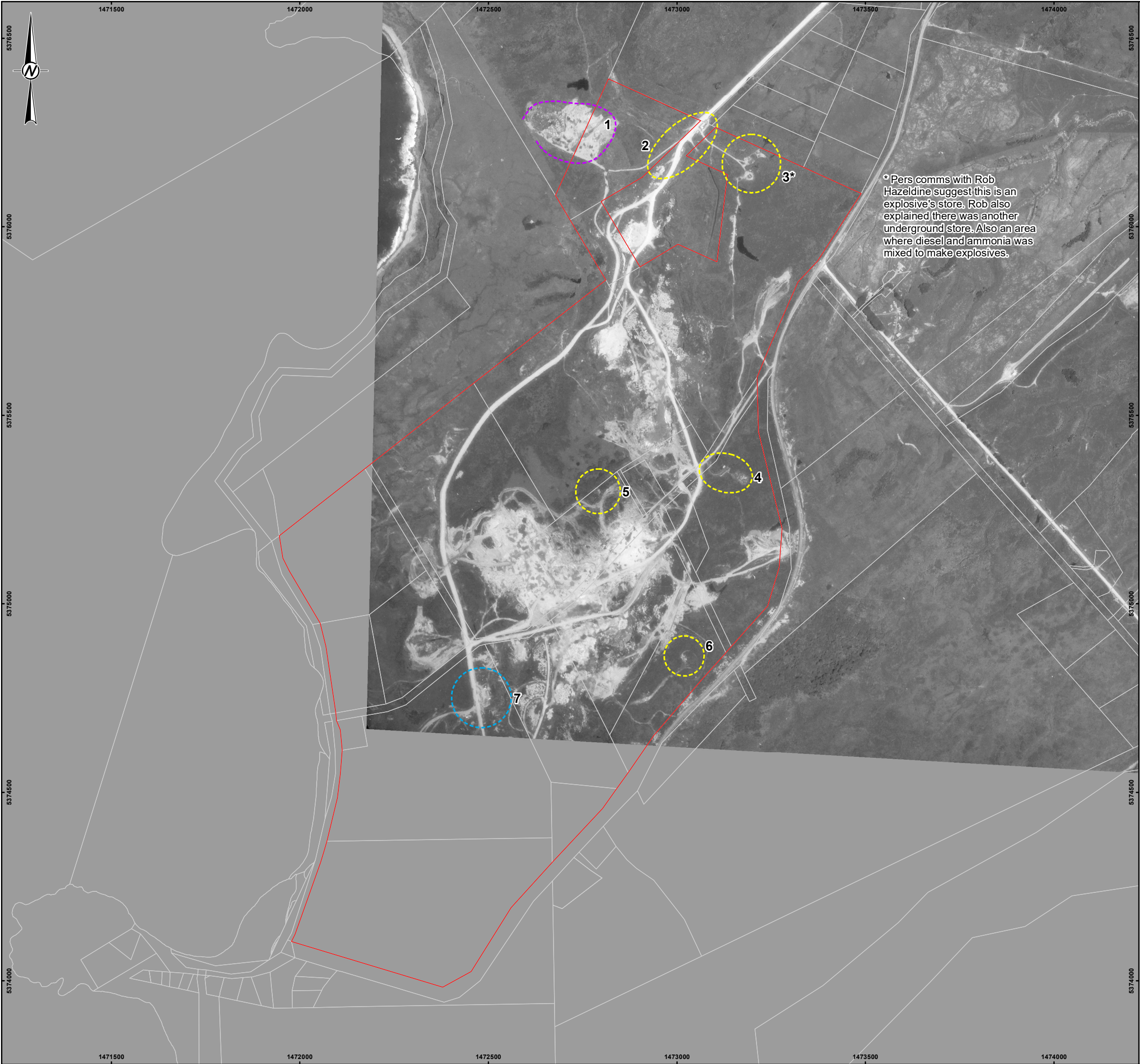
CONSULTANT	YYYY-MM-DD	2018-01-30
	PREPARED	KC
	REVIEW	RK
	APPROVED	TW



PROJECT NO. 1779210 REPORT 002 REV. 0 APPENDIX C3

Path: K:\GIS\Projects-Dynamics\2017\4081779210-Holcim_ConcreteWorks_Webportal\MapDocuments\1779210-002-R-0103-Rev0_A3L_GIS.mxd

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN ON THE SHEET, THE CLIENT HAS BEEN ADVISED FROM A3



LEGEND

- Appears to be earthworks or kiln dust laydown (1)
- Appears to be buildings (2-6)
- Appears to be a material laydown area (7)
- Site boundary
- Parcel boundary

* Pers comms with Rob Hazeldine suggest this is an explosive's store. Rob also explained there was another underground store. Also an area where diesel and ammonia was mixed to make explosives.

NOTES

1. Aerial: sourced from Opus - SN 5817 flown 23/12/1980 at 1:25000 scale.
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REFERENCE SCALE: 1:10,000 (at A3)
 PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT			
HOLCIM NEW ZEALAND LIMITED			
PROJECT			
TAURANGA BAY QUARRY PSI			
TITLE			
1980 AERIAL IMAGE			
CONSULTANT	YYYY-MM-DD	2018-01-30	
	PREPARED	KC	
	REVIEW	RK	
	APPROVED	TW	
PROJECT NO.	REPORT	REV.	APPENDIX
1779210	002	0	C2

Path: K:\GIS\Projects-Dynamics\2017\4081779210_Holcim_CementWorks_Webport\MapDocuments\1779210-002-RC-002-Rev0_A3L_GIS.mxd

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SUBJECT HAS BEEN ADJUSTED FROM A3



LEGEND

- Appears to be earthworks (3)
- Appears to be buildings (1,2,4-10)
- Site boundary
- Parcel boundary

NOTES

1. Aerial: sourced from Opus - SN 1249 flown 07/10/1959 at 1:44000 scale.
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0 250 500
METRES

REFERENCE SCALE: 1:10,000 (at A3)

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

CLIENT
HOLCIM NEW ZEALAND LIMITED

PROJECT
TAURANGA BAY QUARRY PSI

TITLE
1959 AERIAL IMAGE

CONSULTANT	YYYY-MM-DD	2018-01-30
GOLDER	PREPARED	KC
	REVIEW	RK
	APPROVED	TW

PROJECT NO. 1779210	REPORT 002	REV. 0	APPENDIX C1
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN ON THE SHEET, THE SHEET HAS BEEN MODIFIED FROM A3L

APPENDIX D

Buller District Council Property
File Records



BP Oil New Zealand Limited
Collins Street
PO Box 5014 Port Nelson
Telephone: 0-3-548 0042
Facsimile: 0-3-546 8792
Carphone: 025-431 633
Pager: 026-109 353

Tony Lang
Area Sales Manager

23 November 1992

Dangerous Goods Inspector
Buller District Council
PO Box 21
WESTPORT

Attention: Bede Brown

Dear Sir

Re: Milburn NZ Ltd - Westport

Your approval is requested for the following fuel storage upgrades.

QUARRY SITE

Installation 1 x 40,000 litre underground diesel tank.
Existing 2 x 13,600 litre, 1 x 6,750 litre U/G tanks to be removed and destroyed.

CEMENT WORKS

Installation 1 x 5,000 litre above ground Motorspirit tank inside existing fuel compound.

Please refer to attached site plans for location of tanks.

Your co-operation and assistance towards this matter is appreciated.

Yours faithfully
BP OIL NEW ZEALAND LIMITED

T C Lang
COMMERCIAL AREA SALES MANAGER

061

... Council
... Rn 732 8821

Buller District Council
P.O. Box 21
WESTPORT
Phone 7239

26 JUL 1991

D.G. 061 - 1991/92

Date: 26 July 1991

TO: The Manager
Milburn New Zealand Ltd
P.O. Box 111
WESTPORT

APPLICATION TO RENEW DANGEROUS GOODS LICENCE
FOR THE YEAR COMMENCING 1 APRIL 1991

The Dangerous Goods Licence in respect of your premises expired on 31 March 1991 and you must now apply for renewal of licence for the ensuing year.

Our records show that you will require to hold a licence for the following classes and quantities of dangerous goods:

CLASS	QUANTITY
CAPE FOULWIND QUARRY 3c (Diesel Fuel)	35 400 l U.S.T. x 3

Based on the above classes and quantities the total fees payable will be \$112.50. This total includes G.S.T.

Please complete the details below and return this application with the required fees within fourteen (14) days.

Following receipt of the same your Dangerous Goods Licence for the 1991-92 licencing year will be issued.

G. Scrimgeour
G. SCRIMGEOUR
Dangerous Goods Inspector

I/We/Company (State full name of legal occupier) *Milburn New Zealand Ltd.*
certify that the above details in respect of Classes and Quantities of Dangerous Goods are correct and now wish to make application for Renewal of Licence in respect of the above listed activities.

Signature *[Signature]* Date *21-7-91*

For Office Use: Fee Received \$ *112.50* Receipt No. *5259*
Date of Receipt *25 AUG 1991*

Approval to Issue: *[Signature]* *27.10.91*

1985/86

Proprietor,
New Zealand Cement Holdings Ltd
P.O. Box 111
WESTPORT

Butler County Council
P.O. Box 247

Butler County Council
Route 6405
15 APR 1985
Date: 1 April 1985

APPLICATION TO RENEW DANGEROUS GOODS LICENCE
FOR THE YEAR COMMENCING 1 APRIL 1985

Dangerous Goods Licence in respect of your premises expired on March 1985 and you must now apply for renewal of licence for the coming year.

records show that you will require to hold a licence for the following classes and quantities of dangerous goods:

CLASS	QUANTITY
CAPE FOUNDRY GUNNY	47525 - U.S.T x 4
Diesel Fuel	10000 U.S.T. x 4

On the above classes and quantities the fees payable will be \$100

To complete the details below and return this application with required fees within fourteen (14) days.

On receipt of the same your Dangerous Goods Licence for the 1985-86 licensing year will be issued.

L. COMBER
District Building Inspector

I, Company PETE LOMLEY, NEW ZEALAND CEMENT HOLDINGS LIMITED
certify that the details in respect of Classes and Quantities of Dangerous Goods are correct and do not wish to make application for renewal of Licence in respect of the above stated activities.
Signed Pete Lomley Date 9/4/85

Office Use: Fee Received
Receipt No.
Date of Receipt

Issued to Licensee: [Signature]

11 10 85



DANGEROUS GOODS LICENCE

(Dangerous Goods Act 1974)

Under the Dangerous Goods Act 1974, and regulations made thereunder, licence is hereby granted to the under-mentioned person to store dangerous goods in quantities and in containers scheduled hereunder, and only under the conditions set out in this licence.

Hilburn Sea Zealand Limited

PO Box 265

HAUPŌKI

Location of licensed premises: Quarry, Cape Foulwind.

For and on behalf of the Chief Inspector of Dangerous Goods

Inspector of Dangerous Goods

Dated: 18 April 1989

Unless sooner surrendered or revoked, this licence shall remain in force until 31 March 1990 and may be renewed annually thereafter.

CLASSES, MAXIMUM QUANTITIES AND NUMBER OF CONTAINERS OF DANGEROUS GOODS AUTHORIZED IN THIS LICENCE.

CLASS 2: GASES

Tanks

Cylinders

CLASS 3: FLAMMABLE LIQUIDS

Underground tanks Class 3(a) Diesel. 55,400 litres. Qty 3 Tanks.

Aboveground tanks

Mobile tanks

Drums (over 60 litres)

Drums (under 60 litres)

Workshop containers

No. dispensing pumps 2 x 3(a)

No. oil heaters

CLASS 4: FLAMMABLE SOLIDS

CLASS 5: OXIDISING SUBSTANCES

CONDITIONS OF STORAGE

RECEIPT
Received with
BULLER

Application for Dangerous Goods Licence

for the period ended 31 March 2001. (Dangerous Goods Act 1974)

Please confirm the following information, completing panels as necessary. Please print clearly in BLOCK CAPITALS. Return to Buller District Council by 21 March 2000, enclosing application fee.

Licensee: MILBURN NEW ZEALAND LTD, PO BOX 245, WESTPORT

Business: MILBURN NEW ZEALAND LIMITED

Street location: CAPE FOULWIND QUARRY, WESTPORT

Classes, maximum quantities and number of containers of dangerous goods:
litres Class 3c: Diesel Fuel 1 x U.G.T 40 000

Renewal of Dangerous Goods Licence

I hereby apply for renewal of the Dangerous Goods licence. I certify that I have examined the above details and that, other than as indicated below, no alteration is required.:

Signature: *Abeyaratne*

Date: 10-2-00

Change of Ownership

Please note that these premises have changed hands. The name and postal address of the new owner is:

Name: _____

Address: _____

Signature: _____

Date: _____

Cancellation of Licence

I certify that:

- a) No dangerous goods in drums, tanks or other containers are being stored, either above ground or underground, on the premises referred to above, and
- b) all underground storage tanks for dangerous goods of Class 3 have been/are to be removed, or
- c) I have obtained/intend seeking written permission to retain the tanks under such conditions as are determined by you.

Signature: _____

Date: _____

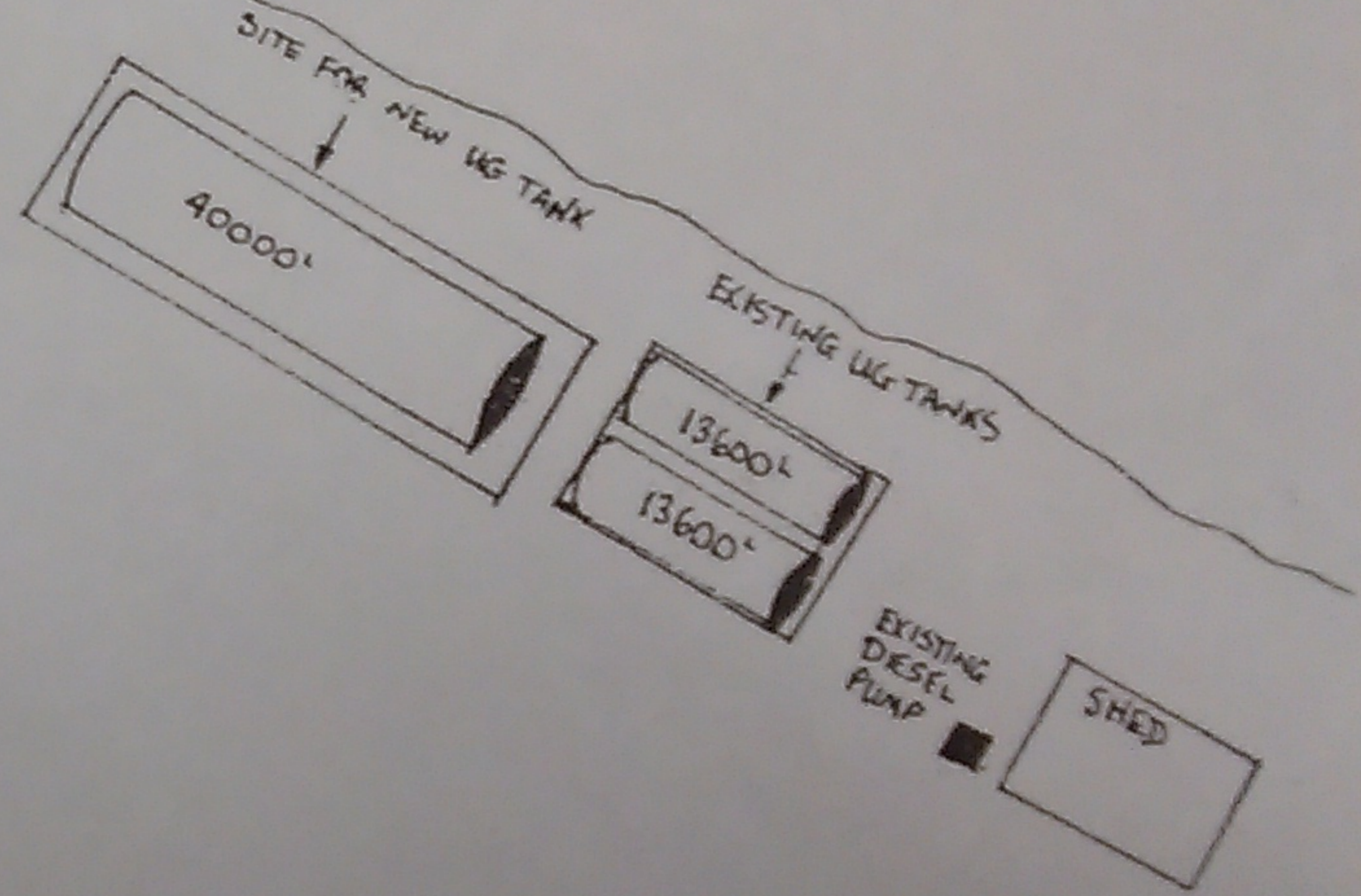
Ref. No. DG052

Debtor No.: 8066 L



POWER POLE

EARTH BANK



OPEN YARD

Scale 1:200



MILBURN NZ LTD
CAPE FOLLWIND QUARRY

that you will require to hold a licence for the
classes and quantities of dangerous goods:

	QUANTITY
CAPE FOULWIND QUARRY	47,925 - U.S.T x 4
	+ 45,457 1 U.G.T. x 4
	+ 30,000 Amend x 3

CORRECT AS AT 12/6/55

For the above classes and quantities the fees payable will be

the details below and return this application with
fees within fourteen (14) days.

APPENDIX E

West Coast Regional Council
Documents



Holcim

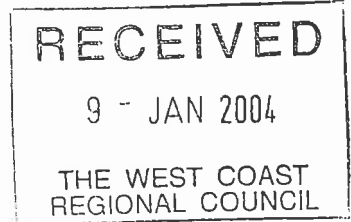
Westport Works
Holcim (New Zealand) Ltd
Cape Foulwind, PO Box 245
Westport, New Zealand

Phone +64 3 789 7259
Fax +64 3 789 5892
www.holcim.com/nz

TJ

File No.:	06-309
Accession No.:	2004/00394
Referred To:	CI-TJ
Further Action:	

7 January 2004



West Coast Regional Council
PO Box 66
GREYMOUTH

Attention: Trevor James

Dear Trevor

In response to your letters dated 31 July 2003, regarding registration of properties on your sites associated with the hazardous substances register. Below is the list of sites relating to the Westport Works Plant that we consider to contain hazardous substances.

- 1 ✓ Pt Sec 8 Blk 1 (DP4484)
- 2 ✓ Pt Sec 2 Sq 142 (DP 2822)
- 3 ✓ Sec 23 (SO 9707)
- 4 ✓ Lot 1 (DP 5510)
- 5 ✓ Sec 2 (SO 14160)
- 6 ✓ Sec 3 (SO 14160)
- 7 ✓ Sec 1 (SO 14851) Blk 1 Steeples
- 8 ✓ Pt Sec 8 Blk 1 (SO 3430)
- 9 ✓ Lot 3 (DP 5510)

1, 2 & 8 = SAHS-473
 3, 4 & 5 = SAHS-465
 6, 7 & 9 = SAHS-10

Please refer to the attached Terraview plan for locations of these sites.

The sites recorded above are those sites in which the Cement Works, Cement Kiln Dust landfill, the municipal landfill and the Fertiliser plant are located on.

Below is the list of sites relating to the Westport Works Quarry, that we consider to contain hazardous substances.

- 1 Pt 5 Blk 1 (DP 4458)
- 2 Pt Sec 5 Blk 1 (SO 2829)
- 3 Lot 1 (DP 51)
- 4 Lot 1 (DP 5455)
- 5 Lot 3 (DP 5455)
- 6 Lot 1 (DP 2078)
- 7 Lot 2 (DP 2078)
- 8 Pt Sec 3 Blk 1 (SO 2827)

ALL SAHS-1



- 9 Lot 2 (DP 51)
- 10 Lot 3 (DP 51)
- 11 Sec 41 Blk 111 (SO 11713)
- 12 Pt Sec 15 Sq 142 (SO 3431)
- 13 Sec 9 Sq 142 (SO 2829)
- 14 Lot 2 (DP 5455)
- 15 Pt Sec 12 Sq 142 (SO 3431)
- 16 Pt Sec 16 Blk 1 (SO 6263)

ALL SAHS-1

Please refer to the attached Terraview plan for locations of these sites.

All other sites have no records of containing hazardous substances; it is therefore considered that these sites should not be included on the hazardous substances site register.

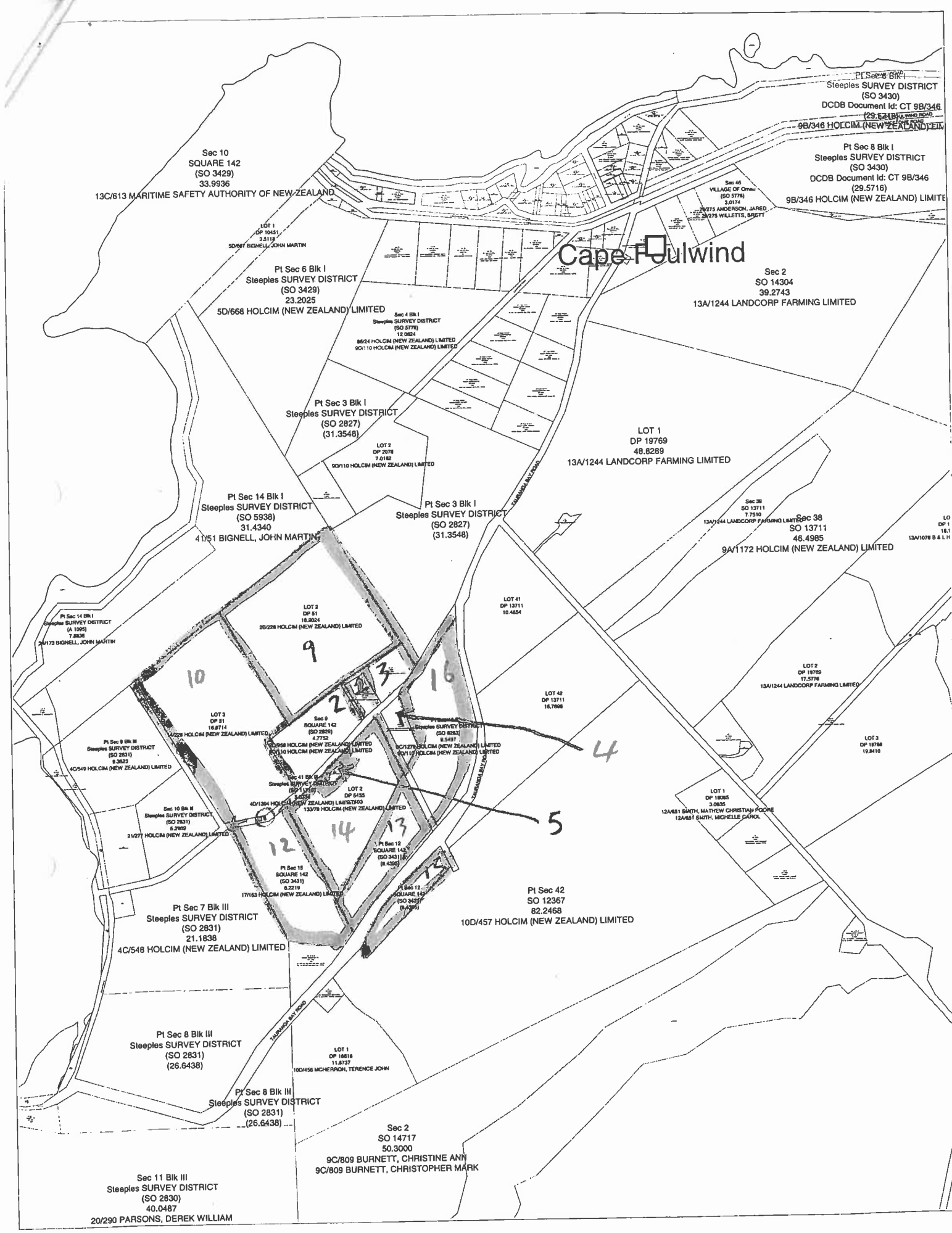
Please also find attached two letters that were sent to us, however the properties do not belong to us, they belong to those names at the top of the letters.

Should you have any questions regarding the above information please contact the undersigned on 03 789 7259.

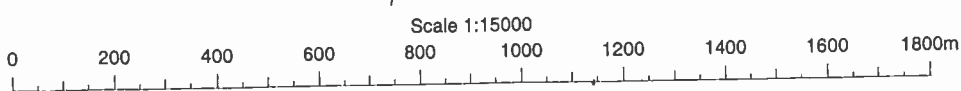
Yours sincerely



Allanagh Clarke
Environmental Advisor




Cape Foulwind



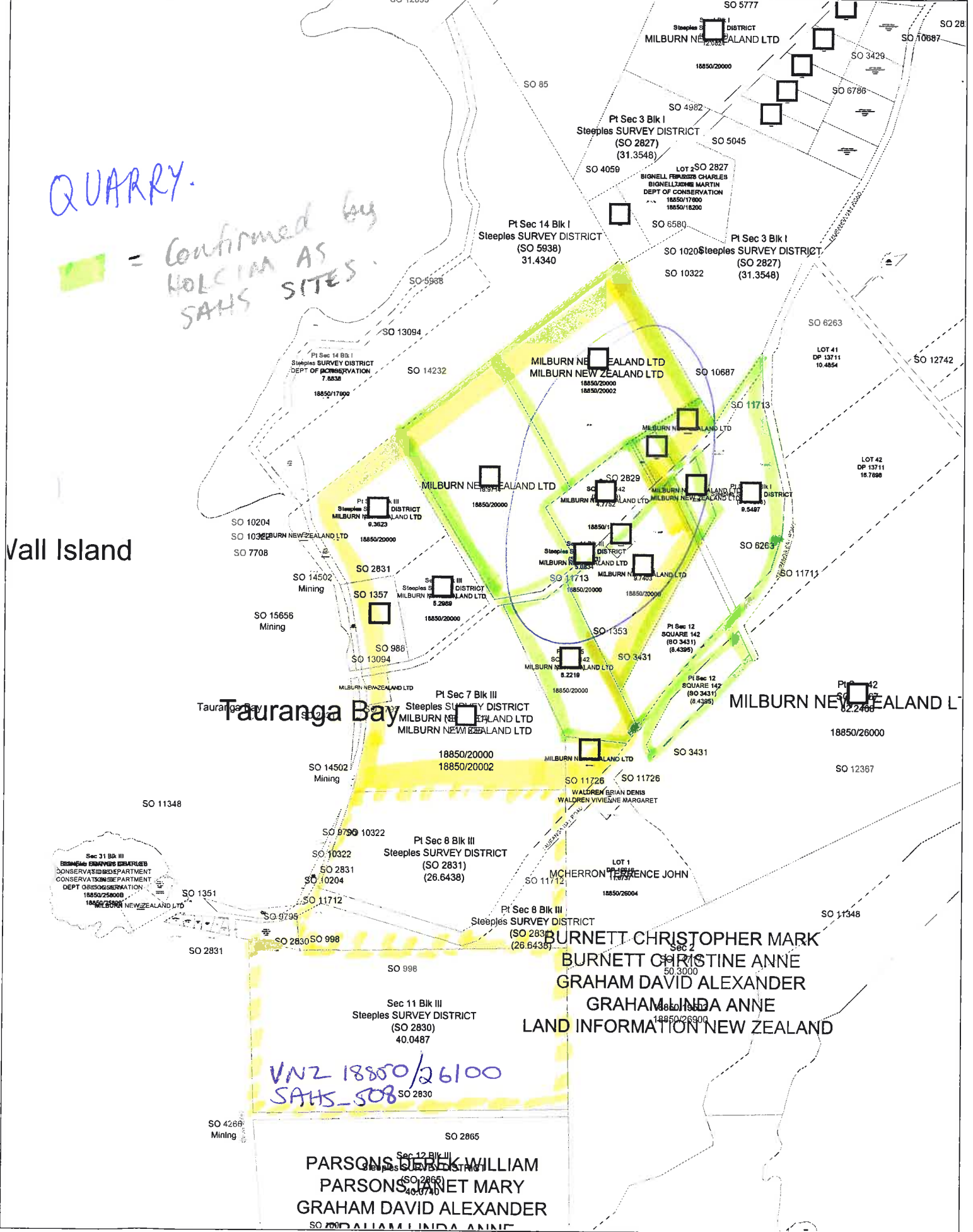
Survey and Title Data as at 25-OCTOBER-2003, Valuation and Sales Data as at 21-OCTOBER-2003 and Geodetic Mark data as at 25-OCTOBER-2003. For additional mark data visit www.linz.govt.nz. Cadastral Information from LINZ Core Record System (CRS). CROWN COPYRIGHT

QUARRY.

 = Confirmed by HOLLIM AS SAMS SITES.

Vall Island

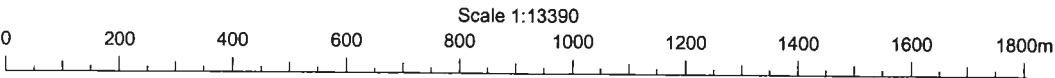
Tauranga Bay



VNZ 18850/26100
SAMS 508

BURNETT CHRISTOPHER MARK
BURNETT CHRISTINE ANNE
GRAHAM DAVID ALEXANDER
GRAHAM LINDA ANNE
LAND INFORMATION NEW ZEALAND

PARSONS JANE WILLIAM
PARSONS JANE MARY
GRAHAM DAVID ALEXANDER
GRAHAM LINDA ANNE

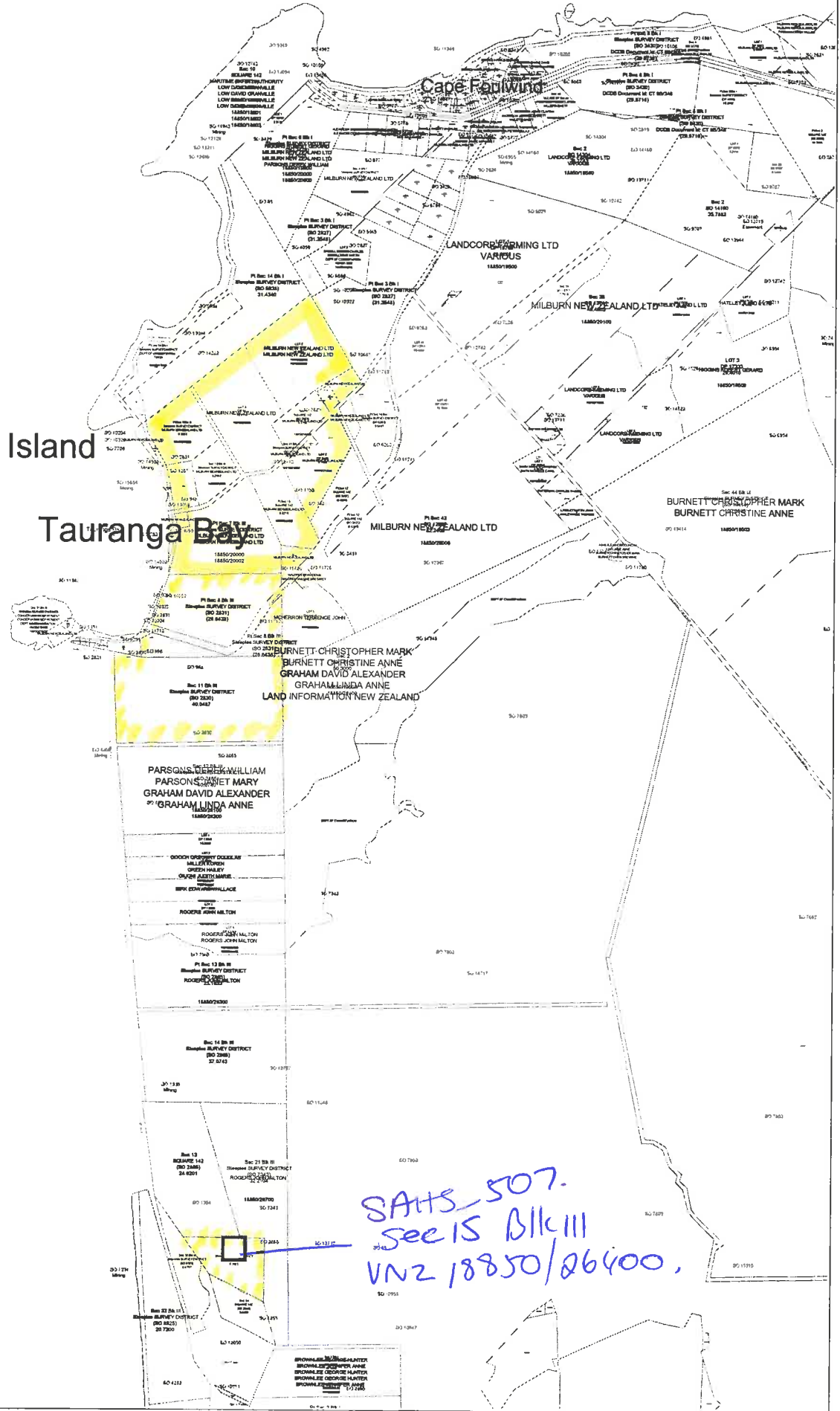


QUARRY

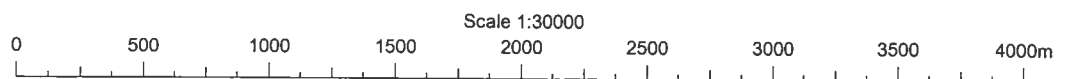
Wall Island

Tauranga Bay

Cape Foulwind



SATS 507.
See IS Blk III
VN2 18850/26400.





P.O. Box 21
Westport
New Zealand
Phone: (03) 789 7239
Fax: (03) 789 7233

Dangerous Goods Licence

Dangerous Goods Act 1974

No.: DG052

Issued: 9 June 1998

MILBURN NEW ZEALAND LTD
PO BOX 111
WESTPORT

**Location: MILBURN NEW ZEALAND LIMITED : CAPE FOULWIND QUARRY,
WESTPORT**

Pursuant to Section 9 of the Dangerous Goods Act 1974, licence is hereby granted to the abovenamed to store dangerous goods in the maximum quantities and containers scheduled hereunder.

In granting this licence, the licensee shall at all times comply with the appropriate provisions of the regulations made pursuant to the Dangerous Goods Act 1974 and, where applicable, with the additional conditions set out below.

Unless surrendered or revoked beforehand, this licence shall remain in force until 31 March 1999 and may be renewed annually thereafter.

Classes, maximum quantities and number of containers of dangerous goods authorised in this licence:

litres Class 3c: Diesel Fuel 1 x U.G.T 40 000

Signed for and on behalf of the Council:


Bede Brown, Dangerous Goods Inspector



MILBURN NEW ZEALAND LTD
Cape Foulwind Works
PO Box 245, Westport
New Zealand
Fax (03) 789 8798
Phone (03) 789 7259

To **Martin M.** West Coast Regional Council

Facsimile Number 03 768 7133

From Trish Costelloe

Date/Time 23 July 2001

Number of Pages including this page 2

Message

Dangerous Goods Licenses for MNZ.
~~Packing Plant~~
~~Cement works~~
Quarry

Sorry
I forgot to send this one

MILBURN NZ LTD

WALLS CREEK

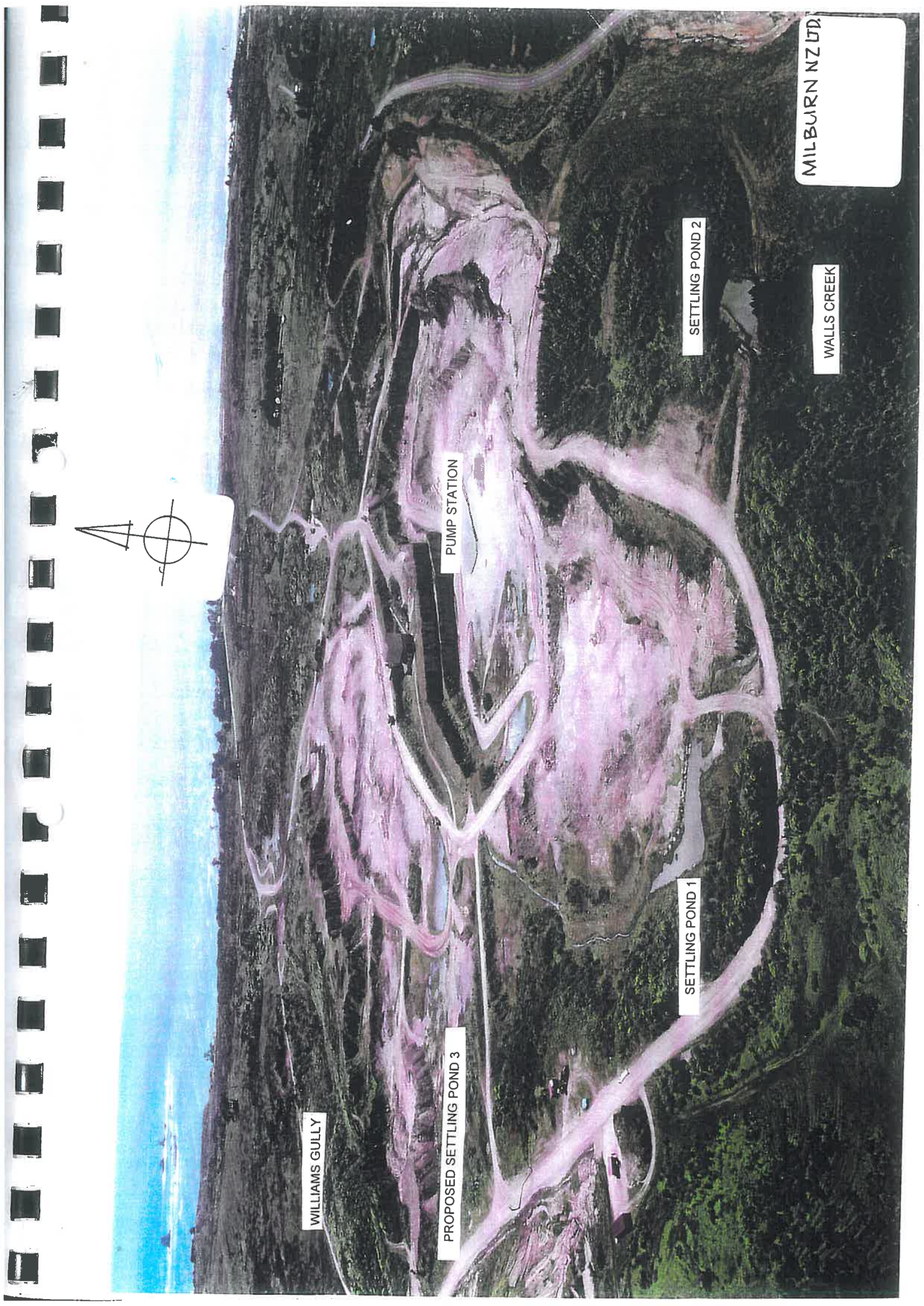
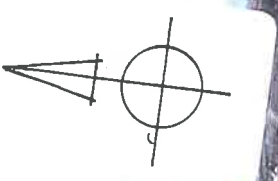
SETTLING POND 2

PUMP STATION

SETTLING POND 1

PROPOSED SETTLING POND 3

WILLIAMS GULLY



N 98/332

**CAPE FOULWIND QUARRY
STORMWATER DISCHARGE TO WILLIAM'S GULLY
ASSESSMENT OF ENVIRONMENTAL EFFECTS**

**Milburn (NZ) Ltd
AUGUST 1998**

1 Introduction

This report is an assessment of environmental effects to support an application for renewing the consent for discharge of storm water from the Milburn Cement limestone quarry into William's Gully.

The company holds an existing consent which was granted under the Water and Soil Conservation Act 1967 (WLD 780047). This is attached as appendix 1. The consent expires on 24th October 1998 and Milburn seeks to renew it for a further term.

Key points of the existing consent are:

- Storm water discharge of up to 6,552,000 litres per day
- Before discharge all water to pass through a settling pond of minimum dimensions 50m x 50m x 0.6m.

Storm water in the quarry is collected from several areas and flows or is pumped to settling ponds. The ponds discharge water into Wall's Creek (also known as Limestone Creek) which flows out to Tauranga Bay. This activity is covered by water right WLD780049, renewal of which is being sought separately.

No water is currently discharged from the quarry into William's Gully. Renewal of the consent is to allow the future division of quarry storm water and discharge a portion via William's Gully. The creek does not have high aesthetic qualities due to its "yellow" pakihi colour but as it flows into Tauranga Bay, which is a popular recreational reserve, it can not pose a health risk to the public. Affected parties are detailed in the application and have been contacted. A copy of the application documentation is included as appendix 2

Milburn's programme of storm water control and monitoring contribute to the minimal effects these activities have on the environment. Section 2 of this report describes the layout of the site and the current and proposed storm water discharge points together with activities at the quarry and explains where storm water comes from. Section 3 describes the proposed receiving water, William's Gully, in terms of its nature, hydrology and water quality.

Section 4 discusses the storm water treatment system, and the potential environmental effects associated with the discharge of site storm water on the resources of William's Gully. Section 5 provides a summary of assessed environmental effects.

2 Site Water Management

The Milburn quarry is located at Cape Foulwind near Westport. Storm water in the quarry is collected from several areas:

1 Area draining to main pit	290,000 m ²
2 North Western corner	210,000 m ²
3 Area draining to settling ponds and drain	80,000 m ²
4 G quarry	385,000 m ²

At present area 1 is pumped to settling pond 1. Area 2 is pumped approximately 3m up to the settling pond 1. Settling pond 1 flows via a channel to settling pond 2. Area 3 flows over land directly to the ponds.

The ponds discharge water into Wall's Creek which flows out to Tauranga Bay. G quarry flows north and is pumped to a drain flowing through the old marl quarry to the sea. These discharges are covered by separate consents (WLD840054-58 and WLD780047) and are not considered further here.

As the quarry advances northward a greater proportion of the water now collecting at the north end of G Quarry will be diverted southward. At that stage it will be necessary to review the direction of flow and divide the flow towards an alternative discharge point by installing a new pump station and discharge canal.

To access William's Gully it is proposed that a hole be drilled from the quarry in Seaside Bay to low in the floor of William's Gully. This would be cased and grouted into place. The overflow from the settling ponds to be constructed in the North Western corner would pass down this pipe.

Installation of this system would allow the diversion of some of the flow from Wall's Creek particularly at times of above average flow. This arrangement will accommodate increasing flows to the North Western corner from the advancing face into the G Quarry. At some stage it will be necessary to divert water from other parts of the quarry in this direction. This arrangement is an alternative that will enable water quality management to be better controlled.

Storm water flows from each of the areas for a ten year return period were calculated and on the basis of these a peak discharge figure of 40,000 m³/day and mean flow of 3120 m³/day to William's Gully is applied for. It is assumed that any losses by seepage or evaporation are made up by inflow of ground water. Table 2.1 describes the retention capacities and flow rates of the components.

Table 2.1 Quarry Water Management Capacities

Element	Capacity/Quantity Average conditions	Capacity/Quantity Maximum conditions
Pump from Area 1	1366 m ³ /day	38,800 m ³ /day
Pump from Area 2	575 m ³ /day	4,700 m ³ /day
Settling Pond 1		1500 m ³
Settling Pond 2		1000 m ³
Proposed new Settling Pond		5000 m ³
Discharge to William's Gully	3120 m ³ /day	40000 m ³ /day

William's Gully is shown in the plates.

Plate 1: Looking down William's Gully towards Tauranga Bay



A series of maps detailing the quarry are included in appendix 3. Map 1 is an aerial photograph of the quarry with key areas relevant to the application marked:

- Pumping station
- Settling pond 1
- Settling pond 2
- Proposed new settling ponds
- Sampling points
 1. Settling pond 1 discharge
 2. Settling pond 2 discharge
 3. Wall's (Limestone) Creek control
 4. Wall's (Limestone) Creek discharge to Tauranga Bay
 5. William's Gully

Map 2 shows the contours and water management at the quarry in flow chart form. Map 3 is a title plan showing the quarry area and surroundings with the section numbers and owners marked. Map 4 is a topographical map showing the quarry location in a general plan.

Plate 2: Looking up William's Gully towards quarry



Plate 3 (top): William's Gully sample site

Plate 4 (bottom): William's Gully outlet to Tauranga Bay

Plate 5 (over page): Aerial photograph showing quarry area



3 Receiving Water Resources

3.1 Hydrology of William's Gully

William's Gully contains a small stream that passes through a predominantly agricultural catchment. The stream ranges from 1 to 2 meters in width and average depths of 20 cm to 1-2 meters in places. The headwaters of the stream are boggy areas in the undulating terrain.

There have been no quantitative hydrological investigations in the area. However Milburn commenced a routine water quality monitoring programme at the quarry in November 1997. In addition daily rainfall data is collected at the Works. Observations of water flow are visual estimates of cross sectional area and stream velocity.

Table 3.1 summarises the observations of flow in William's Gully. Four measurements were taken a week apart in November/December 1997 and an additional five in June/July 1998. Data from Limestone Creek are included for comparison.

Table 3.1 Water Flow Rates in Limestone Creek in m³/s

Sample Area	Mean Flow	Minimum Flow	Maximum Flow	Standard Deviation
William's Gully	0.03	0.00	0.24	0.07
Control Limestone Creek	0.05	0.00	0.20	0.06
Limestone Creek – Tauranga Bay	0.24	0.07	0.47	0.12
Settling Pond 2 Discharge	0.18	0.01	0.50	0.15

Table 3.2 shows a summary of rainfall at the Works during the monitoring period. The rainfall during the test periods appears to be typical for annual rainfall in the region (2136 mm, Westport Airport).

Table 3.2 Monthly Rainfall at Cape Foulwind during Monitoring Period

Month	Rainfall (mm)	Month	Rainfall (mm)
October 1997	136.4	March 1998	144.8
November 1997	259.0	April 1998	135.8
December 1997	278.8	May 1998	213.8
January 1998	131.6	June 1998	168.6
February 1998	144.8	July 1998	161.6

3.2 Status of William's Gully

No water is currently discharged from the Quarry to William's Gully. However data on water discharged to Limestone Creek is expected to be representative of water discharges proposed for William's Gully. Therefore of relevance to the present application are results from monitoring at the following locations:

- 2nd settling pond (discharge)
- Limestone Creek control
- Limestone Creek discharge to Tauranga Bay
- William's Gully

Milburn have carried out monitoring of the above locations for the following parameters:

- pH
- dissolved oxygen
- turbidity
- specific conductance
- temperature

These are basic parameters for determining water quality. For the existence of aquatic life pH should be 6-9, dissolved oxygen should be >6 mg/l (>80% saturation), turbidity should be <10% change seasonal mean and temperature of discharge water should be < 2 °C variance from receiving water temperature. Salinity (measured by specific conductance) should be <1000 mg/l (about 1500 μ S/cm).

In addition absorbance at 270 and 420 nm and suspended solids were measured for two samples in July 1998. High suspended solids in waterways deter aquatic life from the streams. Turbidity is a relative measure of suspended solids.

Absorbance at 420 nm is of interest because it is the absorption peak for chlorophyll a, which assesses competition for light between aquatic plants and other water components. Absorbance at 270 nm provides an index of organic matter rather than light absorbing matter. The "yellow" colour of water is due to the dissolved organic matter.

Milburn's recent observations show that the lower reaches of William's Gully have aquatic plants and animals present. This indicates a healthy stream biota. This is discussed further in section 4 where results are presented of the recent water monitoring programme.

4 Assessment of Environmental Effects

Table 4.1 summarises the mean results of the water quality monitoring programme. A description of the methodology for sample collection and testing and details regarding analytical techniques are included in appendix 4. Full results from the monitoring programme are included in appendix 5.

Table 4.1 Mean results from quarry water monitoring programme

Parameter	Limestone Creek control site	William's Gully Outlet	Settling pond 2 discharge	Limestone Creek discharge to Tauranga Bay
PH	6.96	6.98	7.62	7.55
Dissolved oxygen %	90.5	96.0	101.7	98.8
Dissolved oxygen mg/l	10.01	10.9	10.73	10.57
Specific conductance $\mu\text{S}/\text{cm}$	100	260	650	480
Temperature $^{\circ}\text{C}$	11.3	9.74	13.1	12.1
Turbidity NTU	6.9	11.39	16.0	8.6
Flow m^3/s	0.05	0.06	0.18	0.24
Absorbance 270 nm	0.699	0.720	0.021	0.207
Absorbance 420 nm	0.071	0.083	<0.002	0.023
Suspended solids g/m^3	21	143	45	37

The William's Gully results are similar to the Limestone Creek control site. The proposed storm water discharge has slightly elevated levels of suspended solids and turbidity and is slightly alkaline with a pH of 7.62 reflecting the presence of minor amounts of limestone from the quarry run off. It has a marginally higher conductivity, which is indicative of minor amounts of dissolved material. Absorbances are lower than the proposed receiving waters indicating that the site water has better clarity and less colour than the creek water. Visually the storm water discharge is slightly greyish whereas the William's Gully water is brownish.

All other components in the storm water are similar to those in William's Gully, which supports the premise that no contaminants would enter the storm water system other than solids, which are mitigated by the storm water retention system. The suspended solids and turbidities observed at the down stream site in Limestone Creek are in the same range as for the control site and are very low under average flow conditions. This is probably aided by the presence of the holding ponds, which prevent ingress of excess solids into the storm water during moderate flood flow conditions. This would be expected to hold true for discharges to William's Gully.

5 Summary of Environmental Effects

The site storm water discharge has no significant effect on the water quality or resources of Limestone (Walls) creek. Specifically:

- There are few changes in quality from the control site to the discharge site downstream of the holding ponds.
- The storm water quality is similar to the quality at the control site.
- The only parameters likely to be increased in the storm water prior to it entering the storm water treatment system are suspended solids and turbidity.
- The storm water retention pond system is effective in removing suspended solids from the water prior to discharge into Limestone (Walls) creek.
- The range in suspended solids and turbidity at the downstream site is similar to that found at the control site.
- All of the parameters measured at the down stream site are within the usual limits for the protection of aquatic life. ✕

The properties of the water in William's Gully are comparable to those in Limestone Creek. Therefore the conclusion is drawn that the effects of discharging storm water from the quarry to William's Gully would be minimal, as is the case for Limestone Creek.

Appendix 1: Copy of existing water right.

WESTLAND CATCHMENT BOARD AND REGIONAL WATER BOARD

78004

WATER RIGHT No. WLD 780

RIGHT IN RESPECT OF NATURAL WATER

Pursuant to Section 21 (3) of the Water and Soil Conservation Act 1967 the Westland Catchment Board, a Regional Water Board duly constituted under the said Act, hereby grants to NEW ZEALAND CEMENT HOLDINGS LIMITED

.....of
.....P.O. Box 111, WESTPORT......(Address)

.....Cement Manufacturers.....(Occupation)

the right in respect of natural water for the term and upon the conditions hereinafter set forth.

TERM: 20 years from the 24th day of October 1978

PURPOSE FOR WHICH WATER IS TAKEN:

SOURCE AND LEGAL DESCRIPTION OF LAND:

QUANTITY:

MAXIMUM RATE:

DESCRIPTION OF DISCHARGE: .. Stormwater

POINT OF DISCHARGE .. Drain Lot 3 Block I Steeples S.D.

QUANTITY: .. Up to 6,552,000 litres per day

MAXIMUM RATE: .. 6,552,000 litres per day

Conditions of Right

- (a) This Right may be cancelled upon not less than six months notice in writing to the grantee if, in the opinion of the Board, the public interest so requires; but without prejudice to the rights of the grantee to apply for a further right in respect of the same matter.
- (b) The grantee is required to keep such records of water used or water or waste discharged as may be required by the Board and to supply this information to the Board if and when requested and in particular the grantee shall if the Board so requests, at his own expense, install such measuring devices as are considered necessary by the Board.
- (c) The grantee or his agent shall not be entitled to any compensation from the Board on account of any review, amendment, cancellation or variation of this "right" or any condition thereof.

- (d) The "right" is granted subject to the Board or its agents being permitted access to all installations and workings and every part thereof in connection with or relating to the "right" and for this purpose the Board or its agents shall have access to all such installations and workings and every part thereof at all reasonable times and from time to time.
- (e) Damages arising from faulty construction or in any way from the exercise of this Right will be the responsibility of the grantee, and the grantee shall indemnify the Board against any liability which may be incurred by the Board in connection with this Right.
- (f) Where for any cause (accidental or otherwise) waste associated with the grantees operations escapes to natural water otherwise than in conformity with this Right the holder of the right shall:-
 - (i) Forthwith (and in any event not later than 24 hours of the escape of the waste) notify the Board of the escape of waste; and
 - (ii) Forthwith report to the Board in writing of the manner and cause of the escape of waste and the steps taken or being taken to effectively control or prevent such escape.
 - (iii) Proceed with all due diligence to take such action or execute such work as may be necessary to stop such escape.
- (g) This right is not a guarantee that the quantity and quality of water specified will be available nor is it an authority to obtain access to a source of water or point of discharge.
- (h) The grantee will take all reasonable and proper measures to ensure that all materials used in quarrying operations shall be prevented from entering into any natural water courses. In this respect the discharge of solid materials directly to the unnamed creek is not permitted.
- (i) Before discharge all stormwater shall pass through a settling pond of minimum dimensions 50 metres x 50 metres x 0.6 metre.
- (j) The settling area is to be cleaned at regular intervals so that it is not permitted to become inoperative.
- (k) Grantee report to Regional Water Board quarterly on state of settling ponds and discharge area.

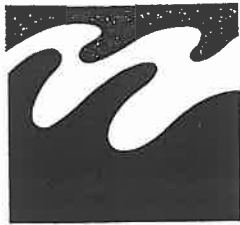
Signed at Greymouth this

2nd day of November 1978

For and on behalf of the
Westland Catchment Board


.....
A. N. BOWEN - CHAIRMAN

Appendix 2: Copy of application documentation.



153 Tainui Street,
 P.O. Box 66, Greymouth.
 The West Coast, New Zealand.
 Telephone (03) 768 0466
 Toll Free 0508 800 118
 Facsimile (03) 768 7133

1

THE WEST COAST
 REGIONAL COUNCIL

Resource Consent Application

Applicant(s) name(s): (Please write all names in full)Milburn New Zealand Limited	
Postal Address: ..Milburn NZ LimitedP.O. Box 245Westport.....	Telephone: Business: ..03 789 7259 Private: ..-..... Facsimile: ..03 789 8798.....
Property owner's name: (If different from above)	Telephone: Business: ..As above Private: Facsimile:
Service name and address: (If different from above)	Telephone: Business: Private: Facsimile:
Location of activity and/or property address: ..Tauranga Bay..... ..Milburn NZ Limited ..PO Box 245 Westport	Map Reference NZMS 260: ..K29..... (1:50,000) ..823368.....
(include the name of any relevant stream, river or other water body to which the application may relate, proximity to any well known landmark, etc.) Legal description: ..Lot 3 and Pt. Section 9 Steeples S.D.DP 51 unnamed creek Tauranga Bay locally known as Williams Gully.... (from rates notice, CT or valuation notice).	

Territorial authority in which land is situated: (Place a ✓ in the appropriate)

Westland District Council

Grey District Council

Buller District Council

Consent(s) being applied for: (The appropriate form must be attached for each box ticked)

Water:

Dam Divert Take Surface Water Take Groundwater

Discharge onto or into:

Land Water Air

Land Use:

Bore Construction or alteration

Activities in or on beds of lakes or rivers Land clearing/tracking/logging

Coastal:

Activities in or on the coastal marine area (ie. below mean high spring tide)?

TERMThirty..Five..... (years)

Do you require any other resource consents from the District Council? Yes No

If Yes, please list:

.....
.....

Have these consents been applied for? N/A Yes No

Consultation

Have you discussed your proposal with your neighbours and other parties who may be affected (eg. Fish and Game Council, Department of Conservation, Iwi, Transit New Zealand, user groups and interest groups) Yes No

If so, who was consulted?

..... All adjoining landowners and affected parties listed on following page.

..... Existing use - renewal of Water Right WLD780047 granted 24 October 1978

Do they have any concerns?

.....
.....

If so, how can these concerns be met?

.....
.....

What are the names of the adjoining landowners/neighbours and affected parties?

(1) Owner's name: Department of Conservation
Address: Westport Field Centre, Russell Street, Westport
Telephone/Facsimile: 03 788 8008/03 788 8009
Occupier's Name:
Address:
Telephone/Facsimile:

(2) Owner's name: Buller District Council
Address: Brougham Street, Westport
Telephone/Facsimile: 03 789 7239/03 789 7233
Occupier's Name:
Address:
Telephone/Facsimile:

(3) Owner's name:
Address:
Telephone/Facsimile:
Occupier's Name:
Address:
Telephone/Facsimile:

(4) Owner's name:
Address:
Telephone/Facsimile:
Occupier's Name:
Address:
Telephone/Facsimile:

(5) Owner's name:
Address:
Telephone/Facsimile:
Occupier's Name:
Address:
Telephone/Facsimile:

(6) Owner's name:
Address:
Telephone/Facsimile:
Occupier's Name:
Address:
Telephone/Facsimile:

(Continue on a separate page if necessary)

Sketch of the locality and activity points and/or supply an aerial photograph with activity points marked on it:

See attached maps

Have you remembered to?

- | | Yes | Check |
|--|-------------------------------------|--------------------------|
| • Sketch the locality and activity points or supply an aerial photograph? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| • Include permit application forms for each box ticked above? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| • Complete an assessment of effects? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| • Include a plan of any structures for which an application is being made? N/A | <input type="checkbox"/> | <input type="checkbox"/> |

I hereby certify that, to the best of my knowledge and belief, the information given in this application is true and correct. I undertake to pay all actual and reasonable application costs incurred by the Regional Council.

Signature of applicant: *Sheralyn Hume* Date: *28/8/98*

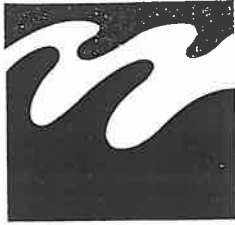
Name: (Block Capitals) *Sheralyn Hume for Milburn New Zealand Limited*

Fees

No deposit fee is required with the application.

The applicant will be invoiced to recover the Council's processing costs following completion of processing of the application, in accordance with this Council's Special order.

The permit will be issued immediately following payment of the Council's invoice.



153 Tainui Street,
 P.O. Box 66, Greymouth.
 The West Coast, New Zealand.
 Telephone (03) 768 0466
 Toll Free 0508 800 118
 Facsimile (03) 768 7133

7

THE WEST COAST
 REGIONAL COUNCIL

Discharge or Coastal Permit Application To Discharge Water or Contaminants to Water

This application form should be used for all discharges to water. Discharges to coastal water below mean high water springs and within the outer limits of the territorial sea require a Coastal Permit. All other discharges to water require a Discharge Permit.

Please answer all questions fully. You should discuss your application with Council officers before completing this form.

Show the location of the discharge on your map on Form 1. Include design plans and details with this application.

Part A: General

1. What is the discharge: water or contaminant ?

(A contaminant is any substance or water which is likely to change the water into which it is discharged in any way.)

2. What is the source of the water or contaminant (eg. sewage treatment, industry, sewage pumping station, water treatment, rural activity)?

.....Storm Water run off.....

3. Describe the contaminant: Limestone sediment and clay sediment

including, where appropriate:

Temperature: ...13.1.. °C pH: ...7.62.. Suspended solids: ...45..... g/m³

BOD₅: ...N/A... g/m³ Faecal coliforms: ...N/A... g/m³

The chemical content, including heavy metals or toxic substances, nitrates, ammonia and dissolved reactive phosphorous.

..N/A.....
 Refer assessment of environmental effects

4. Is the contaminant treated in any way before being discharged? Yes No

If Yes, describe treatment. ...Settling Ponds.....

5. What is the name of the water body into which the discharge is made (eg. name of stream, river, lake, bay, harbour, etc.)?

.....Williams Gully Tauranga Bay.....

Part A: General (Continued)

6. Discharge Rate Information

Maximum flow rate: $\frac{465}{40,000}$ litres per second or cubic metres per second
 Maximum daily flow: cubic metres

For sewage discharges:

Average dry weather flow: litres per second or cubic metres per second

Peak flow: litres per second or cubic metres per second

Daily peak flow: cubic metres per day

Peak wet weather flow: litres per second or cubic metres per second

Is the discharge: continuous or intermittent ?

What will be the maximum discharging period? $\frac{24}{7}$ hours per day
 days per week
 ...52..... weeks per year

7. Does the discharge also involve:
- | | | |
|-------------------|------------------------------|--|
| Outlet structure? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Diversion? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Discharge to air? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |

If you answered Yes to any of 7 above, a separate consent application may be required.

Part B: Assessment of Effects on the Environment

Where your discharge could have a significant adverse effect on the environment a more detailed environmental assessment is required in accordance with the Fourth Schedule of the Resource Management Act 1991.

1. Comment on the possible effect the discharge may have on the quality of the receiving water and any downstream users:

No change - refer assessment of environmental effects

2. Within a reasonable distance downstream or in the vicinity of the discharge are there any:

- | | Yes | No |
|---|-------------------------------------|-------------------------------------|
| (1) Obvious signs of biota (eg. fish, eels, insect life, aquatic plants)? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| (2) Areas where food is gathered (eg. watercress, fish, kaimoana, blackberries)? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| (3) Water abstractions? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (4) Wetlands (eg. swamp areas)? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| (5) Recreational activities carried out (eg. swimming, fishing, canoeing)? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| (6) Areas of particular aesthetic or scientific value (eg. archaeological sites)? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (7) Areas or aspects of significance to iwi? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Part B: Assessment of Effects on the Environment (continued)

If you have answered yes to any of the above, describe what effects your discharge may have and the steps you propose to take to mitigate these.

.....
Refer assessment of environmental effects
.....
.....
.....
.....
.....
.....
.....
.....
.....

(Continue on a separate page if necessary)

3. What alternative methods of disposal or discharge locations have you considered?
None available
.....
.....
.....
.....
.....

4. Why did you choose the proposed method of disposal and location point?
Existing Water Right
.....
.....
.....
.....
.....

5. How will the equipment controlling the discharge be operated and maintained to prevent equipment failure, and what measures will be implemented to ensure that the effects of any malfunction are remedied?
.....
.....
.....
.....
.....

6. What, if any, monitoring do you propose to carry out to ensure that the discharge does not have any adverse effect?
Existing programme of water quality analysis - at control point
Proposed:
6 monthly analysis of pH, dissolved oxygen, turbidity, specific conductance, temperature at discharge point and downstream
.....
.....
.....
.....

Appendix 3: Quarry Maps.



MAP 4
MILBURN N.Z. LTD.

CAPE FOULWIND

LIGHTHOUSE RESERVE

31
C.T. 9C/1277
0-3693 ha

30
C.T. 26/223
0-0708 ha

58
C.T. 26/778
0-795 ha

57
C.T. 26/221
0-2149 ha

C.T. 30/134
0-3095 ha

C.T. 18/128
1-2712 ha

Sec 62
C.T. 10A/576
4-9816 ha

Sec 5
SOP 16770
C.T. 10A/594
2-8702 ha

PI 8
C.T. 9B/346
2-9-5716

C.T. 9A/1254
3359 m²

LOT 1
7697 m²

Sec 2 SOP 16304
BLK 1 STEEPLES S.D.
29-2763 ha

Sec 2
BLK 1
35 7887

min licence
LIMESTONE
QUARRY RES

PI 5
C.T. 70/154
1-9222 ha

PI 3
C.T. 20/172
Total 31-3497 ha

Sec 37
BLK 1 STEEPLES S.D.
49-1542 ha

Sec 39
7 7510 ha

Sec 38
BLK 1 STEEPLES S.D.
46-4905 ha

Sec 40
BLK 1 STEEPLES S.D.
38 3498 ha

CROWN

approx extent of
quarry workings 1981

2
C.T. 28/228
18-9023 ha

Sec 41
BLK 1 STEEPLES S.D.
10 4854 ha

PI 11
C.T. 113/20
0-8093 ha

PI 11
C.T. 110/245
1-7788 ha

PI 10
C.T. 9C/1276
1 2161 ha

9 sq 142
C.T. 20/959
4-7752 ha

C.T. 135/44 pt
0-3315 ha

Sec 42 Pt Sec 16
C.T. 9C/1279
26-3395 ha

PT Sec 42
SOP 12387
C.T. 10D/457
87-7468 ha

3
C.T. 14/228
18-9696 ha

PI 9
C.T. 4C/549
9-3623 ha

10
C.T. 28/277
5-2986 ha

15
C.T. 17/153
8-2219 ha

C.T. 133/78
9-7402 ha

12
C.T. 135/44 pt
Total 8-7738 ha

WILLIAMS GULLY

RECREATIONAL

PI 7
C.T. 4C/548
Total 1, PI 2, PI 7 24 3538 ha

PI 8
C.T. 4C/547
26-8211 ha

PI 4
C.T. 4C/546
1-1409 ha

D. PARSONS

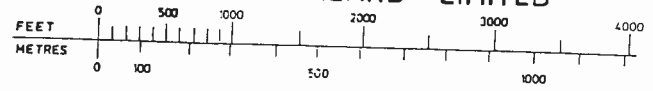
SEC. 11

WALLS CREEK

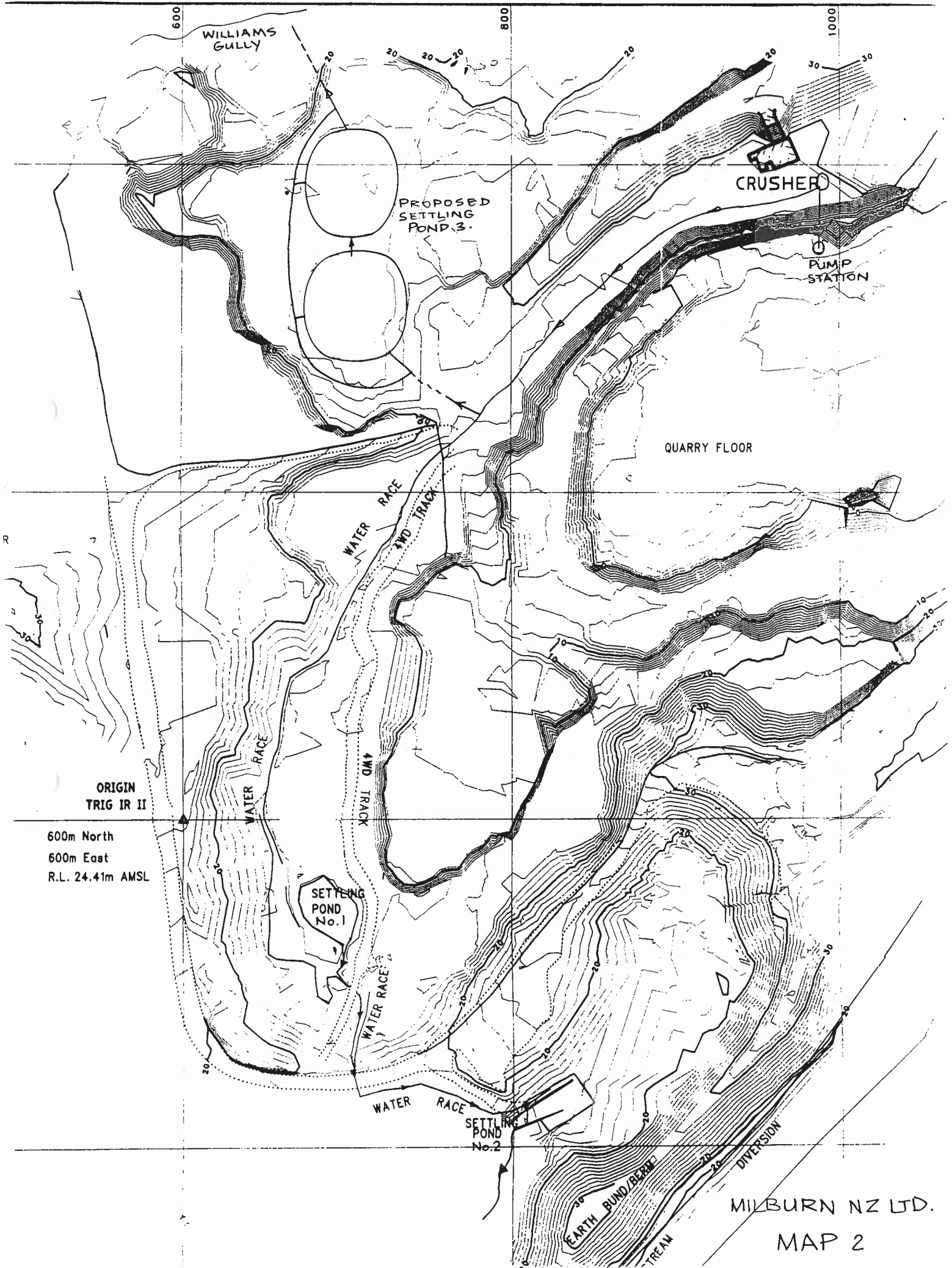
WESTPORT PROPERTY

OF

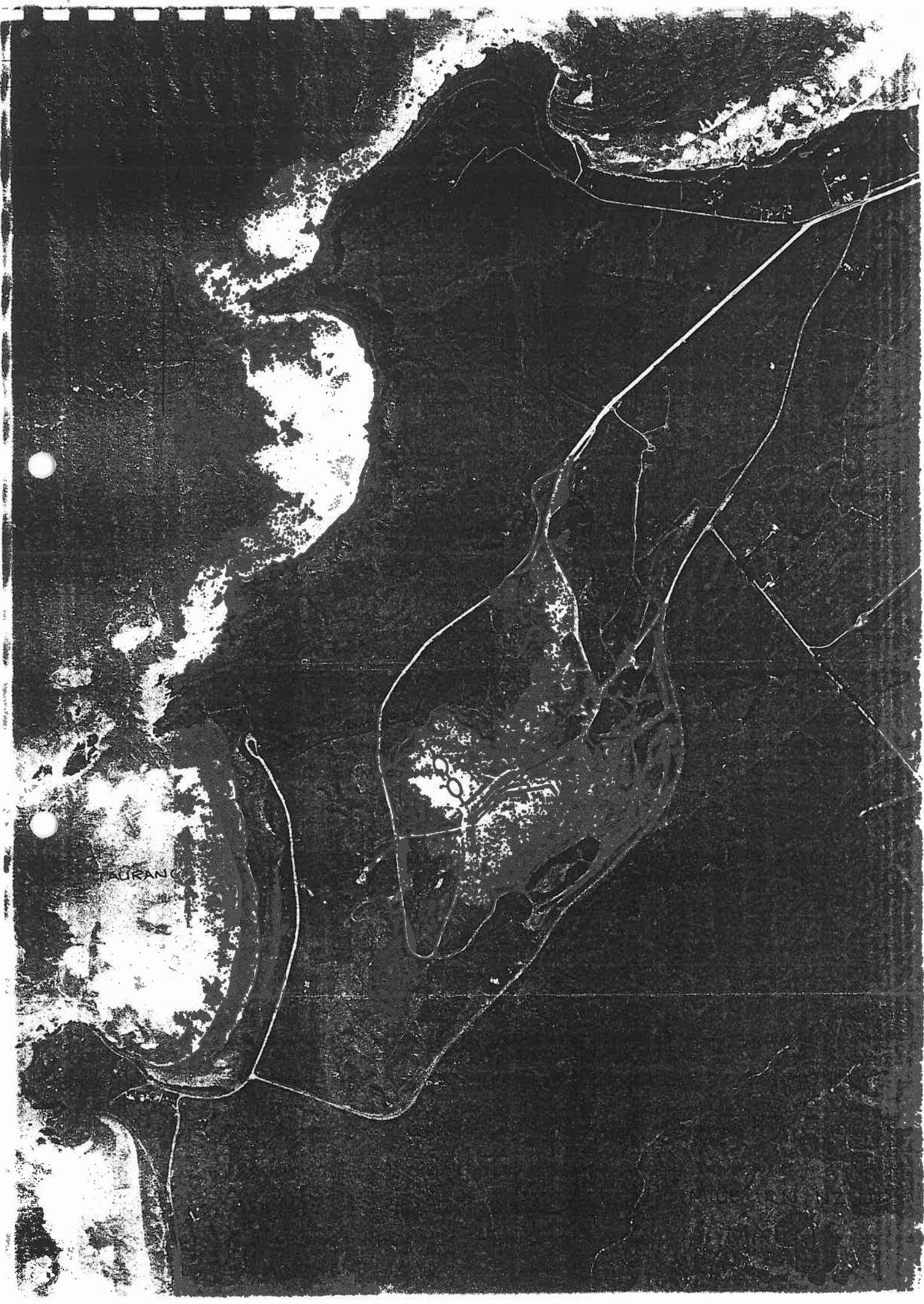
MILBURN NEW ZEALAND LIMITED

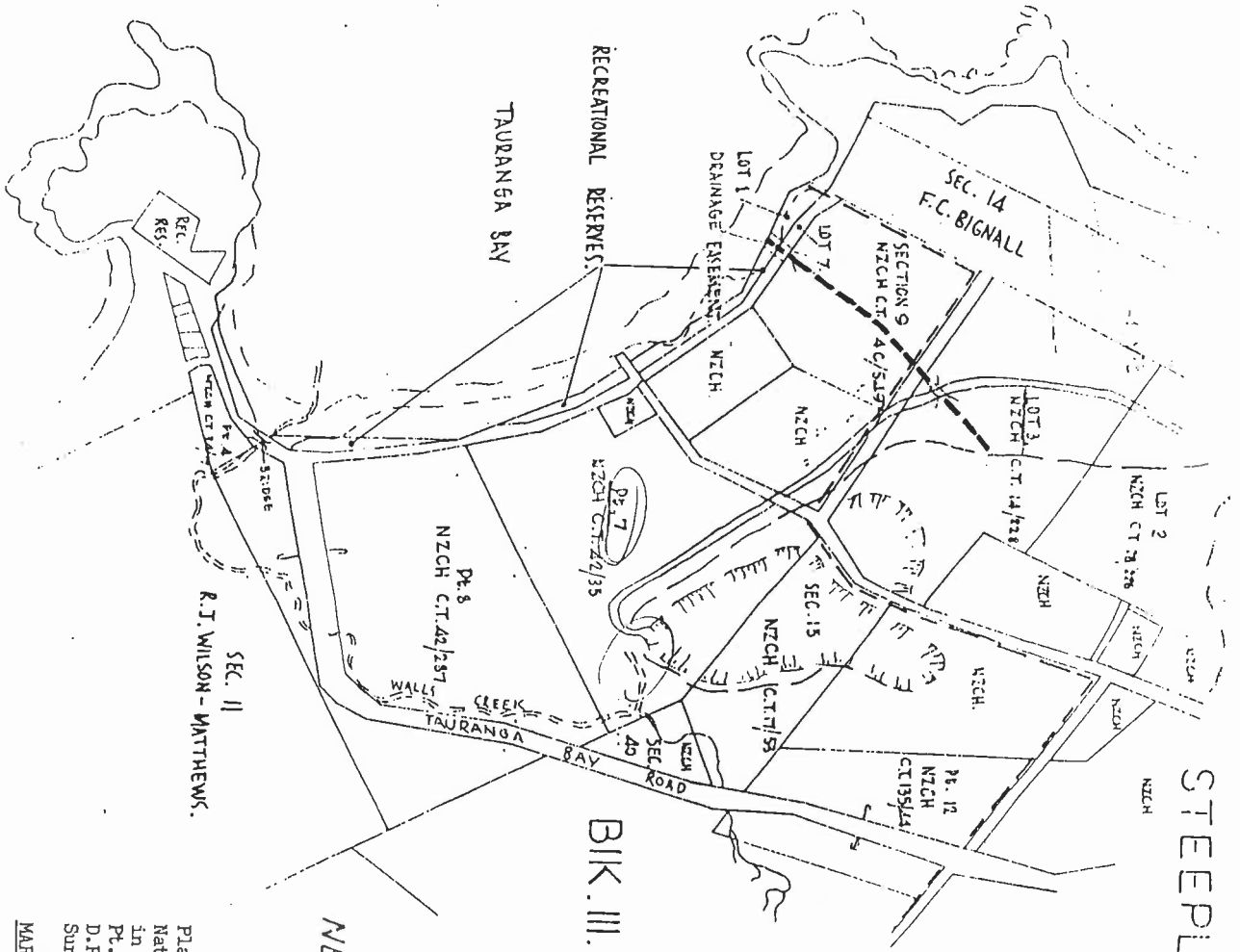


MAP 3



MILBURN NZ LTD.
MAP 2





STEEPLES

BIK. III.

NEW ZEALAND CEMENT HOLDINGS
WESTPORT.

Plan for Application for Right in Respect of
Natural Water showing location of Works situated
in Lot 3 Block I Steeples Survey District and
Pt. Section 9 and Drainage Basement over Lot 1
D.P. 9191 and Lot 7 D.P. 681 Block III Steeples
Survey District Buller County.

MARKED BLUE.

WESTPORT COUNTY

Appendix 4: Details of analytical techniques.

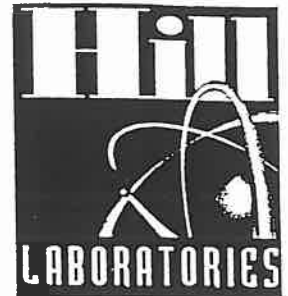
Hill Laboratories

R J Hill Laboratories Limited — accredited by International Accreditation New Zealand

Address:
1 Clyde Street,
Private Bag 3205,
Hamilton, New Zealand

Telephone:
+64 (7) 858-2000
Facsimile:
+64 (7) 858-2001

Email:
mail@hill-labs.co.nz
Internet:
www.hill-labs.co.nz



Client: Milburn NZ Ltd
Address: P O Box 245,
WESTPORT
Contact: Trish Costelloe

Laboratory No: 119679
Date Registered: 28/07/98
Date Completed: 31/07/98
Page Number: 1 of 1

The results for the analyses you requested are as follows:

Sample Type: Water,

Sample Name	Lab No	Absorbance at 270nm (AU, 1cm cell)	Absorbance at 420nm (AU, 1cm cell)	Total Suspended Solids (g.m-3)
Limestone Creek 27/7/98	119679/1	0.700	0.070	< 3
1st Settling Pond 27/7/98	119679/2	0.016	< 0.002	6
2nd Settling Pond 27/7/98	119679/3	0.016	< 0.002	8
Tauranga Bay 27/7/98	119679/4	0.043	0.004	8
Williams Gully 27/7/98	119679/5	0.289	0.030	< 3
F Blank 27/7/98	119679/6	< 0.002	< 0.002	< 3

Sample Containers

The following table shows the sample containers that were provided by R J Hill Laboratories Ltd.

Container Description	Container Size (mL)	Number of Containers
Unpreserved	1000	6

Details of sample bottle preparation procedures are available upon request.

Summary of Methods Used and Detection Limits

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Substance Type: Water

Parameter	Method Used	Detection Limit
0.45 um filtration for Absorbance measurement	0.45 um membrane filtration	N/A
Absorbance at 270nm	Filtered sample. Spectrophotometry, 1cm cell APHA 5910 B	0.002 AU, 1cm cell
Absorbance at 420nm	Filtered sample. Spectrophotometry, 1cm cell APHA 5910 B	0.002 AU, 1cm cell
Total Suspended Solids	Gravimetric APHA 2540-D	3 g.m-3

Analyst's Comments:

These samples were collected by yourselves and analysed as received at the laboratory. Samples are held at the laboratory for three months (where appropriate) after reporting of results. After this date they are discarded unless otherwise advised by the submitter. This report must not be reproduced, except in full, without the written consent of the signatory.

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager

Terry Cooney, MSc(Hons), PhD MNZIC
Operations Manager



This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited. This report may not be reproduced, except in full, without the written consent of the signatory.

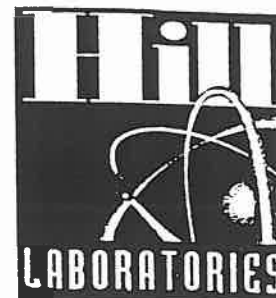
Hill Laboratories

R J Hill Laboratories Limited — accredited by International Accreditation New Zealand

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Contact: Trish Costelloe

Laboratory No: 119570
Date Registered: 23/07/98
Date Completed: 28/07/98
Page Number: 1 of 1

Client's Reference: Water Monitoring Programme

The results for the analyses you requested are as follows:

Sample Type: Water,

Sample Name	Lab No	Absorbance at 270nm (AU, 1cm cell)	Absorbance at 420nm (AU, 1cm cell)	Total Suspended Solids (g.m-3)
Limestone Creek 21/7/98	119570/1	0.697	0.072	21
1st Settling Pond 21/7/98	119570/2	0.019	< 0.002	149
2nd Settling Pond 21/7/98	119570/3	0.026	< 0.002	82
Tauranga Bay 21/7/98	119570/4	0.371	0.042	66
Williams Gully 21/7/98	119570/5	1.15	0.135	286

Sample Containers

The following table shows the sample containers that were provided by R J Hill Laboratories Ltd.

Container Description	Container Size (mL)	Number of Containers
Unpreserved	1000	5

Details of sample bottle preparation procedures are available upon request.

Summary of Methods Used and Detection Limits

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Substance Type: Water

Parameter	Method Used	Detection Limit
Absorbance at 270nm	Filtered sample. Spectrophotometry, 1cm cell APHA 5910 B	0.002 AU, 1cm cell
Absorbance at 420nm	Filtered sample. Spectrophotometry, 1cm cell APHA 5910 B	0.002 AU, 1cm cell
Total Suspended Solids	Gravimetric APHA 2540-D	3 g.m-3

Analyst's Comments:

These samples were collected by yourselves and analysed as received at the laboratory. Samples are held at the laboratory for three months (where appropriate) after reporting of results. After this date they are discarded unless otherwise advised by the submitter. This report must not be reproduced, except in full, without the written consent of the signatory.

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager

Terry Cooney, MSc(Hons), PhD MNZIC
Operations Manager



This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited. This report may not be reproduced, except in full, without the written consent of the signatory.

Sensor specifications for YSI Model 600L Field Meter

Temperature: ± 0.15 degrees Centigrade

Dissolved Oxygen: $\pm 2\%$ all saturation
+ .2 mg/l

Conductivity: $\pm 0.5\%$ of reading

pH : ± 0.2 units

APPENDIX F

Photographic Log



Main Entrance



Photograph 1: Main entrance gate – facing north-west.



Photograph 2: Main entrance – facing south.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 3: Former AST footprint.



Photograph 4: Former AST footprint.



Photograph 5: Former core storage footprint (inferred).



Photograph 6: Former core storage (inferred).



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 7: Burning area and dumping ground.



Photograph 8: Former office footprint and transformer.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 9: Transformer.



Photograph 10: Workshop.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 11: Workshop – internal.



Photograph 12: Workshop – internal.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 13: Workshop – internal.



Electrical Substation



Photograph 14: Electrical substation.



Photograph 15: Electrical substation – internal.



Quarry Landfill



Photograph 16: Landfill disposal area.



Photograph 17: Landfill surface.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 18: Ponded water.



Photograph 19: Discoloured water around base of landfill.



The Crusher



Photograph 20: Crusher – facing north.



Photograph 21: Crusher electrical substation.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 22: Crusher – electrical substation transformer.



Photograph 23: Crusher – flooded basement.



Photograph 24: Crushers conveyors.



Explosives Stores



Photograph 25: Explosives store (near main entrance).



Photograph 26: Explosives store (south-west of 'M' Quarry).



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 27: Explosives store (south-west of 'M' Quarry) - general dumping area.



Photograph 28: Explosives store (south-west of 'M' Quarry) – diesel AST.



APPENDIX F
Photographic Log – Tauranga Bay Quarry PSI



Photograph 29: Explosives store (south-west of 'M' Quarry) – diesel AST.

APPENDIX G

Limited Soil Sampling



1.0 LIMITED SOIL SAMPLING

1.1 Overview

During the walkover of the Quarry site, limited targeted soil sampling was undertaken at areas of interest, based on visual evidence for contamination. The purpose of the limited soil sampling was to utilise time on site to gain a preliminary understanding of the contamination status of selected features of interest which would inform the need for more focused investigation/assessment. The sampled features of interest were:

- Main Entrance:
 - Re-fuelling area;
 - Burning area/dumping ground;
 - Above ground storage tank (AST) footprint.
- Quarry Landfill.

The investigation locations for the limited soil sampling are presented on Figure G1. The rationale for selecting the areas of interest is outlined in Table G1.

Table G1: Areas of interest and associated contaminants of concern.

Area	Rationale	Potential contaminants
Main Entrance Area		
Re-fuelling area	Evidence of three former USTs.	TPH and PAH.
Burning area/dumping ground	Evidence of waste dumping and burning on ground surface.	Metals and SVOCs.
Former AST footprint	Evidence of former diesel tank.	TPH and PAH.
Quarry Landfill	Known waste disposal site.	Metals, thallium, TPH and PAH.

Notes: TPH – total petroleum hydrocarbons. PAH – polycyclic aromatic hydrocarbons. SVOC – semi-volatile organic compounds.

1.2 Methodology

The limited soil sampling was undertaken on 14 and 15 June 2017 using a combination of machine excavated test pits and hand excavation, Figure 3 shows the investigation locations. Test pits were excavated, using a 14 tonne excavator, in areas where the soil was compacted and/or sampling depths greater than 0.5 m (metres) below ground level (bgl) were required. These areas comprised the location of the former AST (Test Pits QU9 and QU10) and the former re-fuelling area (Test Pits QU1 and QU6).

Hand excavation, using a shovel, was used to obtain shallow soil samples, less than 0.5 m bgl, in areas where the soil was not compacted. These areas comprised the waste disposal area (QU2 and QU3) and the burning/dumping area (QU4 and QU5).

During test pitting and hand excavation, the soil profile was logged and evidence of any visual or olfactory contamination was noted. Sampled soils were screened for volatile organic compounds (VOC) using a photo-ionisation detector (PID) and then placed in laboratory prepared sample jars. Nitrile gloves were worn during sampling and sampling equipment was wiped clean between sampling locations. Samples were chilled and transported to the analytical laboratory under chain of custody (CoC) documentation.

Test pits were re-instated with excavated soil which were compacted with the excavator bucket. The test pit and hand excavation logs, together with PID calibration certificates are provided in Appendix H. Copies of the CoC are presented in Appendix I.



1.3 Laboratory Analysis

Soil samples were analysed for contaminants of concern at RJ Hill Laboratories Limited (Hill Laboratories). The contaminants of concern associated with each feature are:

- Re-fuelling area – total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAH).
- Burning area/dumping ground – metals (arsenic, cadmium, chromium, copper, lead, nickel, and zinc) and semi-volatile organic compounds (SVOC).
- AST – TPH and PAH.
- Quarry Landfill – TPH, PAH, metals (including thallium).

1.4 Soil Assessment Criteria

The assessment of risk to human health from contaminated soil is regulated by the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (NES). The NES has established a set of soil contaminant standards (SCS) for 12 priority contaminants which are protective of human health. The SCS apply to specific land use (rural, residential, recreation and commercial/industrial) and contaminant exposure pathways (ingestion, inhalation and dermal contact).

In selecting a land use scenario for applying the SCS, HNZN has advised that the Quarry land use will remain as commercial/industrial. Accordingly, the NES commercial/industrial outdoor worker (unpaved) exposure scenario is considered to be applicable for this assessment.

Where a SCS has not been derived, an applicable standard (soil guideline value (SGV)) for the protection of human health has been selected in accordance with MfE (2011c) Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values.

With respect to the contaminants of concern for this limited soil sampling, there is no SCS for TPH. Therefore the MfE (2011d) Tier 1 acceptance criteria for a commercial/industrial land use and based on sandy soils have been adopted. While the main soil constituent is gravel, Tier 1 criteria are not available for gravel soils, therefore the closest soil type (sand) has been selected.

2.0 INVESTIGATION FINDINGS

2.1 Overview

The findings of the soil sampling and laboratory analysis are discussed separately for each feature of interest. The laboratory data reports are included in Appendix I and the results are summarised, with the adopted assessment criteria in Appendix I.

2.2 Re-fuelling Area

Two test pits (QU1 and QU6) were machine excavated to a maximum depth of 3.5 m bgl to target the base of the former tank pit. Soils encountered comprised compacted sand and gravel (inferred to be crushed limestone). Some black staining of soil was observed at 1.0 m bgl in test pit QU6. Evidence of the former fuel bowser and associated infrastructure was observed in test pit QU1. PID readings (maximum 10.8 ppm) from test pit QU6 were suggestive of potential hydrocarbon impact (PID readings are recorded on the borehole logs in Appendix H).



Groundwater was not encountered in the test pits.

Soil samples collected from test pits QU1 (0.3 m and 1.0 m) and QU6 (0.2 m, 2.0 m and 3.0 m) were analysed for TPH and PAH.

TPH was detected in samples from both test pits, but not at concentrations above adopted MfE (2011d) Tier 1 assessment criteria. In the sample from test pit QU6 at 0.2 m bgl, concentrations of C₁₅-C₃₆ band TPH were detected at 22,000 mg/kg. While there are no applicable human health criteria for C₁₅-C₃₆ band TPH, concentrations exceeding 20,000 mg/kg are likely to be indicative of the presence of residual non-aqueous phase liquids (NAPL) in soil.

Of note is that concentrations of TPH (C₁₅-C₃₆) were significantly higher (22,000 mg/kg at QU6 and 820 mg/kg at QU1) in near surface soils (0.2-0.3 m bgl) than in deeper soils, which is not what would be expected when investigating underground fuel storage. This suggests either some spillage of fuel at surface (possibly when the tanks were removed) or re-burial (in reverse sequence) of contaminated soils from the tank pit.

Concentrations for calculated benzo(a)pyrene equivalent (BaP eq.) were below the NES SCS for commercial/industrial land use.

2.3 Burning Area/Dumping Ground

Two test pits (QU4 and QU5) were excavated by hand to a maximum depth of 0.5 m bgl. Soils encountered comprised compacted sand and gravel (inferred to be crushed limestone). Groundwater was not encountered in the test pits.

One soil sample from test pit QU5 (0.3 m), at the location of previous burning of waste, was analysed for metals and SVOC.

Concentrations of metals/metalloids were above the laboratory limits of reporting (LORs) but below the NES SCS for commercial/industrial land use. Concentrations of SVOCs were below the laboratory LORs.

2.4 Former AST

Two test pits (QU9 and QU10) were machine excavated, in the former AST footprint, to a maximum depth of 0.5 m bgl (both pits were terminated on encountering groundwater). Soils encountered comprised compacted sand and gravel (inferred to be crushed limestone).

One soil sample from test pit QU10 (0.3 m) was analysed for TPH and PAH.

The analytical results for PAH (including BaP eq.) were below the laboratory LORs. Concentrations of TPH (C₁₅-C₃₆) were reported at 330 mg/kg, however, there is no applicable assessment criteria for this TPH band (see Section 2.2).

2.5 Quarry Landfill

Two test pits (QU2 and QU3) were machine excavated to a depth of 0.5 m bgl. Fill material encountered comprised clinker, kiln bricks, hessian sacks, plastic, ball bearings, silicon waste, coal, and concrete test blocks in a sandy matrix. Groundwater was not encountered in the test pits.

Soil samples collected from test pits QU2 (0.5 m) and QU3 (0.5 m) were analysed for metals (including thallium), TPH and PAH.



Concentrations of metals/metalloids were above the laboratory LORs but were below the NES SCS for commercial/industrial land use. Thallium was reported at concentrations of 3.1 mg/kg and 2.0 mg/kg in test pits QU2 and QU3 respectively, which is below the adopted guideline value of 12 mg/kg (USEPA 2016).

Concentrations for individual PAH compounds in both samples were reported above the laboratory LORs. However, the calculated BaP eq. was below the NES SCS for commercial/industrial land use.

Concentrations of TPH (C₇-C₉) were identified at 210 mg/kg, which is above the adopted MfE (2011d) Tier 1 assessment criteria of 120 mg/kg.

2.6 Quality Assurance

One quality control sample (QAQC2) was collected from test pit QU2 at 0.5 m bgl. The results of the quality control sample analysis have been compared to the primary sample analysis from test pit QU2 (0.5 m) and the relative percentage difference (RPD) calculated (Appendix J). The calculations show that 74 % of the analytes tested meet the <50% RPD quality objective. The non-conformances (TPH and selected PAH compounds) were likely a consequence of the heterogeneity of the sampled soil between the primary and duplicate samples. In each case, the reported TPH and PAH concentrations in the quality control sample did not exceed the guideline values and they are not considered to be significant with respect to the interpretation of the results.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

During the site walkover, which formed part of the PSI for the Quarry, limited soil sampling was undertaken at selected features of interest where evidence for possible contamination was observed. The soil sampling analysis results have identified contaminants of concern at the following features of interest:

- Main Entrance:
 - Re-fuelling area (TPH)
- Quarry Landfill (TPH).

While the analytical results for the re-fuelling area did not exceed the MfE (2011d) Tier 1 assessment criteria (commercial/industrial land use), they are suggestive of the presence of NAPL in the soil and thus wider contamination in that area, as supported by observations of soil condition during the sampling.

The analytical results for the Quarry Landfill identified concentrations of TPH (C₇-C₉) above the adopted MfE (2011d) Tier 1 assessment criteria for protection of human health.

3.2 Recommendations

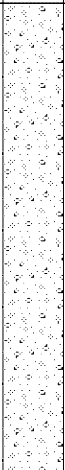
Based on the findings of the limited soil sampling, the following further investigation/assessment is recommended:

- Further investigation and delineation of soil contamination in the vicinity of the re-fuelling area.
- Investigation of potential hydrocarbon impacts on groundwater from the re-fuelling area.
- Further investigation of the Quarry Landfill to establish the extent of the area, the degree of contamination, and the potential impacts on groundwater quality.

APPENDIX H

Test Pit Logs

CLIENT: Holcim (NZ) Limited	COORDS: 1473137 mE 5375442 mN	CONTRACTOR: GP Contracting
PROJECT: Holcim Quarry PSI	SURFACE RL: 40 m DATUM: MSL	MACHINE: Volvo EC140
LOCATION: Limestone Quarry, Cape Foulwind	TEST DEPTH: 0.50 m	RECORDED: J Grinsted DATE: 15/06/2017
JOB NO.: 1779210		CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Sandy fine to coarse GRAVEL with minor cobbles and trace boulders; grey. Moist, well graded, subangular to subrounded; sand, fine to coarse; cobbles and boulders, subangular; limestone.	GW	M		Groundwater not encountered	0.5	D Sample: 0.30m Description: QU10_0.3 PID = 0.2 ppm	

End of hole at: 0.5 m



Remarks: Terminated due to water ingress.

Termination: Other - see notes.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473147 mE 5375440 mN

CONTRACTOR: GP Contracting

PROJECT: Holcim Quarry PSI

SURFACE RL: 40 m DATUM: MSL

MACHINE: Volco EC140

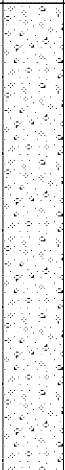
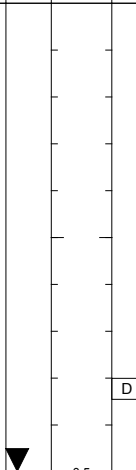
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 0.50 m

RECORDED: J Grinsted DATE: 15/06/2017

JOB NO.: 1779210

CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Sandy fine to coarse GRAVEL with minor cobbles and trace boulders; grey. Moist, well graded, subangular to subrounded; sand, fine to coarse; cobbles and boulders, subangular; limestone.	GW	M				Sample: 0.40m Description: QU9_0.4 PID = 0.1 ppm	

End of hole at: 0.5 m



Remarks: Terminated due to water ingress.

Termination: Other - see notes.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473106 mE 5375385 mN

CONTRACTOR: Golder Associates

PROJECT: Holcim Quarry PSI

SURFACE RL: 40 m DATUM: MSL

MACHINE: Hand Excavation

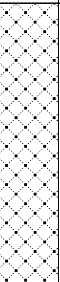
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 0.30 m

RECORDED: J Grinsted DATE: 15/07/2017

JOB NO.: 1779210

CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Sandy fine to coarse GRAVEL; grey brown. Moist, well graded; subangular to angular; sand, fine to coarse (FILL).	GW	M		Groundwater not encountered			

End of hole at: 0.3 m

D

 Sample: 0.30m
 Description: QU8_0.3
 PID = 0.2 ppm


Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473125 mE 5375422 mN

CONTRACTOR: GP Contracting

PROJECT: Holcim Quarry PSI

SURFACE RL: 39 m DATUM: MSL

MACHINE: Volvo EC140

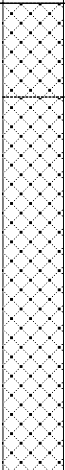
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 0.50 m

RECORDED: J Grinsted DATE: 15/06/2017

JOB NO.: 1779210

CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Gravelly fine to coarse SAND; grey. Moist, well graded; gravel, fine to coarse; subangular to subrounded (FILL). Becoming brown.	SW	M		Groundwater not encountered	0.5	D Sample: 0.40m Description: QU7_0.4 PID = 0.1 ppm	
		End of hole at: 0.5 m							

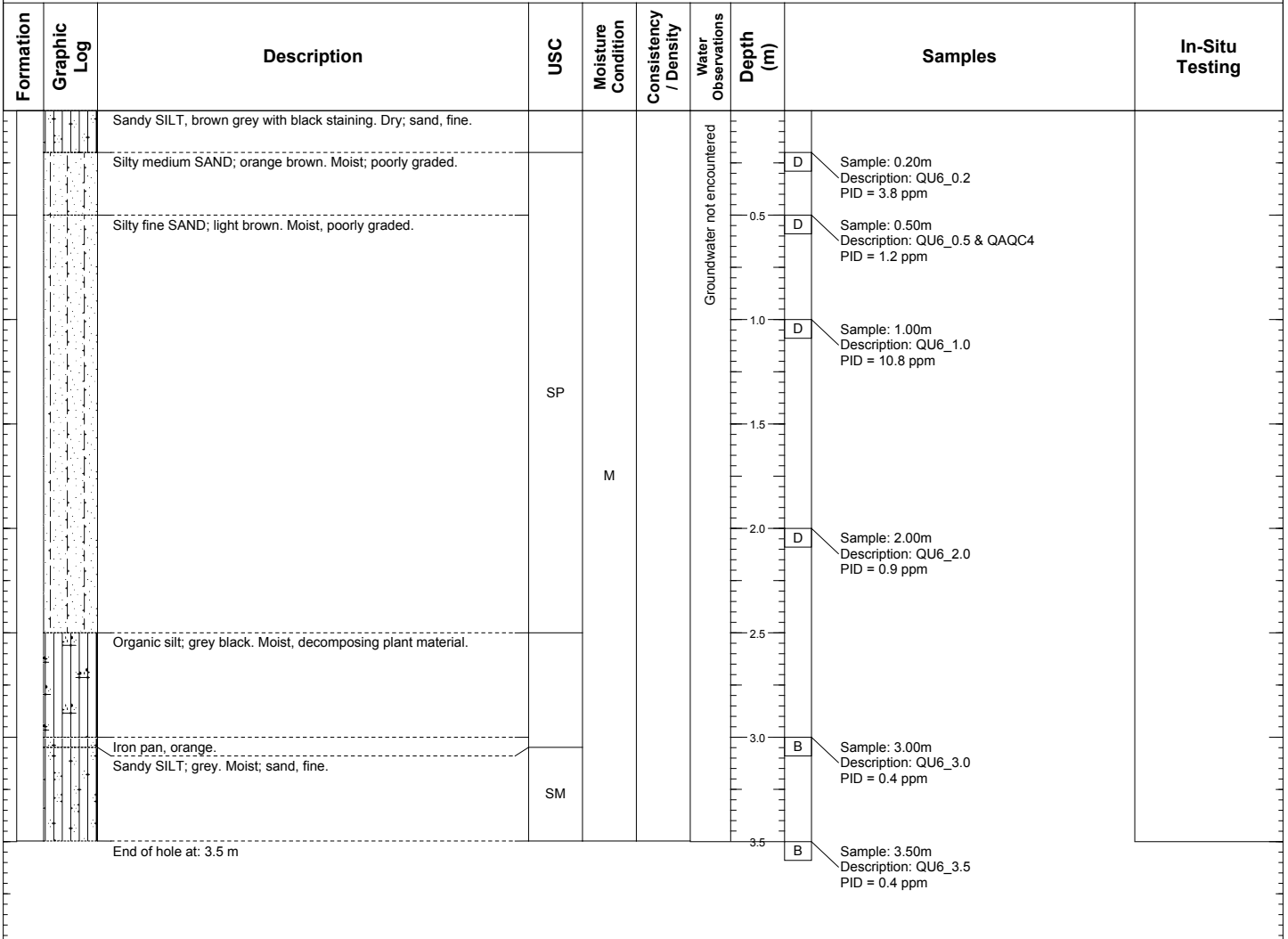


Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited	COORDS: 1473103 mE	5375466 mN	CONTRACTOR: GP Contracting
PROJECT: Holcim Quarry PSI	SURFACE RL: 40 m	DATUM: MSL	MACHINE: Volvo EC140
LOCATION: Limestone Quarry, Cape Foulwind	TEST DEPTH: 3.50 m		RECORDED: J Grinsted DATE: 15/06/2017
JOB NO.: 1779210			CHECKED: - DATE: -


Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473153 mE 5375412 mN

CONTRACTOR: Golder Associates

PROJECT: Holcim Quarry PSI

SURFACE RL: 39 m DATUM: MSL

MACHINE: Hand Excavation

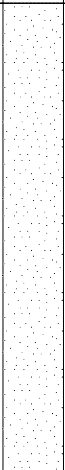
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 0.50 m

RECORDED: J Grinsted DATE: 15/06/2017

JOB NO.: 1779210

CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Silty fine sand; orange brown with white specs. Moist; poorly graded.	SM	M		Groundwater not encountered	0.5	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> D Sample: 0.30m Description: QU5_0.3 PID = 0.2 ppm </div>	

End of hole at: 0.5 m



Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473136 mE 5375408 mN

CONTRACTOR: Golder Associates

PROJECT: Holcim Quarry PSI

SURFACE RL: 39 m DATUM: MSL

MACHINE: Hand Excavation

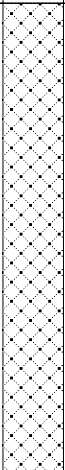
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 0.50 m

RECORDED: J Grinsted DATE: 15/06/2017

JOB NO.: 1779210

CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Sandy fine to coarse GRAVEL; grey brown. Moist; well graded; subangular to subrounded; limestone; sand, fine to coarse (FILL).	GW	M		Groundwater not encountered	0.5	D Sample: 0.20m Description: QU4_0.2 PID = 0.3 ppm	

End of hole at: 0.5 m



Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited	COORDS: 1472572 mE	5375170 mN	CONTRACTOR: Golder Associates
PROJECT: Holcim Quarry PSI	SURFACE RL: 40 m	DATUM: MSL	MACHINE: Hand Excavation
LOCATION: Limestone Quarry, Cape Foulwind	TEST DEPTH: 0.50 m		RECORDED: J Grinsted DATE: 15/06/2017
JOB NO.: 1779210			CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Gravelly fine to coarse SAND with cobbles; grey. Moist; well graded; gravel, fine to coarse; subangular to subrounded; cobbles, subangular to subrounded; clinker; bricks and wood fragments within (FILL).	SW	M		Groundwater not encountered	0.5		

End of hole at: 0.5 m

D

 Sample: 0.50m
 Description: QU3_0.5

Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited	COORDS: 1472619 mE	5375167 mN	CONTRACTOR: Golder Associates
PROJECT: Holcim Quarry PSI	SURFACE RL: 40 m	DATUM: MSL	MACHINE: Hand Excavation
LOCATION: Limestone Quarry, Cape Foulwind	TEST DEPTH: 0.50 m		RECORDED: J Grinsted DATE: 15/06/2017
JOB NO.: 1779210			CHECKED: - DATE: -

Formation	Graphic Log	Description	USC	Moisture Condition	Consistency / Density	Water Observations	Depth (m)	Samples	In-Situ Testing
		Fine to coarse SAND with some gravel, trace cobbles and trace boulders; blackish brown. Moist; well graded; gravel, fine to coarse; subangular to subrounded; cobbles and boulders, subangular; plastic, ball bearings, silicon waste, coal, bricks and plastic wrap within (FILL).	SW			Groundwater not encountered	0.5		

End of hole at: 0.5 m

Sample: 0.50m
Description: QU2_0.5 & QAQC2
PID = 0 ppm



Remarks:

Termination: Target depth.

Notes:
Coordinates and elevation are estimates only.

CLIENT: Holcim (NZ) Limited

COORDS: 1473101 mE 5375456 mN

CONTRACTOR: GP Contracting

PROJECT: Holcim Quarry PSI

SURFACE RL: 40 m DATUM: MSL

MACHINE: Volvo EC140

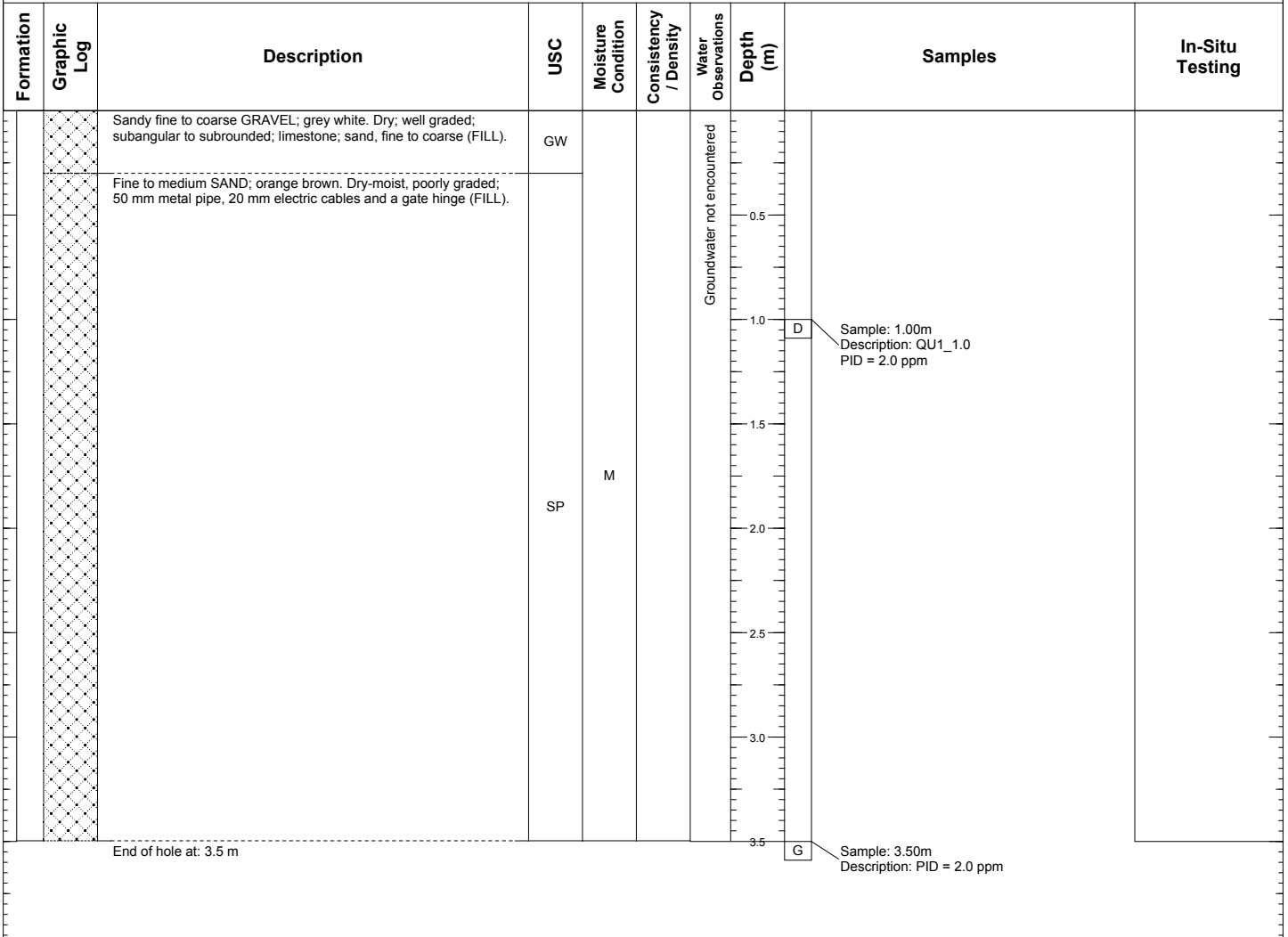
LOCATION: Limestone Quarry, Cape Foulwind

TEST DEPTH: 3.50 m

RECORDED: J Grinsted DATE: 14/06/2017

JOB NO.: 1779210

CHECKED: - DATE: -


Remarks:

Termination: Target depth.

Notes:
 Coordinates and elevation are estimates only.

APPENDIX I

**Chain of Custody Documentation
and Laboratory Analytical Results**



File Copy

**CALIBRATION CERTIFICATE FOR
PHOTO IONIZATION DETECTOR (PID)**

MAKE: MINIRAE 3000 PROJECT NO: 1779210
MODEL: _____
SERIAL NO.: 592-911248
Iso-Butylene: 100 Zero: 0 Clean Air
Iso-Butylene Cylinder No: 18102939 Certificate No: 33865976700

The above detector was calibrated in accordance with the manufacturers specifications.

SIGNED: [Signature]

DATE: 15/6/17

This PID does not distinguish between individual chemicals. The reading displayed represents the total concentration of all ionizable chemicals in the sample. The Thermo Environmental Instruments, 580 EZ --Organic Vapour Metre is equipped with a 10.6 eV lamp. Relative response data, from which approximations can be made for concentrations of specific pure chemicals, are provided in the User's Manual.

[Handwritten mark]



ANALYSIS REPORT

Client:	Golder Associates (NZ) Limited	Lab No:	1793996	SPv3
Contact:	Cara Di Vitto C/- Golder Associates (NZ) Limited PO Box 2281 Christchurch Mail Centre Christchurch 8140	Date Received:	17-Jun-2017	
		Date Reported:	04-Jul-2017	
		Quote No:	85739	
		Order No:		
		Client Reference:	HOLCIM_Quarry	
		Submitted By:	Jack Grinsted	

Sample Type: Soil						
Sample Name:	20170614_QU1_0	20170614_QU1_1	20170615_QU2_0	20170615_QU3_0	QAQC2	
	.3 14-Jun-2017 4:45 pm	.0 14-Jun-2017 4:00 pm	.5 15-Jun-2017 9:00 am	.5 15-Jun-2017 9:20 am	15-Jun-2017	
Lab Number:	1793996.1	1793996.2	1793996.4	1793996.5	1793996.7	
Individual Tests						
Dry Matter	g/100g as rcvd	91	88	73	79	77
Total Recoverable Thallium	mg/kg dry wt	-	-	3.1	2.0	3.1
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	-	-	10	9	8
Total Recoverable Cadmium	mg/kg dry wt	-	-	0.43	0.36	0.49
Total Recoverable Chromium	mg/kg dry wt	-	-	36	41	31
Total Recoverable Copper	mg/kg dry wt	-	-	6	8	7
Total Recoverable Lead	mg/kg dry wt	-	-	13.6	13.8	14.2
Total Recoverable Nickel	mg/kg dry wt	-	-	7	10	8
Total Recoverable Zinc	mg/kg dry wt	-	-	72	42	77
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	0.62	0.89	0.88
2-Methylnaphthalene	mg/kg dry wt	< 0.011	< 0.011	0.66	1.15	0.97
Perylene*	mg/kg dry wt	< 0.011	< 0.011	0.049	0.029	0.062
Acenaphthylene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	< 0.013	< 0.013
Acenaphthene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	< 0.013	< 0.013
Anthracene	mg/kg dry wt	< 0.011	< 0.011	0.046	0.060	0.138
Benzo[a]anthracene	mg/kg dry wt	< 0.011	< 0.011	0.035	0.035	0.049
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.011	< 0.011	0.014	0.015	0.018
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	0.017	0.020
Benzo[e]pyrene	mg/kg dry wt	< 0.011	< 0.011	0.023	0.028	0.043
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.011	< 0.011	0.27	0.39	0.85
Benzo[k]fluoranthene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	< 0.013	< 0.013
Chrysene	mg/kg dry wt	< 0.011	< 0.011	0.041	0.049	0.060
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	< 0.013	< 0.013
Fluoranthene	mg/kg dry wt	0.017	0.013	0.046	0.037	0.052
Fluorene	mg/kg dry wt	< 0.011	< 0.011	0.032	0.029	0.042
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.011	< 0.011	< 0.014	0.017	0.034
Naphthalene	mg/kg dry wt	< 0.06	< 0.06	0.37	0.39	0.49
Phenanthrene	mg/kg dry wt	< 0.011	< 0.011	0.45	0.55	0.59
Pyrene	mg/kg dry wt	0.025	0.046	0.094	0.104	0.158
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 8	< 8	37	210	86
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	25	20
C15 - C36	mg/kg dry wt	820	93	167	260	400
Total hydrocarbons (C7 - C36)	mg/kg dry wt	820	93	200	500	500



Sample Type: Soil						
Sample Name:	20170615_QU5_0 .3 15-Jun-2017 10:00 am	20170615_QU6_2 .0 15-Jun-2017	20170615_QU6_3 .0 15-Jun-2017	20170615_QU6_0 .2 15-Jun-2017	QU10_0.3 15-Jun-2017 11:45 am	
Lab Number:	1793996.8	1793996.12	1793996.13	1793996.16	1793996.18	
Individual Tests						
Dry Matter	g/100g as rcvd	81	83	78	88	85
3 & 4-Methylphenol (m- + p-cresol)	mg/kg dry wt	< 0.4	-	-	-	-
Heavy Metals, Screen Level						
Total Recoverable Arsenic	mg/kg dry wt	6	-	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.18	-	-	-	-
Total Recoverable Chromium	mg/kg dry wt	12	-	-	-	-
Total Recoverable Copper	mg/kg dry wt	2	-	-	-	-
Total Recoverable Lead	mg/kg dry wt	4.3	-	-	-	-
Total Recoverable Nickel	mg/kg dry wt	9	-	-	-	-
Total Recoverable Zinc	mg/kg dry wt	15	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
2-Methylnaphthalene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Perylene*	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Acenaphthylene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Acenaphthene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Anthracene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[a]anthracene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[e]pyrene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Chrysene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Fluoranthene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Fluorene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Naphthalene	mg/kg dry wt	-	< 0.06	< 0.07	< 0.06	< 0.06
Phenanthrene	mg/kg dry wt	-	< 0.012	< 0.013	< 0.011	< 0.012
Pyrene	mg/kg dry wt	-	< 0.012	< 0.013	0.069	< 0.012
Haloethers Trace in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.10	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.10	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.10	-	-	-	-
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.10	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.10	-	-	-	-
Nitrogen containing compounds Trace in SVOC Soil Samples, GC-MS						
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.14	-	-	-	-
2,4-Dinitrotoluene	mg/kg dry wt	< 0.2	-	-	-	-
2,6-Dinitrotoluene	mg/kg dry wt	< 0.2	-	-	-	-
Nitrobenzene	mg/kg dry wt	< 0.10	-	-	-	-
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.14	-	-	-	-
Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.10	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.10	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.10	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.10	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.10	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.10	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.10	-	-	-	-

Sample Type: Soil

Sample Name:	20170615_QU5_0 .3 15-Jun-2017 10:00 am	20170615_QU6_2 .0 15-Jun-2017	20170615_QU6_3 .0 15-Jun-2017	20170615_QU6_0 .2 15-Jun-2017	QU10_0.3 15-Jun-2017 11:45 am
Lab Number:	1793996.8	1793996.12	1793996.13	1793996.16	1793996.18

Organochlorine Pesticides Trace in SVOC Soil Samples by GC-MS

4,4'-DDT	mg/kg dry wt	< 0.2	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.10	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.2	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.5	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.2	-	-	-	-
Endrin	mg/kg dry wt	< 0.14	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.2	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.10	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.10	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.10	-	-	-	-

Polycyclic Aromatic Hydrocarbons Trace in SVOC Soil Samples

Acenaphthene	mg/kg dry wt	< 0.10	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.10	-	-	-	-
Anthracene	mg/kg dry wt	< 0.10	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.10	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.10	-	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.10	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.10	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.10	-	-	-	-
1&2-Chloronaphthalene	mg/kg dry wt	< 0.10	-	-	-	-
Chrysene	mg/kg dry wt	< 0.10	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.10	-	-	-	-
Fluoranthene	mg/kg dry wt	< 0.10	-	-	-	-
Fluorene	mg/kg dry wt	< 0.10	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.10	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.10	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.10	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.10	-	-	-	-
Pyrene	mg/kg dry wt	< 0.10	-	-	-	-

Phenols Trace in SVOC Soil Samples by GC-MS

2-Chlorophenol	mg/kg dry wt	< 0.2	-	-	-	-
2,4-Dichlorophenol	mg/kg dry wt	< 0.2	-	-	-	-
2,4-Dimethylphenol	mg/kg dry wt	< 0.4	-	-	-	-
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg dry wt	< 0.4	-	-	-	-
Pentachlorophenol (PCP)	mg/kg dry wt	< 6	-	-	-	-
Phenol	mg/kg dry wt	< 0.2	-	-	-	-
2,4,5-Trichlorophenol	mg/kg dry wt	< 0.2	-	-	-	-
2,4,6-Trichlorophenol	mg/kg dry wt	< 0.2	-	-	-	-

Plasticisers Trace in SVOC Soil Samples by GC-MS

Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 0.5	-	-	-	-
Butylbenzylphthalate	mg/kg dry wt	< 0.2	-	-	-	-
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 0.2	-	-	-	-
Diethylphthalate	mg/kg dry wt	< 0.2	-	-	-	-
Dimethylphthalate	mg/kg dry wt	< 0.2	-	-	-	-
Di-n-butylphthalate	mg/kg dry wt	< 0.2	-	-	-	-
Di-n-octylphthalate	mg/kg dry wt	< 0.2	-	-	-	-

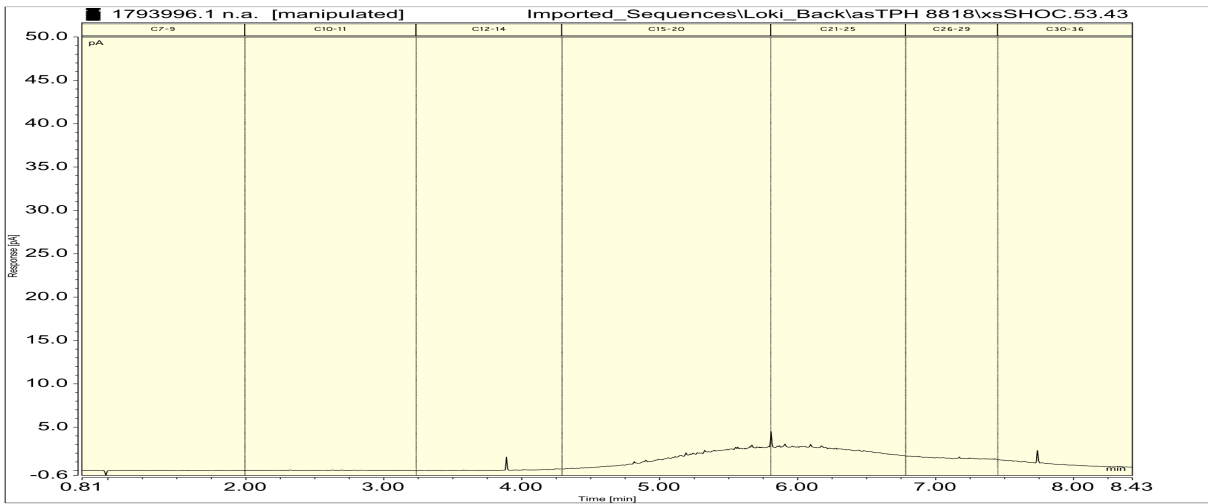
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS

1,2-Dichlorobenzene	mg/kg dry wt	< 0.14	-	-	-	-
1,3-Dichlorobenzene	mg/kg dry wt	< 0.14	-	-	-	-
1,4-Dichlorobenzene	mg/kg dry wt	< 0.14	-	-	-	-
Hexachlorobutadiene	mg/kg dry wt	< 0.14	-	-	-	-
Hexachloroethane	mg/kg dry wt	< 0.14	-	-	-	-

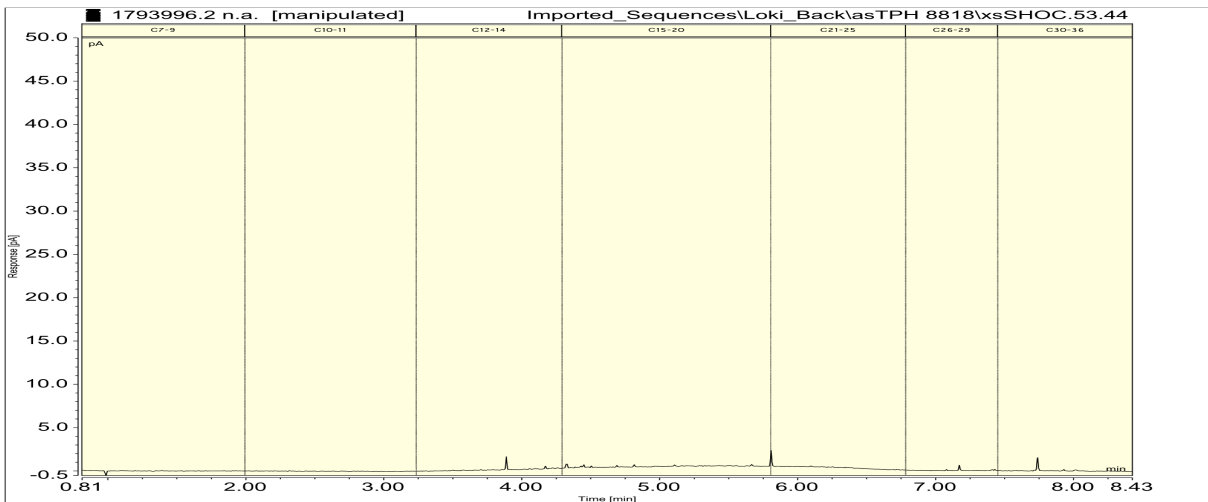
Sample Type: Soil

Sample Name:	20170615_QU5_0 .3 15-Jun-2017 10:00 am	20170615_QU6_2 .0 15-Jun-2017	20170615_QU6_3 .0 15-Jun-2017	20170615_QU6_0 .2 15-Jun-2017	QU10_0.3 15-Jun-2017 11:45 am
Lab Number:	1793996.8	1793996.12	1793996.13	1793996.16	1793996.18
Other Halogenated compounds Trace in SVOC Soil Samples by GC-MS					
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.10	-	-	-
Other SVOC Trace in SVOC Soil Samples by GC-MS					
Benzyl alcohol	mg/kg dry wt	< 1.0	-	-	-
Carbazole	mg/kg dry wt	< 0.10	-	-	-
Dibenzofuran	mg/kg dry wt	< 0.10	-	-	-
Isophorone	mg/kg dry wt	< 0.10	-	-	-
Total Petroleum Hydrocarbons in Soil					
C7 - C9	mg/kg dry wt	-	< 8	< 8	< 8
C10 - C14	mg/kg dry wt	-	< 20	< 20	103
C15 - C36	mg/kg dry wt	-	< 40	73	22,000
Total hydrocarbons (C7 - C36)	mg/kg dry wt	-	< 70	73	22,000

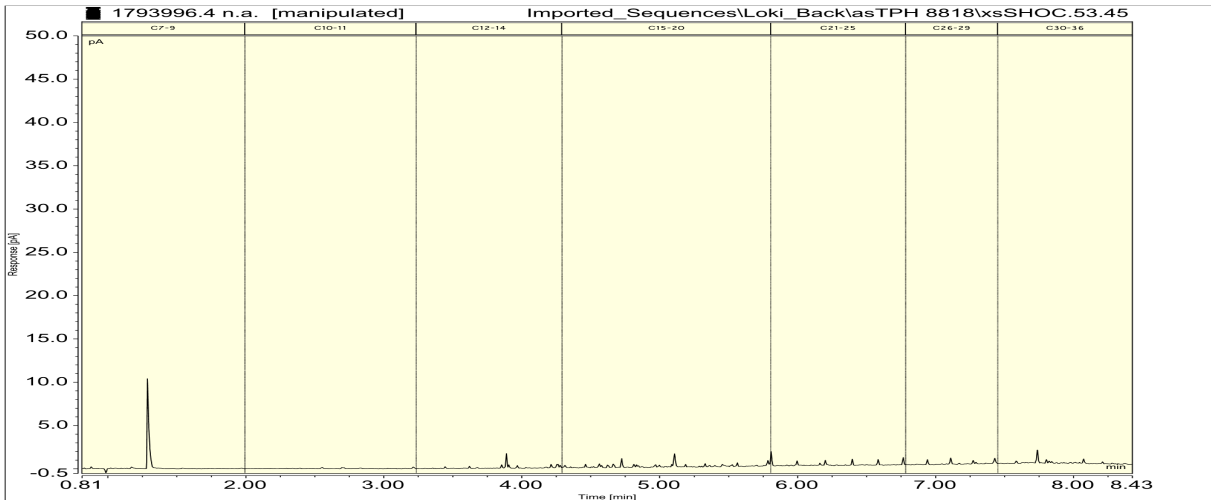
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20170614_QU1_0.3 14-Jun-2017 4:45 pm
Client Chromatogram for TPH by FID



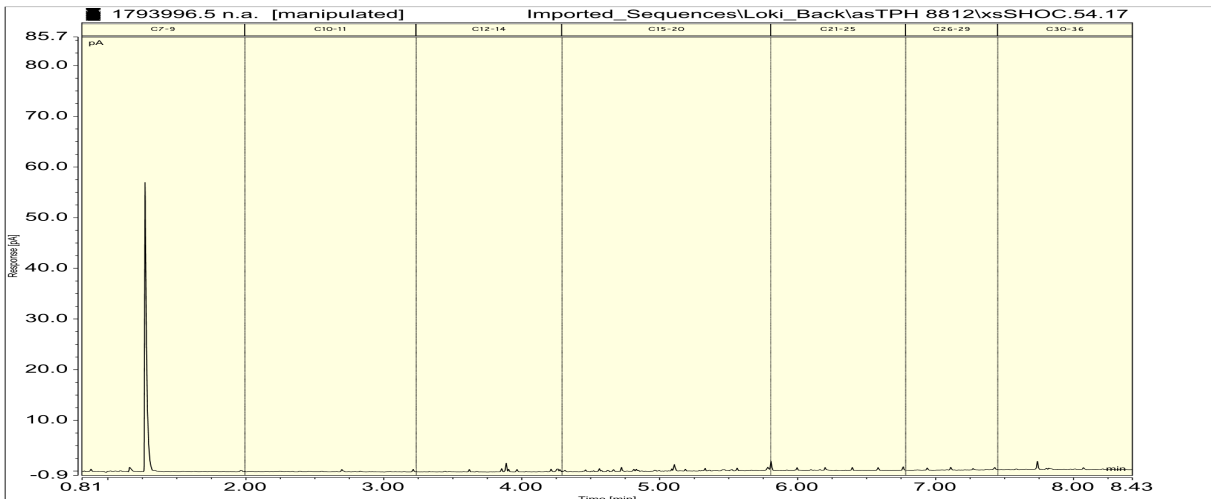
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Client Chromatogram for TPH by FID



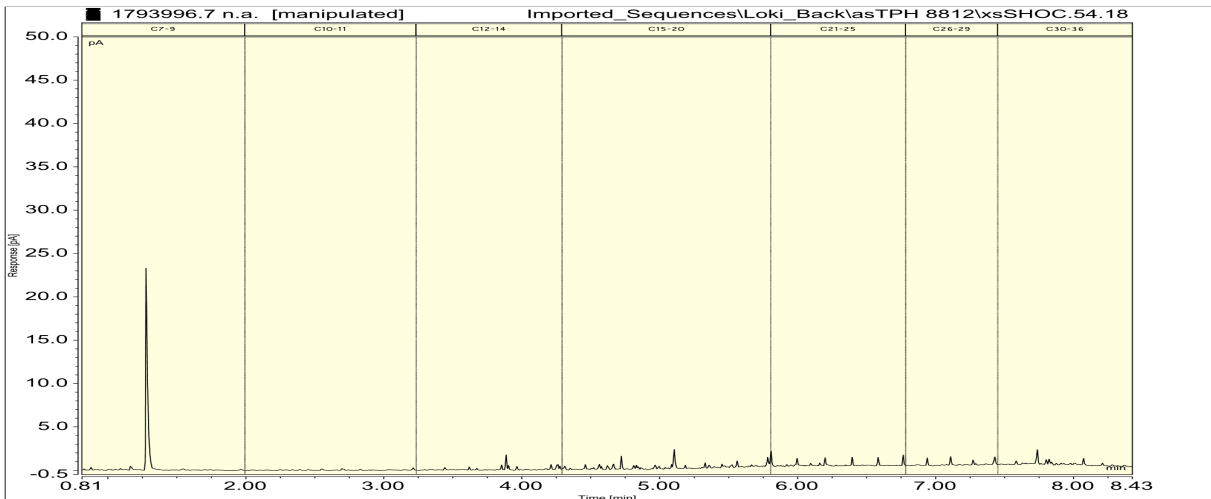
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20170615_QU2_0.5 15-Jun-2017 9:00 am
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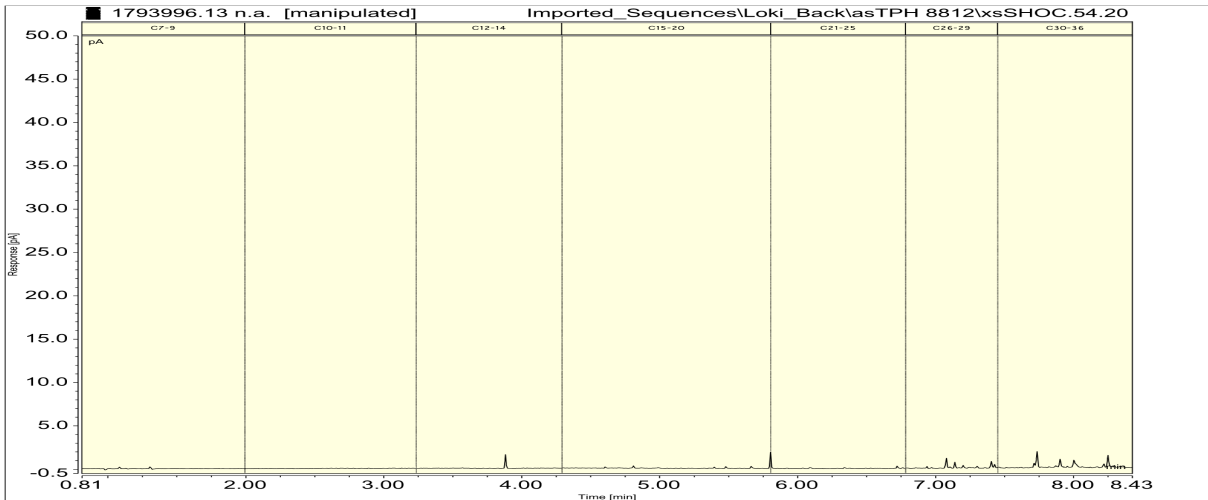
1793996.5
20170615_QU3_0.5 15-Jun-2017 9:20 am
Client Chromatogram for TPH by FID



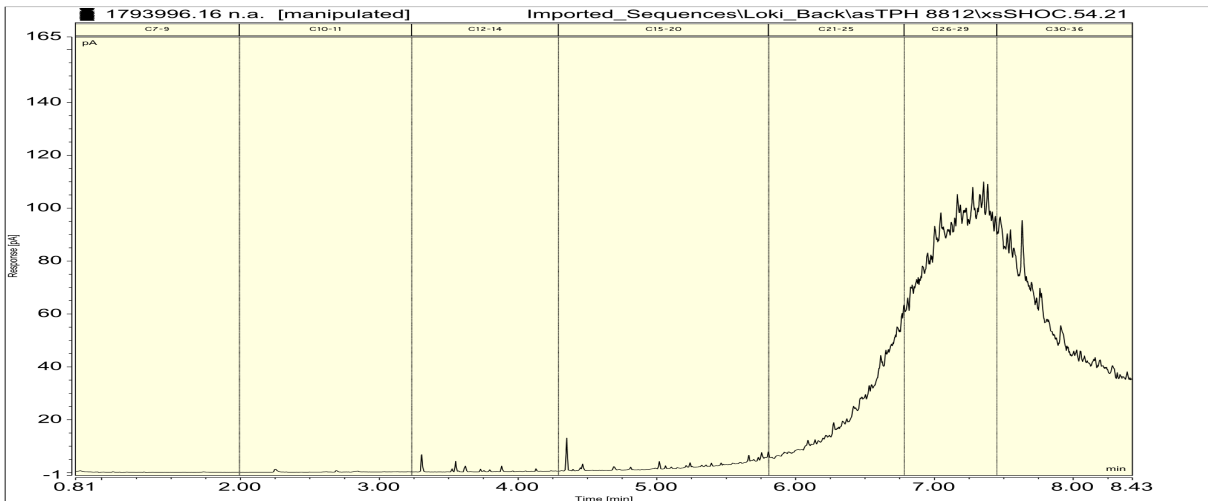
1793996.7
QAQC2 15-Jun-2017
Client Chromatogram for TPH by FID



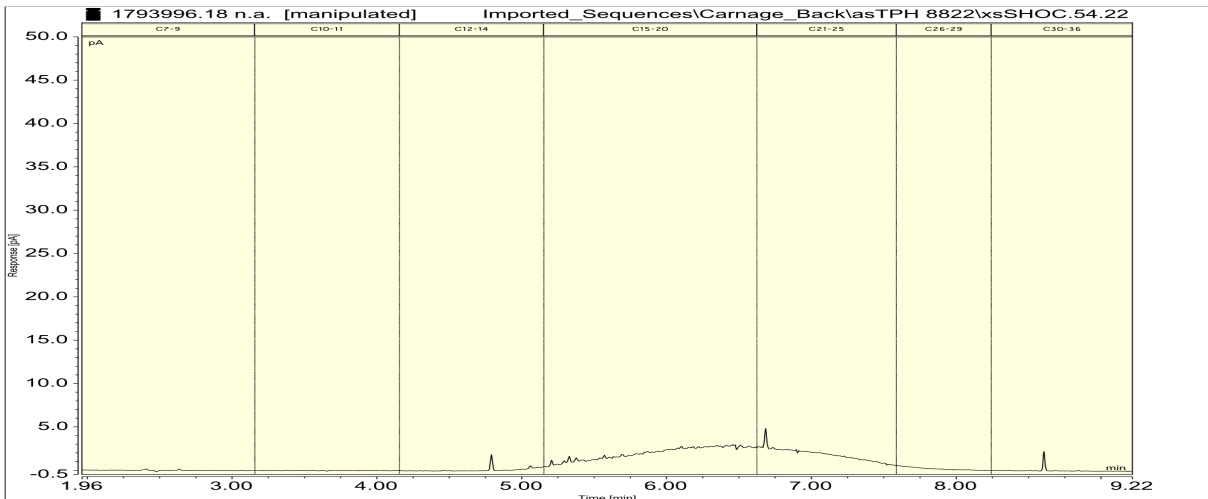
1793996.13
20170615_QU6_3.0 15-Jun-2017
Client Chromatogram for TPH by FID



1793996.16
20170615_QU6_0.2 15-Jun-2017
Client Chromatogram for TPH by FID



1793996.18
QU10_0.3 15-Jun-2017 11:45 am
Client Chromatogram for TPH by FID



Analyst's Comments

Please note that the result for 4-Chlorophenyl phenyl ether could not be reported for sample 1793996.8 due to a low spike recovery.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	0.010 - 60 mg/kg dry wt	1-2, 4-5, 7, 12-13, 16, 18
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	4-5, 7-8
Semivolatile Organic Compounds Trace in Soil by GC-MS	Sonication extraction, GPC cleanup, GC-MS FS analysis. Tested on as received sample	0.10 - 6 mg/kg dry wt	8
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2, 4-5, 7-8, 12-13, 16, 18
Total Recoverable Thallium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.2 mg/kg dry wt	4-5, 7
1-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	1-2, 4-5, 7, 12-13, 16, 18
2-Methylnaphthalene	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	1-2, 4-5, 7, 12-13, 16, 18
3 & 4-Methylphenol (m- + p-cresol)	Sonication extraction, GPC cleanup, GC-MS FS analysis. US EPA 3540, 3550, 3640 & 8270.	0.4 mg/kg dry wt	8
Perylene*	Sonication extraction, SPE cleanup, GC-MS SIM analysis. Modified US EPA 8270.	0.010 mg/kg dry wt	1-2, 4-5, 7, 12-13, 16, 18

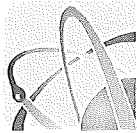
These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This report must not be reproduced, except in full, without the written consent of the signatory.



Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 85739

Primary Contact Cara Di Vitto 229245

Submitted By Cara Di Vitto 229245

Client Name Golder Associates (NZ) Limited 25933

Address PO Box 2281, Christchurch Mail Centre

Christchurch 8140

Phone 03 377 5696 Mobile

Email

Charge To Golder Associates (NZ) Limited 106807

Client Reference HOLCIM - QUARRY

Order No

Results To Reports will be emailed to Primary Contact by default. Additional Reports will be sent as specified below.

- Email Primary Contact Email Submitter Email Client
- Email Other _____
- Other _____

ADDITIONAL INFORMATION

* SAMPLE IN ZIPLOCK BAG (PLEASE TRANSFER TO GLASS ASAP)

Quoted Sample Types

Soil (Soil), Ground Water (GW)

ANALYSIS REQUEST

R J Hill Laboratories Limited Job No: Date Recv: 17-Jun-17 07:45
 1 Clyde Street Hamilton 3216
 Private Bag 3205
 Hamilton 3240 New Zealand

179 3996

Received by: Connor Haisley Bossa

T +64 7 858 2000

E mail@hill-labs.co.nz

W www.hill-laboratories.com



3117939969

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories Date & Time: 15/6/17

Name: J GRINSTED
 Signature: *[Signature]*

Tick if you require COC to be emailed back

Received at Hill Laboratories Date & Time:

Name:

Signature:

Condition Temp:

Room Temp Chilled Frozen

Sample & Analysis details checked
 Signature:

Priority Low Normal High

Urgent (ASAP, extra charge applies, please contact lab first)
 NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 6 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date: _____

No. Sample Name Sample Date/Time Sample Type Tests Required

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	20170615 - Q01_0.3	14/6/17		TO BE SCHEDULED
2	" Q01_1.0	"		
3	" Q01_3.5	"		
4	20170615 - Q02_0.5	15/6/17		
5	" - Q03_0.5			
6	" - Q04_0.2			
7	QAQC 2			
8	20170615 - Q05_0.3			
9	" Q07_0.4*			
10				



Hill Laboratories

TRIED, TESTED AND TRUSTED

Quote No 85739

Primary Contact Cara Di Vitto 229245

Submitted By Cara Di Vitto 229245

Client Name Golder Associates (NZ) Limited 25933

Address PO Box 2281, Christchurch Mail Centre
Christchurch 8140

Phone 03 377 5696 Mobile

Email

Charge To Golder Associates (NZ) Limited 106807

Client Reference HOLCIM QUARRY

Order No

Results To Reports will be emailed to Primary Contact by default.
Additional Reports will be sent as specified below.

- Email Primary Contact Email Submitter Email Client
 Email Other
 Other

ADDITIONAL INFORMATION

* - ZIP LOCK BAG USED FOR SAMPLE - PLEASE TRANSFER TO GLASS ASAP. (HYDRO CARBON TESTS REQUIRED)

Quoted Sample Types

Soil (Soil), Ground Water (GW)

ANALYSIS REQUEST

R J Hill Laboratories Limited
1 Clyde Street Hamilton 3216
Private Bag 3205
Hamilton 3240 New Zealand

Job No: Date Recv: 17-Jun-17 07:45

179 3996

T 0508 HILL LAB (44 555 2200)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com



3117939969

Received by: Connor Haisley Bossa

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 15/6/17

Name: J GRINSTED

Tick if you require COC to be emailed back

Signature:

Received at Hill Laboratories

Date & Time: 20/6/17 14:20

Name: Connor Haisley

Signature: Connor Haisley

Condition

Temp:

- Room Temp Chilled Frozen

19.7°C

Sample & Analysis details checked

Signature:

Priority Low Normal High

Urgent (ASAP, extra charge applies, please contact lab first)

NOTE: The estimated turnaround time for the types and number of samples and analyses specified on this quote is by 4:30 pm, 6 working days following the day of receipt of the samples at the laboratory.

Requested Reporting Date:

No.	Sample Name	Sample Date/Time	Sample Type	Tests Required
1	20170615_Q06_0.3	15/6	SOIL	TO BE SCHEDULED
2	Q06_0.5			
3	Q06_1.0			
4	Q06_2.0			
5	Q06_3.0*			
6	Q06_3.5*			
7	QAQCL4			
8				
9				
10				



Job Information Summary

Page 1 of 1

Client:	Golder Associates (NZ) Limited	Lab No:	1793996
Contact:	Cara Di Vitto	Date Registered:	20-Jun-2017 2:20 pm
	C/- Golder Associates (NZ) Limited	Priority:	High
	PO Box 2281	Quote No:	85739
	Christchurch Mail Centre	Order No:	
	Christchurch 8140	Client Reference:	HOLCIM_Quarry
		Add. Client Ref:	
		Submitted By:	Jack Grinsted
		Charge To:	Golder Associates (NZ) Limited
		Target Date:	21-Jun-2017 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	20170614_QU1_0.3 14-Jun-2017 4:45 pm	Soil	GSoil300	Hold Cold
2	20170614_QU1_1.0 14-Jun-2017 4:00 pm	Soil	GSoil300	Hold Cold
3	20170614_QU1_3.5 14-Jun-2017 4:30 pm	Soil	GSoil300	Hold Cold
4	20170615_QU2_0.5 15-Jun-2017 9:00 am	Soil	PSoil250	Hold Cold
5	20170615_QU3_0.5 15-Jun-2017 9:20 am	Soil	PSoil250	Hold Cold
6	20170615_QU4_0.2 15-Jun-2017 9:50 am	Soil	PSoil250	Hold Cold
7	QAQC2 15-Jun-2017	Soil	PSoil250	Hold Cold
8	20170615_QU5_0.3 15-Jun-2017 10:00 am	Soil	PSoil250	Hold Cold
9	20170615_QU7_0.4 15-Jun-2017	Soil	GSoil300, GSoil300	Hold Cold
10	20170615_QU6_0.5 15-Jun-2017	Soil	GSoil300	Hold Cold
11	20170615_QU6_1.0 15-Jun-2017	Soil	GSoil300	Hold Cold
12	20170615_QU6_2.0 15-Jun-2017	Soil	GSoil300	Hold Cold
13	20170615_QU6_3.0 15-Jun-2017	Soil	GSoil300, GSoil300, GSoil300	Hold Cold
14	20170615_QU6_3.5 15-Jun-2017	Soil	GSoil300, GSoil300	Hold Cold
15	QAQC4 15-Jun-2017	Soil	GSoil300	Hold Cold
16	20170615_QU6_0.2 15-Jun-2017	Soil	GSoil300	
17	QU9_0.5 15-Jun-2017 12:00 pm	Soil	GSoil300	
18	QU10_0.3 15-Jun-2017 11:45 am	Soil	GSoil300	

APPENDIX J

Quality Assurance



Table J1 - Quarry PSI Results

Sample ID	QU2_0.5	QAQC2	RPD
Laboratory Code	1793996.4	1793996.7	
Area	Quarry Landfill	Quarry Landfill	
QA/QC Acceptance Criteria			<50

LOR Unit

Other		LOR Unit	27	23	16
	% Moisture	1 %			
	Total Recoverable Thallium	mg/kg	3.1	3.1	0
Metals	Total Recoverable Arsenic	mg/kg	10	8	22
	Total Recoverable Cadmium	mg/kg	0.43	0.49	13
	Total Recoverable Chromium	mg/kg	36	31	15
	Total Recoverable Copper	mg/kg	6	7	15
	Total Recoverable Lead	mg/kg	13.6	14.2	4.3
	Total Recoverable Nickel	mg/kg	7	8	13
	Total Recoverable Zinc	mg/kg	72	77	6.7
Polycyclic Aromatic Hydrocarbons	1-Methylnaphthalene	mg/kg	0.62	0.88	35
	2-Methylnaphthalene	mg/kg	0.66	0.97	38
	Perylene	mg/kg	0.049	0.062	23
	Acenaphthylene	mg/kg	<0.014	<0.013	7.4
	Acenaphthene	mg/kg	<0.014	<0.013	7.4
	Anthracene	mg/kg	0.046	0.138	100
	Benzo[a]anthracene	mg/kg	0.035	0.049	33
	Benzo[a]pyrene (BAP)	mg/kg	0.014	0.018	25
	Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg	<0.014	0.02	96
	Benzo[e]pyrene	mg/kg	0.023	0.043	61
	Benzo[g,h,i]perylene	mg/kg	0.27	0.85	104
	Benzo[k]fluoranthene	mg/kg	<0.014	<0.013	7.4
	Chrysene	mg/kg	0.041	0.06	38
	Dibenzo[a,h]anthracene	mg/kg	<0.014	<0.013	7.4
	Fluoranthene	mg/kg	0.046	0.052	12
	Fluorene	mg/kg	0.032	0.042	27
	Indeno(1,2,3-c,d)pyrene	mg/kg	<0.014	0.034	132
	Naphthalene	mg/kg	0.37	0.49	28
	Phenanthrene	mg/kg	0.45	0.59	27
	BAP equivalent (NES Calculation)	mg/kg	0.02747	0.03657	28
Pyrene	mg/kg	0.094	0.158	51	
Total Petroleum Hydrocarbons	C7 - C9	mg/kg	37	86	80
	C10 - C14	mg/kg	<20	20	67
	C15 - C36	mg/kg	167	400	82
	Total hydrocarbons (C7 - C36)	mg/kg	200	500	86

Sample ID	QU2_0.5	QAQC2	RPD
Laboratory Code	1793996.4	1793996.7	
Area	Waste Stockpile	Waste Stockpile	
QA/QC Acceptance Criteria			<50

LOR		Unit			
Other	% Moisture	1 %	27	23	16
	Total Recoverable Thallium	mg/kg	3.1	3.1	0
Heavy metals	Total Recoverable Arsenic	mg/kg	10	8	22.22222
	Total Recoverable Cadmium	mg/kg	0.43	0.49	13.04348
	Total Recoverable Chromium	mg/kg	36	31	14.92537
	Total Recoverable Copper	mg/kg	6	7	15.38462
	Total Recoverable Lead	mg/kg	13.6	14.2	4.316547
	Total Recoverable Nickel	mg/kg	7	8	13.33333
	Total Recoverable Zinc	mg/kg	72	77	6.711409
Polycyclic Aromatic Hydrocarbons Screening in Soil	1-Methylnaphthalene	mg/kg	0.62	0.88	34.66667
	2-Methylnaphthalene	mg/kg	0.66	0.97	38.03681
	Perylene	mg/kg	0.049	0.062	23.42342
	Acenaphthylene	mg/kg	0.007	0.0065	7.407407
	Acenaphthene	mg/kg	0.007	0.0065	7.407407
	Anthracene	mg/kg	0.046	0.138	100
	Benzo[a]anthracene	mg/kg	0.035	0.049	33.33333
	Benzo[a]pyrene (BAP)	mg/kg	0.014	0.018	25
	Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg	0.007	0.02	96.2963
	Benzo[e]pyrene	mg/kg	0.023	0.043	60.60606
	Benzo[g,h,i]perylene	mg/kg	0.27	0.85	103.5714
	Benzo[k]fluoranthene	mg/kg	0.007	0.0065	7.407407
	Chrysene	mg/kg	0.041	0.06	37.62376
	Dibenzo[a,h]anthracene	mg/kg	0.007	0.0065	7.407407
	Fluoranthene	mg/kg	0.046	0.052	12.2449
	Fluorene	mg/kg	0.032	0.042	27.02703
	Indeno(1,2,3-c,d)pyrene	mg/kg	0.007	0.034	131.7073
	Naphthalene	mg/kg	0.37	0.49	27.90698
	Phenanthrene	mg/kg	0.45	0.59	26.92308
	BAP equivalent (NES Calculation)	mg/kg	0.02747	0.03657	28.41974
Pyrene	mg/kg	0.094	0.158	50.79365	
Total Petroleum Hydrocarbons	C7 - C9	mg/kg	37	86	79.6748
	C10 - C14	mg/kg	10	20	66.66667
	C15 - C36	mg/kg	167	400	82.18695
	Total hydrocarbons (C7 - C36)	mg/kg	200	500	85.71429



1.0 LIMITED SOIL SAMPLING DATA QUALITY ASSURANCE

1.1 Overview

A quality control program was implemented as part of the Tauranga Bay Quarry (the Quarry) limited soil sampling. The quality control program comprised the collection and analysis of a field duplicate samples and a review of the laboratory internal quality assurance and quality control (QA/QC) results.

The quality control program results are summarised below.

1.2 Results of Soil Sampling QA/QC

Sixteen primary soil samples and two duplicate samples were collected during the sampling assessment. Of the samples collected, nine primary samples and one of the duplicate samples were analysed. This satisfies the minimum target replicate collection rate of one in 10. The duplicate sample was tested for the same analytes as the respective primary sample.

Results of duplicate analysis are presented in Table J1 (included in this Appendix). The relative percentage differences (RPD) between the laboratory-reported concentrations for the primary sample and the field duplicate sample were calculated (Table J1). RPD values for heavy metals and BAP equivalent results were found to be below the accepted maximum value (50 %).

RPD values for the analytes anthracene, benzo[e]pyrene, benzo[g,h,i]perylene, indeno(1,2,3-c,d)pyrene, and total petroleum hydrocarbons C₇-C₃₆ were found to be above accepted maximum value.

The reason for these RPD exceedance is thought to be due to the heterogeneous nature of the waste stockpile where the sample was obtained. While Golder did its best to maintain consistency between the collection of primary and duplicate samples, it is difficult to ensure analogously impacted material is shared evenly between primary and duplicate samples. However, RPDs for most analytes were below 50 % and where a duplicate result reported higher concentrations of an analysis compared to the primary sample, this result was considered in the overall contamination assessment. As such, Golder considers that the repeatability of the data is of acceptable quality.

Overall, the quality of the data is considered to be acceptable for the purposes of this assessment.

APPENDIX K

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